The 2002–2003 University Catalog

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Equal Opportunity/Affirmative Action

George Mason University is an equal opportunity/affirmative action institution. See the “General Policies” chapter in this catalog for a full statement of the university’s equal opportunity/affirmative action policies.
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Programs of Study

Organized by Degree Type

Undergraduate Degrees
Accounting B.S.
Administration of Justice B.S.
Anthropology B.A.
Art History B.A.
Art and Visual Technology B.A., B.F.A.
Biology B.A., B.S.
Chemistry B.A., B.S.
Civil and Infrastructure Engineering B.S.
Communication B.A.
Computer Engineering B.S.
Computer Science B.S.
Dance B.A., B.F.A.
Decision Sciences and Management
Information Systems B.S.
Economics B.A., B.S.
Electrical Engineering B.S.
English B.A.
Finance B.S.
Foreign Languages B.A.
Geography B.A., B.S.
Geology B.A., B.S.
Government and International Politics B.A.
Health, Fitness, and Recreation Resources B.S.
Health Science B.S.
History B.A.
Individualized Study B.A., B.S.
Integrative Studies B.A., B.S.
Interdisciplinary Studies B.A.I.S.
Management B.S.
Marketing B.S.
Mathematics B.A., B.S.
Medical Technology B.S.
Music B.A., B.M.
Nursing B.S.N.
Philosophy B.A.
Physical Education B.S.Ed.
Physics B.S.
Psychology B.A., B.S.
Public Administration B.S.
Religious Studies B.A.
Russian Studies B.A.
Social Work B.S.
Sociology B.A.
Systems Engineering B.S.
Theater B.A.

Undergraduate Certificate Programs
Applied Statistics
Child Welfare
Environmental Chemistry
Environmental Management
Gerontology
Leadership Studies
Operations Research and Engineering
Premedicine
Teaching English as a Second Language

Minors
Administration of Justice
American Government
Anthropology
Art History
Arts Administration
Astronomy
Biology
Business
Business Administration
Chemistry
Classical Studies
Computer Science
Dance
Data Analysis
Early Childhood Special Education
Earth Science
Economics
Electronic Journalism
Emotional Disturbance/Learning Disabilities
English
Exercise Science
French

Urban and Suburban Studies
Women's Studies

Interdisciplinary Minors
African American Studies
Ancient Mediterranean Art and Archaeology
Asia-Pacific Studies
Bioinformatics
Contemporary Europe
Film and Media Studies
Folklore and Mythology
Global Systems
Latin American Studies
Linguistics
North American Studies

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Minors (continued)
Geographic Information Systems
Geography
Geology
German
Health Promotion
History
International/Comparative Studies
Japanese
Jazz Studies
Latin
Legal Studies
Math for School of Management Students
Mathematics
Multimedia
Music
Philosophy
Physics
Psychology
Public Policy and Management
Religious Studies
Russian
Severe Disabilities
Social Work
Sociology
Spanish
Sport Management
Telecommunications
Theater
Tourism and Event Management
Graduate and Professional Degrees
Advanced Clinical Nursing M.S.N.
Applied and Engineering Physics M.S.
Art and Visual Technology M.A. M.F.A.
Bioinformatics Ph.D.
Biology M.S.
Biosciences Ph.D.
Business Administration M.B.A.
Chemistry M.S.
Civil, Environmental and Infrastructure Engineering M.S., Ph.D.
Communication M.A.
Community College Education D.A.
Computational Sciences and Informatics Ph.D.
Computer Engineering M.S.
Computer Science M.S., Ph.D.
Conflict Analysis and Resolution M.S., Ph.D.
Counseling and Development M.Ed.
Creative Writing M.F.A.
Cultural Studies Ph.D.
Curriculum and Instruction M.Ed.
Dance M.F.A.
E-commerce M.S.
Economics M.A., Ph.D.
Education Ph.D.
Education Leadership M.Ed.
Electrical and Computer Engineering Ph.D.
Electrical Engineering M.S.
English M.A.
• Linguistics
• Literature
• Professional Writing and Editing
• Teaching of Writing and Literature
Enterprise Engineering and Policy M.S.
Environmental Science and Policy M.S.
Environmental Science and Public Policy Ph.D.
Executive M.B.A. M.B.A.
Exercise, Fitness, and Health Promotion M.S.
Foreign Languages M.A.
Geographic and Cartographic Sciences M.S.
Health Systems Management M.S.
History M.A., Ph.D.
Information Systems M.S.
Information Technology Ph.D.
Interdisciplinary Studies M.A.I.S.
• Individualized Studies
• Liberal Studies
International Commerce and Policy M.A.
Knowledge Management M.S.
Law J.D., J.M.*
*For information on these degree programs, consult the School of Law at (703) 993-8000.
Mathematics M.S.
Music M.A.
New Professional Studies M.A., M.S.
• Bioinformatics
• Biotechnology
• Forensic Biosciences
• Organizational Learning
• Peace Operations
• Teaching
Nursing M.S.N., M.S.N./M.B.A., Ph.D.
Operations Research M.S.
Physics, Applied and Engineering M.S.
Psychology M.A., Ph.D.
Public Administration M.P.A.
Public Policy M.P.P., Ph.D.
Social Work M.S.W.
Sociology M.A.
Software Engineering M.S.
Special Education M.Ed.
Statistical Science M.S.
Systems Engineering M.S.
Technology Management M.S.
Telecommunications M.A., M.S.
Transportation Policy, Operations, and Logistics M.A.
Graduate Certificate Programs
Administration of Justice
Advanced Graduate Studies in School Psychology
Advanced Studies in Teaching and Learning
Alternative Education
Applied Behavior Analysis
Applied Statistics
Assistive Technology
Association Management
Chief Information Officer
Collaboration and Learning in Policy Organizations
Command, Control, Communication, and Intelligence Systems
Engineering
Communications and Networking
Community College Education
Computational Modeling
Computational Techniques and Applications
Computer Networking
Conflict Resolution for Health Professionals
Culture and Values in Social Policy
Curriculum and Instruction
Discovery, Design and Innovation
Early Childhood Education
Environmental Management
E-commerce
Federal Statistics
Gerontology
Global Trade Management
Governance Systems and Policy Management
History
Information Engineering
Information Policy and Administration
Information Systems Security
Instructional Technology
Integration of Technology in Schools
International Business Planning
International E-commerce and Telecom Policy
International Institutional Policy
International Market Analysis
International Nursing
Library Media
Literacy
Managing International Commerce
Mathematics
Military Operations Research
Multimedia Development
Nonprofit Management
Nursing Administration
Nursing Education
Operations Research and Engineering
Organizational Informatics and Policy Enterprise
Post-master's Counseling Licensure
Professional Writing and Editing
Quality Improvement and Outcomes Management in Health Care Systems
Regional Economic Development and Technology Policy
Regional Trade Policy and Planning
School Counseling Leadership
Science Education
Science, Technology, and the Global Economy
Signal Processing
Software Systems Engineering
Systems Engineering for Computer, Information, and Software Intensive Systems
Teaching of English as a Second Language
Transportation and Logistics Policy
VLSI Design/Manufacturing
Wireless Communications
Women's Studies

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Organized by Unit

College of Arts and Sciences

Biology
- Biology minor, B.A., B.S., M.S.
- Medical Technology B.S.

Chemistry
- Chemistry minor, B.A., B.S., M.S., certificate
- Environmental Chemistry certificate

Communication
- Communication B.A., M.A.
- Electronic Journalism minor
- International Telecommunications certificate
- Telecommunications minor, M.A.
- Telecommunications Management certificate
- Telecommunications Production Theory and Practice certificate

Economics
- Economics minor, B.A., B.S., M.A., Ph.D.

English
- Creative Writing M.F.A.
- English minor, B.A.
- English M.A.: Linguistics, Literature, Professional Writing and Editing, Teaching of Writing and Literature
- Professional Writing and Editing certificate
- Teaching of English as a Second Language certificate

Environmental Science and Policy
- Earth Science minor
- Environmental Management certificate
- Environmental Science and Policy M.S.
- Environmental Science and Public Policy Ph.D.
- Geology minor, B.A., B.S.

Geography
- Geographic Information Systems minor

Geographic and Cartographic Sciences M.S.
- Geography minor, B.A., B.S.

History and Art History
- Art History minor, B.A.
- History minor, B.A., M.A., Ph.D.

Mathematical Sciences
- Mathematics minor, B.A., B.S., M.S.
- Mathematics for School of Management Students minor

Modern and Classical Languages
- Foreign Languages B.A., M.A.
- Minors: Classical Studies, French, German, Japanese, Latin, Russian, Spanish

Philosophy and Religious Studies
- Philosophy minor, B.A.
- Religious Studies minor, B.A.

Physics and Astronomy
- Physics minor, B.S.
- Astronomy minor
- Applied and Engineering Physics M.S.

Psychology
- Psychology minor, B.A., B.S., M.A., Ph.D.
- Advanced Graduate Studies in School Psychology certificate

Public and International Affairs
- Administration of Justice B.S., certificate
- Government and International Politics B.A.
- Public Administration B.S., M.P.A.

Graduate Certificates:
- Association Management
- Information Policy and Administration
- Nonprofit Management
- Administration of Justice

School of Computational Sciences
- Bioinformatics Ph.D.
- Bioinformatics (New Professional Studies) M.S.
- Biotechnology (New Professional Studies) M.S.
- Computational Science M.S.
- Computational Sciences and Informatics Ph.D.
- Computational Techniques and Applications certificate
- Earth Systems Science M.S.
- Forensic Biosciences (New Professional Studies) M.S.

Institute for Conflict Analysis and Resolution
- Conflict Analysis and Resolution M.S., Ph.D.

Graduate School of Education
- Counseling and Development M.Ed.
- Curriculum and Instruction M.Ed.
- Education Ph.D.
- Education Leadership M.Ed.
- Special Education M.Ed.
- Teaching (New Professional Studies) M.A.

Certificates:
- Advanced Studies in Teaching and Learning
- Alternative Education
- Applied Behavior Analysis
- Assistive Technology
- Curriculum and Instruction
- Early Childhood Special Education
- History
- Instructional Technology
- Integration of Technology in Schools
- Library Media
- Literacy
- Mathematics
- Multimedia Development
- Post-master's Counseling Licensure
- School Counseling and Leadership
- Science Education

Minors:
- Early Childhood Special Education
- Emotional Disturbance/Learning Disabilities
- Severe Disabilities

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Health, Fitness, and Recreation Resources

Exercise, Fitness, and Health Promotion, M.S.
Health, Fitness, and Recreation Resources, B.S.
Physical Education B.S.Ed.
Recreation Resources Management, M.A.I.S.

Minors:
- Exercise Science
- Health Promotion
- Sport Management
- Tourism and Events Management

School of Information Technology and Engineering

Applied and Engineering Statistics
Applied Statistics certificate
Data Analysis minor
Federal Statistics certificate
Signal Processing certificate
Statistical Science B.S./Accelerated M.S., M.S.
Study in Statistics, Ph.D.

Civil, Environmental, and Infrastructure Engineering

Civil, Environmental, and Infrastructure Engineering Ph.D.
Civil and Infrastructure Engineering B.S., B.S./Accelerated M.S., M.S.

Computer Science
Computer Networking certificate
Computer Science minor, B.S., B.S./Accelerated M.S., M.S., Ph.D.

Electrical and Computer Engineering

Communications and Networking certificate
Computer Engineering B.S., B.S./Accelerated M.S., M.S.
Electrical and Computer Engineering, Ph.D.
Electrical Engineering B.S., B.S./Accelerated M.S., M.S.
Study in Information and Software Engineering Ph.D.
Signal Processing certificate
VLSI Design/Manufacturing certificate

Information and Software Engineering

Information Engineering certificate
Information Systems M.S.
Information Systems Security certificate
Software Engineering M.S.
Software Systems Engineering certificate

Systems Engineering and Operations Research
Command, Control, Communications, and Intelligence certificate
Computational Modeling certificate
Military Operations Research certificate
Operations Research and Engineering certificate
Operations Research B.S./Accelerated M.S., M.S.
Systems Engineering B.S., B.S./Accelerated M.S., M.S.
Systems Engineering for Computer, Information, and Software Intensive Systems certificate
Study in Systems Engineering and Operations Research Ph.D.

Interdisciplinary Programs

E-commerce M.S.
Enterprise Engineering and Policy M.S.
Information Technology B.S., Ph.D.
Network Technology and Applications certificate
Systems Engineering B.S./Telecommunications B.S./Accelerated M.S., M.S.
Telecommunication Systems Modeling certificate
Wireless Communications certificate

Information and Software Engineering

Information Engineering certificate
Information Systems M.S.
Information Systems Security certificate
Software Engineering M.S.
Software Systems Engineering certificate

Systems Engineering and Operations Research
Command, Control, Communications, and Intelligence certificate
Computational Modeling certificate
Military Operations Research certificate
Operations Research and Engineering certificate
Operations Research B.S./Accelerated M.S., M.S.
Systems Engineering B.S., B.S./Accelerated M.S., M.S.
Systems Engineering for Computer, Information, and Software Intensive Systems certificate
Study in Systems Engineering and Operations Research Ph.D.

Interdisciplinary Programs

E-commerce M.S.
Enterprise Engineering and Policy M.S.
Information Technology B.S., Ph.D.
Network Technology and Applications certificate
Systems Engineering B.S./Telecommunications B.S./Accelerated M.S., M.S.
Telecommunication Systems Modeling certificate
Wireless Communications certificate

School of Law

Law J.D., J.M.
*For information on these degree programs, consult the School of Law at (703) 993-8000.

School of Management

Accounting B.S.
Business minor
Business Administration minor, M.B.A.

Chief Information Officer certificate
Decision Sciences and Management Information Systems B.S.
Executive M.B.A. M.B.A.
Finance B.S.
Management B.S.
Marketing B.S.
Technology Management M.S.

College of Nursing and Health Science

Advanced Clinical Nursing M.S.N.
Health Science B.S.
Health Systems Management M.S.
Nursing B.S.N., M.S.N., M.S.N./M.B.A., Ph.D.

Certificates:
- Gerontology
- Conflict Resolution for Health Professionals
- International Nursing
- Nursing Administration
- Nursing Education
- Quality Improvement and Outcomes Management in Health Care Systems

College of Visual and Performing Arts

Arts Administration minor

Art and Visual Technology
Multimedia minor

Dance
Dance minor, B.A., B.F.A., M.F.A.

Music
Music minor, B.A., B.M., M.A.
Jazz Studies minor

Theater
Theater minor, B.A.
A Vision for the New Century

The university president developed George Mason's Vision Statement, after discussions with many others who care about the future of this vibrant institution, to give clarity to George Mason's fundamental character and aspirations. The vision is forward-looking and identifies the distinctive attributes and strengths of the university that are believed to be most important to its future.

The Innovative University for the Information Society

George Mason will be the university needed by a region and world driven by new social, economic, and technological realities.

We are in the right place: The nation's capital region is the epicenter of the world's political web, its information and communications network, and its new economy.

We are ready: In an age that demands originality and imagination, George Mason is among the nation's most innovative universities.

George Mason will:
• Be a magnet for outstanding faculty who will devise new ways to approach problems, invent new ways to teach, and develop new knowledge for the benefit of the region and nation.
• Attract inventive, industrious students of all ages and cultures and produce citizens who are intellectually and technologically literate—people who will lead by the force of their ideas.
• Transform into knowledge and wisdom the vast amounts of information now accessible through new technologies.
• Build strong alliances that bring the know-how of business and the community into the university and take the knowledge of the university into the workplace and the larger society.
• Be a center of inquiry, knowledge, and professional expertise in fields with vital implications for human needs and opportunities in the future.
• Remain innovative, resourceful, and responsive, while drawing on the intellectual and cultural heritage of the classical university.

by Alan G. Merten
President, George Mason University

A Distributed University

George Mason University is a distributed university with three campuses in Fairfax, Arlington, and Prince William counties, and two satellite sites in Herndon and Reston. Each campus has a distinctive academic focus that plays a critical role in the economy of its region. At each campus, students
About George Mason

The Fairfax Campus, situated on 677 acres of wooded land, offers a wealth of opportunities beyond the numerous academic programs and continues to be the principal center for undergraduate residence and life. The resident student population is expected to grow to 5,000 over the next five years as new residential units are constructed. The George W. Johnson Center, the first building of its kind in the country, fosters university-wide learning by integrating students' curricular and extracurricular activities and by strengthening relationships between the university's communities. The Center for the Arts and the Patriot Center offer the George Mason and Northern Virginia communities numerous opportunities to experience the arts, as well as sports and other entertainment. Professional artistic events presented on campus include music and dance from around the world; Theater of the First Amendment; and regional, national, and international visual art exhibitions. A designated number of free tickets is available to these events for full-time George Mason University students. The Aquatics and Fitness Center provides state-of-the-art exercise equipment and competitive and recreational swimming to the university community and outside teams.

Arlington Campus

Located in the heart of the Washington, D.C., metropolitan area, the Arlington Campus enjoys an alliance with more than 195 high-tech firms. George Mason's commitment to form relationships with area businesses provides students with direct access to employment experience and career opportunities.

The newest building is the beginning of a three-phase plan to develop the 5.2-acre site. Upon completion of all three phases, the Arlington Campus will include 750,000 square feet of space and many new facilities to accommodate its projected 8,000 undergraduate, graduate, and professional students.

The Arlington Campus offers courses that focus on economics, public policy, and public administration, and is home to the university's School of Law. The School of Information Technology and Engineering (IT&E) offers special certification courses in information technology through its Train to Technology program.

The Arlington Campus is the location of the Mercatus Center, the James M. Buchanan Center for Political Economy, and the Institute for Humane Studies, an independent entity affiliated with the university. These groups work together on projects of mutual interest. In addition, the campus houses the Professional Center, which works with the community to provide a venue for special events.

Prince William Campus

The Prince William Campus is a 124-acre site, located near the intersection of I-66 and the Route 234 Bypass. It serves all of Northern Virginia and provides convenient access to the university for citizens of Prince William, Fauquier, and western Fairfax counties; the cities of Manassas and Manassas Park; and adjoining areas to the west and south.

From the start, the campus has encouraged mutually beneficial relationships with the private sector. One example is the unique partnership between the School of Computational Sciences (SCS) and the American Type Culture Collection, the world's foremost archive of living cultures. The two entities share facilities and collaborate on ongoing research and workshops.

The primary focus of the campus is high-tech/bio-tech and emphasizes bioinformatics, biotechnology, and forensic biosciences educational and research programs, in addition to computer and information technology.

The new 300-plus seat, state-of-the-art Verizon Auditorium and the 110,000-square-foot Freedom Aquatic and Fitness Center are available to serve both university and community needs. The Freedom Center provides state-of-the-art exercise equipment, a full gymnasium, recreational and instructional swimming in the 50-meter competition pool, as well as the human performance laboratory, academic classrooms and other meeting space. The campus currently includes three buildings—one academic, one research and academic, and the Freedom Center. Plans for a third academic building are underway.

Herndon Training Center at the Center for Innovative Technology and Reston Lab

The Office of Continuing Professional Education (OCPE) Herndon Training Center, located off the Dulles Toll Road and Route 28, provides a wide range of yearly open enrollment seminars and workshops in their meeting facilities. The CIT classrooms are fully electronic and include a groupware platform. The School of Management's Executive Master of Business Administration program and the IT&E's Train to Technology program are located at the Herndon Training Center.

George Mason, 1725-92

When George Mason of Gunston Hall wrote the Virginia Declaration of Rights in 1776, he gave America the noble concept that the rights of the individual must be protected against the power of government. By placing in Virginia's first constitution a list of rights that could never be taken away from citizens, Mason sought to ensure a society in which government could not become all-powerful.

As a result of his influence, the first 10 amendments, which we know as the Bill of Rights, were added to the U.S. Constitution. The universal significance of this action made the American Revolution much more than a war for independence from Great Britain; it enshrined in our most important public document the principle that a government must always respect the rights of the people.

Mason, a slave owner, did not recognize that those rights extended to slaves. Nevertheless, his words were later used to demonstrate that slavery could not exist in a country that proclaimed its belief in human rights. In the United States we have not always adhered to Mason's great ideas, but they remain the measure of the best in our national life.
Highlights of George Mason’s History

George Mason University’s growing reputation as an innovative educational leader is rooted in Virginia’s strong educational tradition. By emphasizing the needs of its region, high technology, public policy, and the fine and performing arts, George Mason has created a curriculum and mission to meet the needs of Northern Virginia’s extraordinary cosmopolitan constituency.

The idea for George Mason University was born in 1949 when the Northern Virginia University Center, essentially an adult education extension of the University of Virginia at Charlottesville, opened under the direction of John Norville Gibson Finley. In 1955–6, the Board of Visitors of University of Virginia and Virginia legislature authorized the establishment of a two-year branch college to serve Northern Virginia, also under Finley.

The university’s formal history began in 1957 as University College, the Northern Virginia branch of the University of Virginia, offering courses in engineering and the liberal arts. It opened in a renovated elementary school in Bailey’s Crossroads with an enrollment of 17 students.

Eager to support the fledgling institution, the Town (now City) of Fairfax purchased 150 acres in 1958 and donated the land to the University of Virginia for a permanent branch campus. The following year, the University of Virginia Board of Visitors selected the name George Mason College. Construction of the campus’s first four buildings was completed in 1964. In September of that year, 356 students began their studies in the new classrooms.

In March 1966, the General Assembly authorized the expansion of George Mason College into a four-year, degree-granting institution and gave it the long-range mandate to expand into a major regional university. The first senior class received degrees in June 1968. Graduate programs began in September 1970, with the first master’s degrees conferred in June 1971. The George Mason College Board of Control, supported by citizens of Alexandria, Falls Church, and Arlington and Fairfax counties, acquired an additional 422 acres. By the end of 1970, the college’s Fairfax Campus reached 572 acres; it is now 677 acres.

In 1972, the Board of Visitors of the University of Virginia recommended that the college separate from its parent institution. On April 7, the governor signed the General Assembly legislation that established George Mason University as an independent member of the commonwealth’s system of colleges and universities.

Since 1972, the university’s development has been marked by rapid growth and innovative planning. In 29 years, enrollment has risen from 4,166 to nearly 25,000 students in 2001. In 1979, George Mason was given the authority to grant doctoral degrees and began offering programs at this level. In the same year, the university acquired what became George Mason University School of Law, located at the Arlington Campus.

In 1984, the first Robinson Professors, a group of outstanding scholars committed to undergraduate teaching and interdisciplinary scholarship, joined the faculty as the result of a generous bequest from Clarence J. Robinson.

Drawing prominent scholars from all fields, George Mason’s outstanding faculty also includes Pulitzer Prize winners, IEEE Centennial Medalists, and recipients of numerous Fulbright, National Science Foundation, and National Endowment of the Arts grants and awards, among others. The university’s 34 endowed chairs have also brought many artists and scholars to campus.

In 1985, George Mason, in partnership with area businesses, developed an engineering program geared toward the emerging information technology field and started the School of Information Technology and Engineering (IT&E). Through IT&E, George Mason was the first institution in the country to offer a doctoral degree in information technology.

The establishment of the Institute of the Arts in 1990 (which became the College of Visual and Performing Arts in 2000) solidified the university’s commitment to make the arts a pervasive part of students’ lives. The Center for the Arts and the arts complex, which includes art galleries, studio and rehearsal space, and performing venues such as Harris Theater and TheaterSpace, are all components of the college.

George Mason has expanded its presence to serve the entire Northern Virginia region by employing the revolutionary concept of the “distributed university.” Designed to help George Mason serve the needs of its region, the distributed universe consists of one university at multiple locations, with each location based on a programmatic theme that reflects the needs of the community. The Prince William Campus was established in partnership with state and county governments and the private sector. A partnership with American Type Culture Collection, the world’s foremost archive of living cultures, has led to academic programs focusing on the biosciences, which will make Prince William County a center for biotechnology.

The university is also expanding its presence in Arlington. Arlington I, completed in 1999, is a 132,000-square-foot building and the first in a three-phase plan to develop the 5.2-acre site. Arlington County recently approved a $5 million bond referendum to assist the university with the development of the second new building. The Phase II expansion, estimated to cost $42 million, will be a 240,000-square-foot building and public plaza, each with two levels of underground parking, located between Arlington I and the Original Building. The new building also will house an auditorium, art gallery, library, and conference space designed for educational and community use. Also, the George Mason University Foundation is working with the county to develop a commercial and parking structure next to the campus on Washington Boulevard.

The innovative George W. Johnson Center was dedicated on April 12, 1996. By combining student life resources with educational support facilities such as an interactive library, George Mason has created the learning workspace of the future. Educational administrators from around the world have toured the center.

George Mason University has achieved national distinction in many areas. Its reputation continues to grow as the university provides an educational, cultural, and economic resource for the people of Northern Virginia, the Commonwealth of Virginia, and the nation.

http://catalog.gmu.edu
The University's Mission

The mission statement of the Board of Visitors reads as follows:

George Mason University will be an institution of international academic reputation providing superior education for students to develop critical, analytical, and imaginative thinking and to make well-founded ethical decisions. It will respond to the call for interdisciplinary research and teaching, not simply by adding programs but by rethinking the traditional structure of the academy.

The university will prepare students to address the complex issues facing them in society and to discover meaning in their own lives. It will encourage diversity in its student body and will meet the needs of students by providing them with interdisciplinary and innovative undergraduate, graduate, and professional courses. The university will energetically seek ways to interact with and serve the needs of the student body.

The university will nurture and support a faculty that is diverse, innovative, excellent in teaching, active in pure and applied research, and responsive to the needs of students and the community. The faculty will embody the university's interactive approach to change both in the academy and in the world.

The university will be a resource of the Commonwealth of Virginia serving private and public sectors. It will be an intellectual and cultural nexus between Northern Virginia, the nation, and the world. (Adopted January 1991)

Faculty and Students

The university's more than 900 full-time instructional and research faculty members are experts in a broad range of fields, and have published widely, contributed to major research findings, and consulted with government and business. George Mason faculty members have received grants and awards from the Guggenheim Foundation, the Templeton Foundation, the National Science Foundation, the National Endowment for the Arts, the National Endowment for the Humanities, and are winners of Fulbright Scholar grants and Mellon Fellowships.

Of particular interest to undergraduates are the Robinson Professors, outstanding scholars in the liberal arts and sciences who have come to George Mason from prestigious positions elsewhere. They are concerned with broad and fundamental intellectual issues and are dedicated to undergraduate teaching. The Schedule of Classes printed every semester gives details about courses taught by Robinson Professors. The majority of the university's nearly 25,000 students are from Virginia, with all 50 states, the District of Columbia, and 130 countries and regions represented in the student body. While full-time undergraduates, 18 to 24 years in age, make up the largest student group, part-time graduate and undergraduate students account for nearly half of the student population. George Mason welcomes qualified students with a wide range of interests and backgrounds.

Accreditation

George Mason University is accredited by the Commission on Colleges of the Southern Association of Colleges and Schools to award bachelor's, master's, and doctoral degrees. George Mason is a member of the Council of Graduate Schools in the United States.

The George Mason University Foundation

Established in 1966, the George Mason University Foundation works to advance and further the aims and purposes of George Mason University. It is a 501(c)(3) nonprofit foundation organized and operated exclusively for the benefit of the university.

The foundation assists the university in generating private support, and manages, invests, and administers private gifts, including endowment and real property. It is governed by a volunteer Board of Trustees, led by a chairman. The vice president of University Development and Alumni Affairs of George Mason University serve as president of the foundation.
Admission to George Mason is competitive because the number of qualified candidates for admission exceeds the number of new students who can be accommodated. Each candidate who presents sufficient admission qualifications is reviewed in the context of other qualified applicants. An offer of admission is valid only for the semester for which the student applied. Programs with limited space or special requirements may need a second review process for admission.

Admission Procedures

Applying for Admission
Application for undergraduate admission should be made to the Office of Admissions. Application forms are provided on request or are available on the Internet at [www.admissions.gmu.edu/ugrad/onapps.html](http://www.admissions.gmu.edu/ugrad/onapps.html). A nonrefundable and nontransferable fee of $35 must accompany the application. (The international application fee is $75.) Catalog information, the Schedule of Classes, tuition information, campus events listings, and departmental information are available at [www.gmu.edu](http://www.gmu.edu).

Application Deadlines

The priority application deadline for fall admission is February 1 for freshman applicants and April 1 for transfer applicants. The application deadline for the spring semester is November 1. Applications for the 2003-2004 fall and spring semesters may be submitted starting July 1, 2002. George Mason encourages early applications from prospective freshmen who wish to be considered for academic scholarships. The university reserves the right to close applications before published deadlines if conditions so warrant. Admission decisions for freshmen are usually made after the first-semester grades of the senior year and all appropriate test results have been received by the Office of Admissions. Transfer decisions are made as files become complete. Admission is contingent upon satisfactory completion of in-progress course work and graduation from high school.

Early Admission

High school juniors who have completed high school graduation requirements except for senior English and government courses may, with the approval of their high school guidance counselor or principal, apply for admission and thereby enter the university one year early. Applicants should present above-average grades, Scholastic Assessment Test
The following table specifies the minimum units of college preparatory work required for admission, as well as the minimum units recommended. The recommended units reflect the typical high school program of students who have succeeded in competing for admission in recent years.

Columns (1), (2), and (3) refer to the following categories:

1. Students applying for a Bachelor of Arts [excluding those in category 3], Bachelor of Fine Arts, or Bachelor of Music program, or with an undeclared major
2. Students applying for a Bachelor of Science degree program, excluding those in category 3
3. Students applying with an intended major in pre-business, chemistry, computer science, engineering, geology, mathematics, or physics

<table>
<thead>
<tr>
<th>Column</th>
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<th>Recommended Minimum</th>
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<tbody>
<tr>
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</tr>
<tr>
<td>Total</td>
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<td>17</td>
</tr>
</tbody>
</table>

* Selected from algebra I, algebra II, geometry, trigonometry, analytic geometry, functions, math analysis, calculus.
** Selected from biology, chemistry, physics, or other advanced lab science.

Test Requirements

Freshman candidates for admission are required to take the SAT I or the ACT. All non-native English speakers are also required to take the TOEFL. Official test scores should be sent directly from the appropriate testing service.

Acceptance of Offer of Admission

The university complies with the national candidate reply date of May 1. Students confirm by completing the enrollment confirmation form provided in the admission packet and submitting it to the university with a $250.00 enrollment deposit. The deposit is non-refundable after May 1.

Right to Withdraw Offer of Admission

The university reserves the right to withdraw offers of admission if applicants fail to satisfy all requirements or if it is determined that admission was obtained through the use of falsified, altered, or embellished information. In the instance of withdrawal of admission from a matriculated student, credit earned at George Mason may be withheld.

Re-admission after Previous Attendance

Students who have missed two or more consecutive semesters of enrollment (excluding Summer Term) at George Mason University must apply for re-admission through the Office of Admissions if any of the following conditions are true:

- The student is an undergraduate returning after an absence during which he or she studied at another institution, without prior written permission of his or her school/college. Such students must reapply as transfer students.
- The student is a degree-seeking undergraduate who was last enrolled five or more years ago.
- The student is international, in F-1 or J-1 immigration status.
- The student was ever suspended or dismissed from any college/university for non-academic reasons.
- The student was academically dismissed from George Mason University.
- The student was ever convicted of a felony.

Re-enrollment after Previous Attendance

Unless any of the conditions requiring re-enrollment apply, students in good academic standing who have missed two or more consecutive semester of enrollment (excluding Summer Term) at Mason may re-enter the university by completing a Re-Enrollment Form available through the Registrar's Office.
Office. For graduate students and some undergraduate programs, academic department approval is also required.

Application for a Second Bachelor's Degree
Application for a second bachelor's degree following conferral of a first degree from any accredited institution must be conducted through the Office of Admission. After admission, the student will work with the academic program to develop an approved contract or course of study of at least 30 credit hours beyond the first degree. While this contract will detail college level and major requirements to be met, such students do not have to meet additional university General Education requirements. Determination of academic standing will begin anew for the second degree.

Transfer Requirements
The university accepts qualified students who wish to transfer from other regionally accredited colleges or universities. Transfer applicants must submit official transcripts from each collegiate institution attended. Transfer applicants with fewer than 30 transferable credits must also submit a copy of their secondary school record and test scores. All non-native English speakers are also required to submit a TOEFL score or acceptable grades (C or better) in at least two English composition/literature classes taken at another U.S. university/college.

Application for admission as a transfer student is competitive. Successful candidates for admission usually have a minimum of 2.50 on a 4.00 scale. Students on active social or academic probation, suspension, or dismissal are not eligible for transfer admission.

Transfer applicants who have been out of school for a semester or longer, excluding summers and school designated breaks, must provide the Admissions Office with a statement describing activities during this period. A resume may be submitted in lieu of a statement.

Transfer Credit
A student transferring into the university receives a formal evaluation of transfer credit following the offer of admission. The student is responsible for seeing that the Office of Admissions receives official transcripts of all course work taken elsewhere.

In general, credits are accepted from regionally accredited institutions, provided that a grade of C or better has been earned in the course, and that the course content is equal to that offered at George Mason University. Transfer credit is not granted for study in non-accredited institutions.

Forty-five credits of upper-level course work are required for graduation. While lower-level courses taken at previously attended institutions may meet the content requirement of some upper-level courses, they do not reduce the 45-credit requirement.

Students enrolled on a campus of the Virginia Community College System (VCCS) may access transfer information from a computer database located on the university's web site: www.admissions.gmu.edu/ugrad/transguide.

Credit to Be Earned at Other Institutions
A student who applies for admission to the university would not normally be expected to seek simultaneous credit enrollment at another collegiate institution. In those unique situations when a student does desire concurrent enrollment at another university/college, the student must obtain advance written approval from the appropriate George Mason dean. (This rule also applies to courses taken through the Consortium of Universities of the Washington Metropolitan Area.) This process permits a student to enroll elsewhere in a suitable course unavailable at George Mason. Catalog numbers and descriptions of courses to be taken elsewhere must be submitted with the request for approval. Students who enroll elsewhere without advance written permission while enrolled at George Mason may not receive transfer credit for course work taken at other institutions.

Admission of International Students

General Requirements
Application for admission to the university by international students holding or seeking F-1 or J-1 visas should be made directly to the Admissions Office before February 1 for the fall semester or October 1 for the spring semester. The deadline is enforced to ensure adequate time to process applications and prepare immigration documents. All international applications must be accompanied by a nonrefundable $75 application fee.

Applications from international students are reviewed with all other applications. Admission to the university is competitive; therefore, while minimum standards ensure that an application will be considered, they do not guarantee admission. The number of applicants, the qualifications of the applicant pool, and the amount of available space determine the number of offers of admission that the university can make. In addition to overall admission requirements, some schools and colleges have individual requirements for acceptance into the major. (See school or college admission requirements.)

Applicants who are accepted to a program will receive a written offer of admission. If the documentation submitted is satisfactory, the University will issue an immigration document (Form I-20 for F-1 status or IAP-66/DS2019 for J-1 status) and mail it to the address indicated on the application. Most students come to the U.S. on an F-1 visa, but students who are sponsored by the U.S. government or their home government may be required to enter the United States on an Exchange Visitor's Visa (J-1). The student will be notified if financial documents are not complete. International students outside the United States must take the immigration document to the nearest U.S. Embassy or Consulate and apply for a student visa (F-1 or J-1). A letter of admission, evidence of financial support, an immigration document, a valid passport, and proof of strong ties to the home country are the basic requirements for obtaining a student visa. For more information about the visa application process, check with the nearest U.S. Embassy or Consulate, or visit the Department of State's web site: www.state.gov.

Students in a nonimmigrant category other than F-1 or J-1 should also submit the International Student Information Form, indicating their immigration status, but they do not need to attach financial support documents. The Office of International Programs and Services (OIPS) should be contacted at 703 993-2970 for all questions pertaining to immigration status. Additional information is available on the OIPS web site at www.gmu.edu/student/oips.
Freshman and Transfer Requirements

Note: A transfer student is a student who has completed course work at a college or university after graduating from high school. In addition to the requirements defined for all transfer applicants, international transfer students must meet the standards listed below:

- Freshman applicants must submit certified copies of all secondary/high school transcripts in the original language along with an English translation (if applicable). Results of any exit certificates or university entrance examinations also must be submitted.
- All freshman applicants are required to submit satisfactory scores on the Scholastic Assessment Test I (SAT I) or the American College Test (ACT).
- Applicants whose native language is not English are required to submit the results of the Test of English as a Foreign Language (TOEFL). A minimum score of 230 on the computer-based TOEFL or 570 on the paper-based TOEFL and 4.5 on the TOEFL essay are required for an applicant to be considered for admission. Official test scores must be sent directly from the Educational Testing Service. Information concerning the time and place of the TOEFL can be obtained from TOEFL, Educational Testing Service, CN 6151, Princeton, NJ 08541-6151, USA. Phone: (609) 921-9000; web site: www.toefl.org, or by contacting the George Mason Testing Center; web site: www.admissions.gmu.edu/testing/asp.
- All transcripts from colleges or universities outside the United States must be translated into English, and evaluated by an accredited U.S. evaluation service before an admission decision can be made. The applicant is responsible for the timely translation and evaluation of documents and for all costs and fees associated with these services. A list of suggested evaluation agencies is available in the Admissions Office or at www.naces.org.
- International students already in the U.S. in F-1 status must complete immigration transfer procedures no later than two weeks after classes begin in their first semester at George Mason University. Contact OIPS for additional information at (703) 993-2970 or www.gmu.edu/student/oips.

Graduate Requirements

International students interested in pursuing graduate study must meet the following requirements:

- Students must complete the Application for U.S. Graduate Study.
- Applicants whose native language is not English are required to submit the results of the Test of English as a Foreign Language (TOEFL). A minimum score of 230 on the computer-based TOEFL or 575 on the paper-based TOEFL and 4.5 on the TOEFL Test of Written English (essay) are required for an applicant to be considered for admission. A TOEFL score of at least 250 (computer-based) or 600 (paper-based) is required to qualify for a teaching or research assistantship. Official test scores must be sent to the Admissions Office directly from the Educational Testing Service. Information concerning the time and place of the TOEFL can be obtained from TOEFL, Educational Testing Service, CN 6151, Princeton, NJ 08541-6151, USA. Phone: (609) 921-9000; web site: www.toefl.org, or by contacting the George Mason Testing Center; web site: www.admissions.gmu.edu/testing/asp.

- All transcripts from colleges or universities outside the United States must be translated into English, and evaluated by an accredited U.S. evaluation service before an admission decision can be made. The applicant is responsible for the timely translation and evaluation of documents and for all costs and fees associated with these services. A list of suggested evaluation agencies is available in the Admissions Office or at www.naces.org.
- Graduate students’ documents should show the award of either a bachelor’s degree or equivalent, or a graduate degree.

Additional Requirements for International Applicants

In addition to the academic requirements mentioned above, international students must meet the following conditions:

- Students enrolled at the university in F-1 or J-1 nonimmigrant status must maintain full-time enrollment each semester (12 credits for undergraduate, normally 9 credits for graduate), excluding Summer Term. Because of this requirement, F-1 or J-1 international students do not qualify for part-time programs.
- A prospective student seeking to enter the United States in F-1 or J-1 visa status (or, if already in the United States, seeking to transfer to Mason) must complete the International Student Information Form (which can be downloaded from http://admissions.gmu.edu). The form and financial support documents must be submitted along with the Application to the Admissions Office.
- In order to be issued an immigration document, sufficient evidence of financial support (original bank statement, scholarship letter, sponsor’s salary statement, graduate assistantship offer letter, for example), must be provided to cover the first year of study. Students must also demonstrate the source of financial support for all the subsequent year(s) of the program. The International Student Information Form gives an estimate of annual expenses, which includes tuition, living expenses, and health insurance.
- All new students at the university must submit an Immunization Requirements Card signed by a health professional. The form must verify that the student’s immunizations are current. The immunizations required are measles/mumps/rubella, and tetanus/diphtheria. A tuberculosis screening, hepatitis B (series of three) and meningococcal vaccines are also encouraged.
- Financial sponsors who wish to be billed directly must provide a U.S. billing address. It is the students’ responsibility to make sure tuition and fees are paid on time.

Health Insurance for International Students

- George Mason University policy requires all students on an F-1 or J-1 visa to have health insurance that is valid through August 18 of the following year. The plan must include coverage for health-care expenses of at least $50,000 per year and the deductible amount must not exceed $500. (The deductible amount is the sum of money that must be paid by the person enrolled in the health-care plan before the insurance company will start to pay any of the bills.)
- Special Note for J-1 Visa Holders: Federal law requires all students on a J-1 visa to have health insurance that includes coverage for medical evacuation and repatriation. The plan also must include costs associated with medical evacuation up to the amount of $10,000 and cost associ-
Admission 13

Admission Requirements
For degree status the general university graduate admission requirements are as follows:

- An earned baccalaureate degree from a regionally accredited institution of higher education
- A 3.0 GPA (on a 4.0 scale) or better in the last 60 semester hours of baccalaureate study. (For students with post-baccalaureate credits, a separate GPA is calculated for each institution.) Note: The minimum GPA may be higher for some graduate programs. The difficulty of the baccalaureate degree and work experience will be considered in making admissions decisions

Graduate Application Requirements
For full consideration for graduate admission, applicants must submit:

- A completed Application for Graduate Study
- A non-refundable application fee
- The Application for Virginia In-State Tuition Rates, if claiming entitlement to Virginia in-state tuition rates
- Two official copies of transcripts from each institution attended
- A goals statement
- Letters of recommendation as required by the program
- The official examination scores, i.e. GRE or Graduate Management Admissions Test (GMAT), reported directly from Educational Testing Service, as required by the program
- Any other materials (i.e.: departmental form, portfolio, interview) as specified by the program
- For international applicants (J-1 and F-1 visas), the International Student Information form and certified bank statement showing that first-year funds are available. Also see Admission of International Students, page 11.
- For non-native English-speaking applicants, the Test of English as a Foreign Language (TOEFL) with a score of at least 575 on the paper examination, or a 230 on the computer-based TOEFL

Specific departmental admission requirements for degree students are listed in this catalog under the relevant discipline, as well as in the Graduate Program Requirements Chart in the Application for Graduate Study.

Graduate Applications
Available on the Internet Graduate applications Internet addresses are:

School of Management (available on the web only):
www.som.gmu.edu/mba/application.html

School of Law: www.law.gmu.edu

All other graduate programs: www.admissions.gmu.edu

Requesting a Printed Application
We highly encourage you to access the appropriate graduate application on the web to apply for graduate admission. If you would like a paper application sent to you for any program (with the exception of the School of Law and the School of Management), please contact the Office of Admissions, MS 3A4, 4400 University Drive, Fairfax, VA 22030-4444, (703) 993-2400; e-mail: admissions@gmu.edu, or fax: (703) 993-2392. For the School of Law and the School of Management, use the contact information below to request a paper application.

Insurance coverage derived from unauthorized employment will not be accepted.

Exemptions from Health Insurance
Exemptions from health insurance requirements for international students are granted by the University’s Student Health Insurance Office. Conditions under which exemptions may be granted include:

- Students with the following sponsored foreign government plans are automatically eligible for exemptions: Kuwait, Saudi Arabia, Hariri Foundation, Oman, Qatar, United Arab Emirates, Egypt, and Malaysia (MSD or MARA plans only).
- Students with evidence of an alternative insurance policy that meets the requirements for coverage may be eligible for exemptions
- If a student believes he/she qualifies, it is his/her responsibility to apply for an exemption. An exemption must be obtained from the university’s Student Health Insurance Office no later than one week after the last day to add classes of the student’s first semester at the university. A continuing student is required to establish eligibility for an exemption no later than one week after the last day to add classes of each fall semester. Information regarding due dates and hours for the Student Health Insurance Office is available by calling (703) 993-2827.

Graduate Admission Policies
Admission to graduate programs is competitive. The criteria for admission selection differs by program and is established by the departmental faculty. Applicants are evaluated on the strength of their academic backgrounds, the results of standardized examinations (if required by the program), work experience, and any additional evidence of potential success in the program. Annually, departmental faculty determine the number of offers of admission they may extend by the university resources available for their program.

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For degree status the general university graduate admission requirements are as follows:

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- For international applicants (J-1 and F-1 visas), the International Student Information form and certified bank statement showing that first-year funds are available. Also see Admission of International Students, page 11.
- For non-native English-speaking applicants, the Test of English as a Foreign Language (TOEFL) with a score of at least 575 on the paper examination, or a 230 on the computer-based TOEFL

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- Any other materials (i.e.: departmental form, portfolio, interview) as specified by the program
- For international applicants (J-1 and F-1 visas), the International Student Information form and certified bank statement showing that first-year funds are available. Also see Admission of International Students, page 11.
- For non-native English-speaking applicants, the Test of English as a Foreign Language (TOEFL) with a score of at least 575 on the paper examination, or a 230 on the computer-based TOEFL

Specific departmental admission requirements for degree students are listed in this catalog under the relevant discipline, as well as in the Graduate Program Requirements Chart in the Application for Graduate Study.

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Graduate Admissions Processing Centers
The graduate admissions process is decentralized at the university. Applicants are directed to send their applications and support documents directly to the Graduate Admissions Processing Center assigned to their program. Specific mailing instructions are listed in the Application for Graduate Study. Once a graduate application is complete and ready to be evaluated for admission, the graduate application file is sent to the academic department for faculty admissions committee review. An applicant is notified by mail of the admission decision.

Below is a list of the Graduate Admissions Processing Centers with contact information. To check on the status of a graduate application, call the university 4GMU student information system at (703) 993-4468. Any other graduate admission questions may be directed to the specific Graduate Admissions Processing Center assigned to an applicant’s program by school, college, or institute.

College of Arts and Sciences (CAS)
College Hall, Room 119, MS 2D2
(703) 993-3699, fax: (703) 993-8714

College of Nursing and Health Science (CNHS)
Robinson Hall, Room A380, MS 5A8
(703) 993-1736, fax: (703) 993-3606

School of Computational Sciences (SCS)
PhD in Computational Sciences and Informatics
Science and Technology I, Room 103, MS 5C3
(703) 993-1990, fax: (703) 993-1993
M.S. in New Professional Studies: Bioinformatics, Biotechnology, Forensic Biosciences
Prince William Campus, MS 4E3
10900 University Boulevard Manassas, VA 20110
(703) 993-8487, fax: (703) 993-8401

Graduate School of Education (GSE)
Robinson Hall, Room A308, MS 4D1
(703) 993-2144, fax: (703) 993-2082

School of Information Technology and Engineering (ITE)
Science and Technology II, Room 160, MS 3D5
(703) 993-1505, fax: (703) 993-1633

School of Law
3401 North Fairfax Dr, Arlington, VA 22201
(703) 993-8000, fax: (703) 993-8088

School of Management (SOM)
Enterprise Hall, Lower Level, Room 156, MS 5A2
(703) 993-2136, fax: (703) 993-1778

School of Public Policy (SPP)
3401 North Fairfax Drive
Arlington, VA 22201

College of Visual and Performing Arts (CVPA)
Robinson Hall, Room A380, MS 5A8
(703) 993-1736, fax: (703) 993-3606

Institute for Conflict Analysis and Resolution (ICAR)
Robinson Hall, Room A308, MS 5A8
(703) 993-1736, fax: (703) 993-3606

Initiatives for Educational Transformation (IET)*
10900 University Blvd., Suite 217, MS 4E4
Manassas, VA 20110-2203
(703) 993-8320, fax (703) 993-8321

* This program requires special permission. Please contact the program administration at the number listed above.

Graduate Admission Examinations
Although a number of graduate programs do not require standardized tests, almost all will use test scores as an additional measurement of an applicant's qualifications. Please consult the Graduate Program Chart in the Application for Graduate Study for departmental admissions test requirements.

The George Mason University Testing Center offers computer-based graduate admissions examinations including the GRE, GMAT, TOEFL, and the Praxis Series. Exams are offered weekdays and some Saturdays. Students may register for an exam in person at the Testing Center, Krug Hall, Room 101, or by calling the appropriate national registration number listed below. For information regarding the tests given by the Testing Center, call (703) 993-2390, or visit the Office of Admissions web site at www.admissions.gmu.edu.

Students who wish to take computer-based graduate admissions exams at George Mason should indicate George Mason’s Test Center Number: 7712 on their registration forms. Information and Registration Bulletins for all national graduate admissions exams are available at the information desk in the Johnson Center and at the brochure display in front of the Testing Center. To have official test scores sent to this university, list George Mason's Institutional Code: 5827 on the registration form.

The GRE may be taken in two forms: (1) the General Examination, and (2) the Subject Examinations. Some departments require official scores for both the General and the Subject Examinations. Students may schedule the computer-based GRE General Exam on campus in the Testing Center by calling (703) 993-2390 or (800) 473-2255. Students may register for the GRE Subject Exam on line at www.gre.org.

The GMAT is required of all applicants seeking an M.B.A and may be taken in lieu of the GRE for the M.S. in Information Systems. Students may schedule the computer-based GMAT on campus at the Testing Center by calling (703) 993-2390, (800) 462-8669, or on line at www.gmat.org.

The Miller Analogies Test (MAT) is a test of 100 analogies and may be a substitute for the GRE in some graduate programs. The MAT is not offered at George Mason, but may be taken at other local universities including the University of Maryland. To have the official MAT scores sent to George Mason, list George Mason's Institutional Code: 1768. For information about scheduling the MAT call (800) 622-3231 or visit the MAT web site at www.tpcweb.com/.

The Praxis I is required by the Graduate School of Education for graduate applicants to initial teacher licensure programs. Students may schedule the Praxis on campus in the Testing Center by calling (703) 993-2390, or (800) 853-6773.

Passing scores on both Praxis I and Praxis II examinations are required for program completion.

The TOEFL exam may be required for graduate applicants for whom English is not their first language. Students may schedule the TOEFL exam on campus at the Testing Center by calling (703) 993-2390, (800) 468-6335, or by visiting www.toefl.org.
Foreign Language Requirements
Certain graduate programs require students who have not already completed 12 undergraduate credits in a foreign language to satisfy a foreign language requirement. This may be accomplished by taking the appropriate courses or demonstrating the equivalent proficiency by passing an examination. Contact the academic program for information on demonstrating language proficiency. Examinations are administered by the Department of Modern and Classical Languages.

Admission of Graduate Degree Holders
An applicant holding one or more graduate degrees may earn an additional graduate degree in another discipline. For admission to a second graduate degree program, the applicant should submit an application, transcripts, and other documents as required by the second degree program. Course credits used to satisfy the degree requirements for the first graduate degree may not be used to satisfy the degree requirements for the second graduate degree at the university. In programs with overlapping or similar requirements, students will be advised in the subsequent degree program regarding appropriate course substitutions for subjects already covered.

Offer of Admission
The written offer of admission specifies the effective date of admission, the category of admission offered, and the name of the faculty advisor assigned to the applicant. This offer of admission is good only for the semester for which the applicant applies. The offer of admission must be accepted by returning an enrollment confirmation card. An individual whose offer of admission has lapsed must submit a new application and fee to be reconsidered for admission at a later date. Students may simultaneously apply for more than one graduate program, but if admitted to more than one program, may accept only one offer and pursue only one degree program at a time.

Provisional Admission
A degree-seeking graduate applicant with a baccalaureate degree who has not met all admissions requirements may be offered provisional admission if sufficient evidence is presented to suggest the applicant has the ability to pursue graduate work. As first priority when starting the graduate program, a provisionally admitted student must satisfy the conditions of admission. Once the student has satisfied the conditions specified in the offer of admission and submitted all admissions credentials, the provisional qualifier will be removed from the student's record. Written confirmation indicating the removal will be sent to the student from the college/school/institute dean or director.

If the student does not meet the admissions conditions within the time limit specified, the student may be terminated from the program. All applicants admitted provisionally are in degree-seeking status, and the course work taken appears as a part of their regular student record and does not need to be transferred.

Reactivation of Deferred Applications
Applicants are notified when action on an application has been deferred pending completion of courses that are prerequisite to graduate study in a chosen field. An applicant is encouraged to notify his/her program's Graduate Admissions Processing Center in writing as soon as the prerequisites have been met. The applicant is responsible for furnishing official transcripts confirming that the prerequisite courses have been satisfactorily completed. An admission decision cannot be made until these grades are received.

Change in Field of Graduate Study
Admission for graduate study is admission to a specific program. Therefore, a student is not free to change graduate programs at will. A student who wishes to change from one field of study to another must submit a new application and application fee. Previous acceptance into one graduate program does not guarantee acceptance into another.

Beginning Graduate Study during Summer Term
Applicants wishing to begin graduate work in summer must complete a standard application for graduate admission and be formally admitted before registering for summer.

Records Maintenance and Disposal
All admission documents, including academic records sent from other institutions, become part of the official university file and can neither be returned nor duplicated for any purpose. A student should maintain copies of official credentials for other personal use.

Admission credentials are retained for 24 months only and are subsequently destroyed if applicants (1) do not register for courses within the time period for which the offer of admission is valid, (2) have been denied admission, (3) do not respond to requests for additional information, or (4) fail to submit complete applications (including all official transcripts and test results).

Special Types of Enrollment

Extended Studies
The Extended Studies program enables students who have no immediate degree objectives, or may need to satisfy prerequisites for graduate admission, to enroll in courses for which they are qualified without seeking formal admission to the university. It is generally expected that Extended Studies enrollees have earned a minimum of 30 credits at another institution before applying for Extended Studies. Extended Studies applications are available through the Admissions Office or on the web at www.admissions.gmu.edu/extstud/onapps.html.

Extended Studies students may be restricted to undergraduate and 500- and 600-level graduate courses. Enrollment is based on eligibility criteria and availability of space in courses, and in high-demand fields may be restricted or prohibited. Prospective enrollees may be required to supply unofficial evidence of their academic background along with the Extended Studies application to the Admissions Office. Students enrolling in both undergraduate and graduate courses during the same semester will be charged at the graduate tuition rate.

Extended Studies enrollees are expected to achieve a semester average of at least C (2.000) in all undergraduate...
courses and at least B (3.000) in all graduate courses. Students who do not meet these criteria during two consecutive periods of enrollment are not permitted to register again through Extended Studies.

Extended Studies enrollees who wish to apply for admission to a degree program may do so at any time by following the standard undergraduate or graduate admission procedures. A maximum of 18 undergraduate credits may be applied to an undergraduate degree program. The Office of Admissions applies the same criteria for admission to Extended Studies students applying for undergraduate degree status as to students transferring from other institutions. Graduate students, with the approval of a school or college dean, may apply a maximum of 12 graduate credits towards a graduate program. If the admitted graduate student has transfer credit from another institution, the amount of applicable credit earned through Extended Studies may be reduced accordingly. Students must fulfill the degree requirements outlined in the catalog in effect at the time they are admitted as degree candidates.

Grades earned through Extended Studies remain a part of the student’s permanent record, are recorded on the standard university transcript, and are counted in determining the student’s future academic standing. Extended Studies students will be assigned to an academic unit on the basis of their educational plans as stated on their application. The academic unit will handle academic advising and determine the student’s eligibility to continue in the Extended Studies program. Students unsure of their future educational plans may consult Academic Support and Advising Services.

High School Guest Matriculant
Secondary school students who wish to take courses at George Mason for transfer back to their high schools may enroll through the Extended Studies program as high school guest matriculants. Students must submit a copy of their high school transcripts and PSAT or SAT scores with the Extended Studies Application to participate. In addition to the Extended Studies Application, high school students are required to have their counselor approve the course selection by signing the “High School Guest Matriculant Registration Approval Form” and returning the form to the Admissions Office with the Extended Studies Application. The High School Guest Matriculant Form is available from the Admissions Office homepage at www.admissions.gmu.edu/exstuds and can be faxed to the office at (703) 993-2392. Students who have completed Advanced Placement (AP) or International Baccalaureate (IB) exams should include copies of the results. High school teachers or counselors wishing to provide support for the student’s enrollment may e-mail Larry Beatty, Associate Dean of Admissions, at extendedstudies@admission.gmu.edu.

College Guest Matriculants
College students enrolled at other accredited institutions who wish to take courses at George Mason for transfer to their home institutes may enroll through the Extended Studies program as guest matriculants. It is recommended that students consult with their home colleges or universities before attempting to register for classes at Mason. Undergraduate or graduate guest matriculants require written permission from their home colleges or universities before admission. The responsibility for determining the transferability of the course work to the home institution lies with the student.

Students may submit an Extended Studies application through the Admissions web site at: www.admissions.gmu.edu/exstuds/onapps.html or contact the Admissions Office at (703) 993-2400 for more information.

Senior Citizens
The Extended Studies Enrollment Office coordinates enrollment under the Senior Citizens Higher Education Act of 1974, as amended and as applicable to the university. Under the terms of this act, eligible Virginia residents 60 years of age or older with a taxable income not exceeding $10,000 are entitled to enroll in courses offered for academic credit on a space-available basis without payment of tuition and fees. Senior citizens who meet the income eligibility requirement and who have completed a minimum of 75 percent of degree requirements may enroll in a degree program during normal registration periods without payment of tuition and fees. The Senior Citizen Tuition Waiver Form is available from the Registrar’s Office, (703) 993-2441, and on the Internet at http://registrar.gmu.edu/forms.html for senior citizens who want to participate.

In addition, the act provides for audit of courses offered for academic credit and also for enrollment in noncredit courses without payment of tuition and fees on a space-available basis, regardless of the taxable income level. Students seeking to audit a class must notify the Registrar’s Office when registering for classes. Tuition, however, may be charged for courses designed exclusively for senior citizen groups. No senior citizen may change registration status in any given semester once he or she has initially registered for classes.

Graduate Non-degree Status
School of Information Technology and Engineering (IT&E)
Admission for non-degree graduate study is suitable for those persons who do not currently wish to pursue a degree, but are interested in taking graduate IT&E courses. The following application materials should be submitted for consideration:

- IT&E non-degree application
- Official or unofficial transcripts
- Nonrefundable application fee
- Course Request Form
- Resume is optional

IT&E non-degree graduate application forms and information regarding future Open Houses is available on the web at http://ite.gmu.edu/grauates/open_house.htm.

Once the student receives an approved Course Request Form from IT&E, he/she may register via the telephone registration system (4GMU) or in person for the course. Approval for non-degree status does not guarantee admission for a degree program at a later date. Up to 12 credit hours taken in non-degree status may be transferred to an IT&E degree or certificate program, subject to the general rules for transfer of graduate credit. Students who do not register for the term for which they are accepted may have their enrollment postponed for one semester upon written request to the Admissions Office. Further information about IT&E programs and course offerings may be obtained from IT&E departmental offices or the IT&E Graduate Student Services Office, Science and Technology II, Room 100, (703) 993-1505.

http://catalog.gmu.edu
School of Computational Sciences
Non-degree status is available for professionals who are interested in taking a limited number of courses in the computational sciences and informatics (CSI) doctoral program. Up to 12 credit hours taken in non-degree status may be transferred into the CSI doctoral or certificate program at a later date. Note that approval for non-degree status does not guarantee admission into either the doctoral or certificate program. For admission into non-degree status, the student should have a 3.00 GPA or higher, and a B.S. degree in mathematics, computer science, engineering, or natural science. Exceptions are reviewed on an individual basis.

The following application materials should be submitted for consideration:

• CSI non-degree application
• Official or unofficial transcripts
• An nonrefundable application fee
• Resume is optional

The CSI non-degree application can be downloaded from the School of Computational Sciences website at www.csi.gmu.edu.

Graduate Course Enrollment by Undergraduates
Undergraduates may request approval to take a graduate course either for reserve graduate credit or for undergraduate credit. Special circumstances apply. See details in the Academic Policies chapter of this catalog or in the Schedule of Classes.

Summer Term
Summer enrollment is open to eligible undergraduate and graduate students on a priority registration basis. The Summer Term offers more than 750 daytime and evening classes in four sessions from five to eight weeks. Academic departments take advantage of the Summer Term's unique opportunities to schedule innovative as well as traditional courses.

Many undergraduate and graduate students use the Summer Term as a third semester with the option of taking up to 14 credits.

Academic Testing
Testing Center
Phone: (703) 993-2390
Fax: (703) 993-3917
Web: admissions.gmu.edu

As a means of assessing the academic preparation of its students, the university requires the submission of certain test information.

Students may obtain applications for the Test of English as a Foreign Language (TOEFL), Graduate Record Examination (GRE), Law School Admission Test (LSAT), Graduate Management Admission Test (GMAT), and Medical College Admission Test (MCAT) from the information desk in the Johnson Center or the Testing Center in Krug Hall, Room 101.

Computer-Based Testing (CBT)
The university, in cooperation with Educational Testing Services (ETS), has established a computer-based testing facility (CBT) in the Testing Center, Krug Hall, Room 101. The CBT facility offers computer-based GRE, GMAT, TOEFL and Praxis exams on a daily basis during the academic year. Students wishing to take any of the CBT tests should obtain the appropriate information and registration bulletin (available at the information desk in the Johnson Center and at the brochure display in front of the testing center) and indicate George Mason's Testing Center number: 7712 as their desired testing location. Space is limited to 15 people during a testing period, so it is to the student's advantage to register early. For additional information regarding computer-based testing facilities, please visit the Testing Center web site at http://admissions.gmu.edu.

Praxis Series of Tests
Persons seeking an initial teacher license in Virginia are required to satisfy the professional teacher's assessment prescribed by the Virginia Board of Education. As of July 1, 1996, the Virginia Board of Education requires the Praxis I: Preprofessional Skills Test (either paper-based or computer-based) and Praxis II: Subject Assessment Test.

The Graduate School of Education requires that Praxis I scores be submitted with an application to an initial teacher licensure program. Those scores become one of the multiple criteria used in making admission decisions.

The Praxis Registration Bulletin is available in Krug Hall, Room 101, and in Robinson Hall, Room A307. Call (800) 853-6773 to register for the computer-based test version of Praxis I. George Mason University's Computer-Based Testing Center (ETS Testing Center number: 7712) is in Krug Hall. Register online (www.teachingandlearning.org) for the PPST paper-based version of the Praxis II test.

Advanced Placement and Credit by Examination
Academic departments frequently revise information regarding credit by examinations. The most current information can be found at: www.admissions.gmu.edu/ugrad/acbe.html.

Advanced Placement (AP) Program
Students who have completed Advanced Placement (AP) examinations in secondary schools can receive academic credit. Additional information or requests to have AP scores forwarded to George Mason University can be obtained from the College Board web site at: www.collegeboard.org/ap/students/ or by calling (609) 771-7300.

International Baccalaureate (IB) Program
George Mason University recognizes the International Baccalaureate (IB) curriculum as a strong pre-university academic program and encourages applicants to complete the requirements for the IB diploma. Specific information regarding the IB program can be found at: wwwibo.org Advancement may be awarded for Higher Level (HL) examinations with scores of 5, 6, and 7. The International Baccalaureate North America Office, 475 Riverside Drive, 16th Floor, New York, NY 10015, must issue official transcripts before credit can be awarded. IB transcripts can be requested by calling (212) 696-4464.

The College Level Examination Program (CLEP)
Academic credit can be awarded based upon the successful completion of a number of College Level Examination Program (CLEP) Subject examinations. The University does
not recognize credit earned by the CLEP General examination. Effective June 1, 2001, the CLEP Subject examinations will be offered in a computer-based format. The policy regarding the awarding of CLEP credit will be posted at the “Credit by Examination” web site: www.admissions.gmu.edu/ugrad/acebe.html.

George Mason University Departmental Exams
Proficiency examinations are offered in a number of courses normally taken during the first two years. Credit is recorded for grades of C or above, but does not affect the student’s grade point average.

Students may not earn credit by examination for courses in which they are currently enrolled beyond the time allotted to add courses in that semester, or in courses already audited or failed at the university. Transfer students may not earn by examination any part of the 30 credits that must be completed at George Mason University to earn a degree.

English 101 Proficiency Exam
Students who pass the English 101 Proficiency Exam will receive three credits for English 101. The three-hour essay is based on a choice of topics. The exam is scheduled periodically during the semester. For additional information, please visit the English Department’s proficiency exam web site at: http://mason.gmu.edu/~stremicks/ or contact Stacey Remick-Simkins, Robinson Hall, Room A487, stremicks@gmu.edu.

English 302 Advanced Composition Exam
Students seeking to be exempt from English 302 may submit a written portfolio to the English Department. To qualify for the exemption, the written portfolio must demonstrate proficiency equal to that of students who have successfully completed English 302. The prerequisite for taking the English 302 advanced composition exam is 1) completion of 45 credits, 2) completion of English 101 or 100, and 3) completion of the literature requirement for the major. The English Department will accept a portfolio between September 1 and April 8. For additional information, please visit the English Department’s proficiency exam web site at: http://mason.gmu.edu/~stremicks/ or contact Stacey Remick-Simkins, Robinson Hall, Room A487, stremicks@gmu.edu.

Foreign Language Placement
The College Board SAT II test in a foreign language is used for placement in French, German, classical Greek, Italian, Latin, Russian, and Spanish. Freshman applicants who wish to receive the appropriate foreign language placement should take this exam during their senior year in high school. Students who have not taken the SAT II in foreign language may take it in the foreign language lab once on campus. The SAT II examination is mandatory for anyone who has studied one of these languages for at least two years, has no previous college credit in the language, and wishes to continue study of the same language at the university. Transfer students receiving credit for college-level foreign language study completed at other colleges do not usually need a placement test, but must consult the Department of Modern and Classical Languages to determine their correct placement.

It is the student’s responsibility to take a placement exam and obtain its results before enrolling in a foreign language course. The placement exam is given in conjunction with Orientation. The schedule can be found on the web at www.gmu.edu/departments/fild/LAB/test2.html. Specific information on interpreting test scores can be obtained from the Department of Modern and Classical Languages.

Students may not enroll for credit in a course at a level lower than the one in which they are placed. Students and instructors should attempt to identify and resolve cases of inappropriate placement during the first days of each course. For students whose degree program contains a foreign language requirement, the placement determines the maximum number of credits, if any, that will be needed to fulfill the requirement.

A foreign language placement is not required of international students who present evidence of having studied for four or more years in an educational institution where the primary language of instruction was other than English. These students will be considered to have fulfilled the foreign language requirement, but are not eligible for credit below the 300 level.

If through transfer credit, a placement test score, or George Mason course work, a student meets the prerequisite for a lower-division foreign language course that is not offered during a particular semester, the dean will normally grant permission to continue the foreign language sequence by allowing the students to take courses at another college or university.

Math Placement Exam
The Math Placement Exam is a computer-based test to help assess a student’s proficiency in math. Entering students are required to successfully complete the exam during orientation, unless they have received AP credit or transfer credit. The web address for the math placement test schedule is: http://cas.gmu.edu/math_placement/.
Tuition, Expenses, and Financial Aid

Student Accounts Office
North Chesapeake Module, Room 11
4400 University Drive, MS 2E2
Fairfax, Virginia 22030-4444
Phone: (703) 993-2484
Fax: (703) 993-2490

Tuition and Fees

General Guidelines and Student Responsibilities

1. Students are responsible for maintaining current addresses via the Internet (webGMU.gmu.edu), and for activating and checking their GMU e-mail accounts.

2. Registration shall not be considered completed unless all prior term outstanding balances due to the university are paid in full.

3. By registering for classes, students accept responsibility for charges for the entire semester.

4. Payments are due at the Cash Office (SUB I, Room 104) on or before 4:30 p.m. on due dates, regardless of postmark if mailed. Refer to the Payment Schedule and Academic Calendar in the Schedule of Classes for payment due dates and penalties.

5. The entire student's early registration may be cancelled if payment or payment arrangements are not made in full by the due date. A $25 cancellation fee is assessed.

6. Students who have not completed the financial aid process must be prepared to pay for their courses by the tuition due date or their classes may be dropped for non-payment. The amount of financial aid accepted and processed will be reflected in the account balance. If the amount of aid awarded is less than the charges, the difference must be paid by the tuition due date. Federal Direct Loan borrowers must submit a completed promissory note at least four weeks before the payment due date for these funds to be considered in the balance. Federal work-study awards cannot be deducted from the balance.

7. Failure to receive a reminder bill confirming charges does not waive the requirement for payment when due. The 4GMU telephone system (703-993-4GMU) will confirm balance due.

8. Students are responsible for dropping unwanted courses (including waitlist courses) by the drop dates and using the drop/withdrawal procedures published in each term's Schedule of Classes. Full or partial tuition liability may apply.

9. Non-returning students are responsible for submitting a written withdrawal to the Offices of the Registrar, Housing and Residence Life, and Student Financial Aid. Penalties may apply.

10. A few George Mason degree programs include academic credits that students must earn at other institutions. Students enrolling for such credits assume all financial responsibility directly with the other institutions.
11. Students enrolling in George Mason off-campus courses are assessed tuition and fees at the same rates as those for on-campus courses.

**Tuition and Required Fees**

**Tuition Charges Per Semester**

*Subject to change. For current tuition charges, call the Student Accounts Office at (703) 993-2484, option 4.*

Students are charged tuition rates according to their classification.

<table>
<thead>
<tr>
<th>In-State</th>
<th>Out of State</th>
<th>Tuition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Undergraduate</td>
<td>In-State*</td>
<td></td>
</tr>
<tr>
<td>Tuition</td>
<td>Graduate</td>
<td>$2,208</td>
</tr>
<tr>
<td>Per credit (fewer than 12 hrs.)</td>
<td>$2,502</td>
<td>$6,858</td>
</tr>
<tr>
<td>or more than 17 hrs.:</td>
<td>Tuition</td>
<td>$208.50</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$571.50</td>
</tr>
</tbody>
</table>

*Graduate rates may vary. Please contact your graduate program.

**Related Fees**

*(Applicable to all students)*

<table>
<thead>
<tr>
<th>In State</th>
<th>Out of State</th>
</tr>
</thead>
<tbody>
<tr>
<td>Application Fee</td>
<td>$35</td>
</tr>
<tr>
<td>Lab Fees</td>
<td>$15</td>
</tr>
<tr>
<td>Orientation/New Student Fee</td>
<td>$100</td>
</tr>
<tr>
<td>International Students Health Insurance Fee</td>
<td>N/A</td>
</tr>
</tbody>
</table>

**Eligibility for In-State Tuition**

To be eligible for in-state tuition charges, a person must have been domiciled in Virginia for at least one year before the semester for which in-state tuition is sought, or qualify through one of the exceptions. A person becomes domiciled in Virginia when legally capable of establishing a domicile and when physically present in Virginia with the present intention of remaining in the state indefinitely.

Domiciliary intent is a part of the definition of domicile. The student seeking the privilege of in-state tuition rates bears the burden of demonstrating such intent existed for at least one year.

A copy of the complete domicile legislation is available at the reserve desk in the Johnson Center Library.

**Change of Domicile Classification**

Domicile classification is made at the time of admission and is considered a Level One decision. Students who believe they qualify for in-state tuition after they have been admitted may apply for a change of domicile classification.

Out-of-state students who seek reclassification of their domicile status are strongly encouraged to complete a Request for Domicile Reclassification form so that a decision can be made before tuition payments must be made. All applications are processed in chronological order as of the date they are received. Reclassification requests are considered to be Level Two by the Registrar's office.

If a student is deemed out-of-state at Level Two, he or she can submit a Request for Reconsideration and/or appeal to the Third Level Domicile Appeals Committee within the time frame set forth in the letter denying in-state status. University procedures for appealing domicile decisions have been established pursuant to state law and are subject to change.

No requests will be accepted after the first day of classes within the semester for which the reclassification is sought. Out-of-state students with request(s) pending at the time of tuition billing will be billed at the out-of-state rate. Students subsequently determined to be in-state can request reimbursements from the Office of Student Accounts.

The Request for Domicile Reclassification form is available in the Registrar's Office, North Chesapeake Module, Room 1A, 703-993-2441. Questions should be addressed to the Registrar's Office.

**Penalties**

A student who fraudulently or knowingly provides false information in an attempt to evade payment of out-of-state tuition shall be charged out-of-state tuition for each term or semester attended, and may be subject to dismissal from the institution.

**Tuition Charges/Refunds for Dropped Courses**

Students are required to pay full or partial tuition for courses that they drop after the first week of classes. See the tuition liability dates in the Academic Calendar in the Schedule of Classes. In cases where charges are less than the payments on the student's account, a refund of the overpayment may be requested. A Refund Request form, available in Student Accounts and the Schedule of Classes, must be completed and submitted to the Student Accounts Office. Questions should be addressed to 703-993-2484. Check refunds payable to the student will come from the Virginia Department of Treasury in Richmond. Credit card refunds will be credited back to the originating credit cards.

**Special Registration Fee**

Students not enrolled in a credit-bearing course, but whose academic department certifies that they are pursuing an activity related to their George Mason matriculation, can retain active status to apply for or receive a degree, take an examination, or participate in cooperative education. Students pursuing a master's or doctor's degree have a requirement to maintain continuous enrollment. See under Graduate Policies in the Academic Policies chapter.

**Orientation/New Student Fee**

The Orientation/New Student Fee is a mandatory, non-refundable, one-time fee. It is charged to the account of every newly admitted, undergraduate degree-seeking student, regardless of Orientation attendance and enrollment status. The fee helps to cover costs associated with Orientation and new student programs throughout the first semester.

**Health Insurance Fee for International Students**

Health insurance is required for all F-1 and J-1 visa holders. The health insurance fee is deducted from all payments received by the university before funds are applied to tuition or other charges. Failure to make this payment can result in cancellation of classes. For more information, see also Additional Requirements for International Students in the Admission section.

**Tuition, Expenses, and Financial Aid**

http://catalog.gmu.edu
Private Music Instruction Fee

Subject to change. Private music instruction is arranged through the Department of Music on a fee-paying basis as follows:

For a music major or minor:
- half-hour lesson (1 credit) $164.50
- hour lesson (2 or 3 credits) $329.00

For a nonmajor:
- half-hour lesson (1 credit) $182.00
- hour lesson (2 credits) $364.00

Payment Methods

Where to Pay
Phone: 703-993-4GMU [703-993-4468], Option 4. MasterCard or VISA
Window: Cash Office, Student Union I, Room 104, 9 a.m. to 4:30 p.m., Monday to Friday
Drop Box: Outside Cash Office, Student Union I, Room 104
Fax: 703-993-2492. Use Fax Payment Authorization form in back of the Schedule of Classes and online at www.gmu.edu/service/fisservice/forms/index.html.

When to Pay
See Payment Schedule on page 2 in the Schedule of Classes for deadlines. Payments received at the Cash Office by 4:30 p.m., Monday to Friday, will be considered as that day's business. Please call 703-993-4GMU, Option 4, to confirm receipt of payment and balance due on account. Allow ample time for processing payments.

Payment Plan Options

Semester Payment Plan
A semester payment plan is available for students whose total balance due is at least $400. A payment contract is available at the Cash Office, Student Accounts Office, in the back of the Schedule of Classes, and online at www.gmu.edu/service/fisservice/forms/index.html. The contract must be submitted to the Cash Office with the required down payment (one-half of contracted amount plus $25 contract fee) by the due date. The contract fee is nonrefundable. Failure to pay the outstanding balance due by the due date on the contract will result in a late fee of up to $50, financial suspension, and normal George Mason University collection activity; and may prevent the student from being eligible to use this contract and defer payments in future terms.

Monthly Installment Plan
Students may budget all or part of their fall and spring tuition, room, and meal expenses in 10 equal monthly payments. Budgets are determined by the student and/or parent and must be a minimum of twice the fall semester balance due. A life insurance benefit is included in this plan. A minimum budget of $1,000 is required and an annual fee is charged. Failure to make budget payments will result in a cancelled budget, financial suspension, a late fee (up to $50), and normal George Mason University collection activity. For complete information, call Academic Management Services, 800-635-0120.

Third-Party Payment Authorizations
Students may receive an individual billing statement. Students must provide the third-party billing authorization or government training voucher before the student's individual payment due date to the Student Accounts Office, North Chesapeake Module, Room 13; or mail to MS 2E2, 4400 University Drive, MS 2E1, Fairfax, VA 22030-4444; or fax to 703-993-2460. See payment schedule on page 2 in the Schedule of Classes. The student's due date is based on the registration date(s). Third-party billing authorizations are accepted through the second week of each semester. Call 703-993-2484 for a copy of the third-party billing requirements or check the web at www.gmu.edu/service/fisservice/departments/students_acc/index.html (Adobe reader required).

Financial Penalties

Late Fee
Failure to make any payment on or before the due date results in a late fee of up to $50.

Nonpayment Cancellation Fee
Students whose classes are cancelled for nonpayment or insufficient payment of tuition are assessed a $25 fee. This fee is not removed upon re-registration.

Returned Check Fee
A $25 returned check fee will be charged for each unpaid check returned by the bank. If the returned check results in an unpaid account, an additional late fee will be charged, and financial suspension will result.

Financial Suspension
All academic services is withheld for students who are not in good financial standing with the university. This means that no transcripts are issued, no diplomas are released, and no registrations are permitted until outstanding obligations have been paid in full. Outstanding obligations include, without limitation, fines owed for traffic and parking violations, and to libraries of institutions and participating public libraries of the Consortium of Universities of the Washington Metropolitan Area.

Collection of Accounts
Failure to meet financial obligations to the university may result in the delinquent account being placed with a collection agency, the withholding of money from tax returns, and other collection procedures. Students are responsible for costs incurred by the university in collecting their delinquent accounts.
Expenses

Housing
Web: www.gmu.edu/student/living/
Phone: (703) 993-2720
Office of Housing and Residence Life
Modular Office on Buffalo Creek Court

George Mason University offers a variety of conveniently located housing options to meet the diverse needs of students living on campus. Upper-class students may choose from among living environments that include traditional-style residence halls, suites, apartments, and townhouses. The university requires freshman students to live in Presidents Park, traditional-style residence halls in quints, triples, and doubles. Housing costs for the 2002-2003 academic year will be approximately $1,385 to $2,250 per semester. All students in housing must provide a prepayment, which is applied to the spring semester rent. Housing assignments, including single rooms, are made on a priority and space-available basis.

Students living on campus are required to sign an academic (two-semester) year contract. Releases from the contract are granted only in cases of unforeseen hardship and carry a financial penalty. To obtain information regarding a contract release, contact the Office of Housing and Residence Life located in the Housing Module, on Buffalo Creek Court behind the University Commons residence cluster.

Dining Services
Student Union Building II, Room 2014
Phone: (703) 993-3300
Web: www.gmu.edu/univ_ctr/services/dining
Meal Plan Office
Student Union Building II, Lower Level, Room 1013
Phone: (703) 993-2870
Web: www.gmu.edu/univsrv/allunivcard/mealplans

George Mason Dining Services offers a variety of food options for students living on campus or commuting to any of the three George Mason campuses. The Dining Services locations at the Fairfax Campus include a traditional all-you-care-to-eat dining facility called Ultimate Dining at Ciao Hall, Student Union Building II; Union Station at Student Union Building I, and in the Johnson Center, several options including a food court featuring national names such as Chick-fil-A and Taco Bell Express; La Patisserie, a gourmet coffee shop; Mason's Market, featuring comfort foods; low-fat ethnic cuisine in the Bistro; and convenience stores. Dining Services units are also located at the Arlington and Prince William Campuses.

Meal plans for students living on campus range from $880 to $1,240 a semester. Students commuting to campus may choose from a variety of meal plans that range from $125 to $465 a semester. Faculty and staff meal plans are also available.

Dining Plan Changes
Meal Plan Office
Student Union Building II, Lower Level, Room 1013
Phone: (703) 993-2870

Increases in meal plans may be made at any time. The last day to decrease mandatory meal plans, however, coincides with the last day to add classes. Seniors with 90 credit hours, or students living in the townhouses or apartments are not required to have a meal plan. Changes must be made at the Meal Plan Office located on the lower level in SUB II, (703) 993-2870.

Motor Vehicle Registration Fee
Student Union Building II, Lower Level, Room 1014
Phone: (703) 993-2710

Students who park their vehicles on university property must register them with Parking Services and pay a fee for a parking decal. Decals are available for a year, semester, summer, or week. For decal sales and fine payments, come to the lower level of Student Union II; hours are Monday Thursday and Friday, 8:30 a.m. to 5 p.m., and Tuesday and Wednesday, 8:30 a.m. to 6 p.m. For special requests or problems, come to Student Union II, Room 1014, Monday through Friday, 8:30 a.m. to 5 p.m. Please see the Parking Policy under the General Policies Section of the catalog.

Financial Aid
Web: apollo.gmu.edu/finaid

Office of Student Financial Aid
South Chesapeake Module
E-mail: finaid@gmu.edu
Phone: 703-993-2353
Fax: 703-993-2350

The Office of Student Financial Aid provides a variety of services to help students finance their education. These services include financial counseling, referral and information resources, and financial assistance. Student financial assistance consists of grants, loans and work-study. Awards are based primarily on financial need, although there are some alternative resources available for those who may not qualify for need-based aid.

Located in South Chesapeake Module, the office is open Monday, Wednesday, Thursday, and Friday from 9 a.m. until 5 p.m., and Tuesday from 9 a.m. until 8 p.m. Financial aid counselors are assigned to students alphabetically based on students' last names, and are available daily on an appointment basis. For information, visit our web page or call (703) 993-2353.

To apply for financial aid, each year new and currently enrolled students must complete a Free Application for Federal Student Aid (FAFSA). George Mason's Federal School Code for the FAFSA is 003749. Priority consideration for all sources of financial aid is given to those students whose financial aid applications are on file with the Office of Student Financial Aid by March 1. To meet this priority filing date, students should file the FAFSA as soon as possible after January 1. The FAFSA can be filed on-line at www.fafsa.ed.gov or be picking up the form in the office.

Financial aid for Summer Term is generally limited to students graduating at the end of Summer Term or the fall semester. Contact the Office of Student Financial Aid for specifics regarding eligibility. The deadline for the summer aid application is available as of March 1.

All students receiving financial aid must:

* Be enrolled in an eligible degree or the TEAC certificate program for at least 6 credits in any given semester
• Maintain satisfactory academic progress as defined by the Office of Student Financial Aid, in accordance with federal guidelines (see below), and
• Be a U.S. citizen or eligible non-citizen as defined by the U.S. Department of Education

All aid recipients are responsible for becoming familiar and complying with applicable federal/state laws, university regulations, George Mason University student aid information resources, and the student aid satisfactory academic progress policy, which is detailed in the glossary section of our home page (apollo.gmu.edu/financialaid) or available in the Office of Student Financial Aid.

Satisfactory Academic Progress Standards for Financial Aid

Federal legislation governing the administration of federal programs requires colleges and universities to define and enforce standards of progress for students receiving or applying for financial aid. To comply with this legislation, the Office of Student Financial Aid has established a formal satisfactory academic progress policy.

For a detailed explanation of the satisfactory academic progress standards, visit the Student Financial Aid home page at apollo.gmu.edu/financialaid, call the Direct On-Line Aid Resource System (DOLARS) at (703) 993-4GMU (4468), or visit the Office of Student Financial Aid to obtain a copy of the policy.

The university administers federal, state, and other aid programs as outlined below:

Federal Programs
• Federal Perkins Loan Program
• Federal Supplemental Educational Opportunity Grant (FSEOG)
• Federal Work-Study (FWS)
• Federal Pell Grant
• Federal Direct Subsidized Stafford Loans
• Federal Direct Unsubsidized Stafford Loans
• Federal Direct Parent Loans for Undergraduate Students (FPLUS)

For more detailed information about these federal programs, refer to the Student Guide for Federal Financial Aid (available in the Office of Student Financial Aid), visit the student Financial Aid home page at apollo.gmu.edu/financialaid, or call DOLARS at (703) 993-4GMU.

State Programs for Undergraduate Virginia Residents

Eligibility for all state programs is based on the results received from the Free Application for Federal Student Aid (FAFSA). State grant funds are limited, so adherence to the March 1st priority filing date is critical.

Virginia Commonwealth Award
This program is open to undergraduate students who have demonstrated financial need, are enrolled at least half-time, and are domiciliary residents of Virginia.

Virginia Guaranteed Assistance Program (VGAP)
This program is a component of the Virginia Commonwealth Award Program that is open to first-time freshmen who demonstrated academic achievement in high school. VGAP awards may be renewable for up to four years.

Virginia College Scholarship Assistance Program (CSAP) Grant
This program uses a combination of federal and state funds to provide additional assistance to students who are enrolled at least half time, are Virginia residents, and who demonstrate significant financial need.

Graduate Student Assistance

Graduate Assistantships, Fellowships, and Scholarships
Graduate funding, exclusive of the federal financial aid programs identified earlier, is administered by the individual graduate programs. Students interested in pursuing graduate assistantships, fellowships, or scholarships should contact their graduate program.

Emergency Loan Programs

Mary E. Ferguson Emergency Loan Program
Currently enrolled students may borrow funds for legitimate emergencies excluding tuition, fees, books, and supplies. Emergency loans must be repaid within 30 days; overdue payment results in a late charge of $5 for each 30 days past due. Failure to repay the loan within 30 days, without requesting an extension for a reasonable justification, will result in financial suspension. Students financially suspended for nonpayment of an emergency loan are ineligible for any future emergency loans. Application is made through the Office of Student Financial Aid.

Doug Beaman Emergency Loan Program
The George Mason Alumni Association has established an emergency loan fund through which students may borrow up to $100; repayment is due within 30 days. The program is available to all students, with priority to children of alumni. Application is made through the Office of Student Financial Aid.

Lisa Kenaga Memorial Student Emergency Loan Fund
The Office of Student Financial Aid has established an emergency loan fund through which currently enrolled students may borrow funds for legitimate emergencies excluding tuition and fees. Emergency loans must be repaid within 30 days with a $10 processing fee; overdue payment results in a late charge of $5 for each 30 days past due. Failure to repay the loan within 30 days, without requesting an extension for a reasonable justification, will result in financial suspension. Students financially suspended for nonpayment of an emergency loan are ineligible for future emergency loans. Application is made through the Office of Student Financial Aid.

ROTC Scholarships
Please see Scholarship Programs in the ROTC section of the University Academic Programs and Resources chapter.
Knowledge of University Policies
Each student is responsible for knowing the rules, regulations, requirements, and academic policies of the university. The catalog is the normal repository of policy statements, but corrections, changes, or interpretations can be promulgated by other means, including electronic publication. When the university or one of its academic units makes changes in course requirements, grading procedures, and/or the level of qualitative performance expected of its students for acceptance into particular programs, academic standing, or graduation, the changes apply to all students enrolled in the university at the time of implementation of the change and thereafter.

Students have certain choices regarding the set of degree requirements under which they graduate, as detailed in the section Catalog Requirements for Degrees. The Special Collections section of the Fenwick Library has a copy of all previous catalogs (which may not be checked out but may be photocopied) for use by staff and students.

A student in doubt concerning an academic matter should consult a faculty advisor or dean.

Students are subject to the university’s stated policies regarding patents and copyrights. These policies are available at www.GMU.edu/pubs/osp/copypol.html and at www.GMU.edu/pubs/osp/patpol.html#author.

Official Communication with Students
Web: www.gmu.edu/email
The university will use electronic mail as an effective way of providing official information to students. Examples include notices from the library, notices about academic standing, financial aid information, class materials, assignments, questions and instructor feedback. Students are responsible for the content of university communication sent to their George Mason University e-mail account, and are required to activate that account and check it regularly. Students who prefer to use another e-mail system as their primary mailbox should place an e-mail forwarder in their university account. See the web site for further information about e-mail and other communication services.

Student Requests and Appeals
A student who wishes to request an exception to published academic regulations or to appeal decisions involving the application of academic regulations to a program of study may do so by submitting a petition to the head of the unit in which the student's program is housed (the department chair, institute director, school or college dean) or his/her designee. Appeal of Grade is a separate process described in the section Examinations and Grades. The process to appeal an
Academic Policies

Honor Committee decision is described in the section Honor System and Code.

Appeals of Academic Procedures
The University Academic Appeals Committee is the final locus for appeal of decisions regarding late withdrawal, late add, suspension, and dismissal for academic reasons. At its discretion, the committee may choose to review other individual cases that are relevant to the application of university-wide policies. Note that this committee is not charged to hear grade appeals or appeals of Honor Committee decisions. The committee consists of five faculty members, including at least one member of the Faculty Senate, and the provost (or designee) who serves in an ex officio, nonvoting capacity.

The student’s appeal must first be adjudicated by the unit (such as college or school) in which the student’s program of study is housed. A student who believes that the decision rendered at this level is unfair may appeal to the provost for referral to the committee. The committee hears cases only where procedural irregularities are clearly demonstrated or demonstrably questionable application of university policies to an individual case is shown.

The burden of proof rests with the student, and the student must provide clear and convincing documentation to support the contention that the decision was unfair. If the provost believes that the student has sufficient cause, the case is heard by the committee. The committee decision is final.

The provost is responsible for maintaining appeals records, determining whether students have just cause, and ensuring that complete documentation is available for all committee members. The committee normally meets at least twice each semester to ensure timely action regarding its cases. The committee communicates its decision to the student, the relevant unit, and the provost.

Ombudsman for Student Academic Affairs
Johnson Center, Room 245
(703) 993-3006

The ombudsman for student academic affairs is appointed by the provost to listen to student academic concerns, provide advice and referrals, and assist students with resolving academic conflicts. The ombudsman does not overturn academic actions but may recommend academic policy changes, where appropriate.

Privacy of Student Records
Office of the Registrar
Web: registrar.gmu.edu/ferpa.html

Annually, George Mason University informs students of the Family Educational Rights and Privacy Act (FERPA) of 1974. This act, with which the institution intends to comply fully, protects the privacy of education records, establishes the right of students to inspect and review their education records, and provides guidelines for the amendment of inaccurate or misleading data through informal and formal hearings. Students also have the right to file complaints with the Family Policy Compliance Office (U.S. Department of Education) concerning alleged failures by the institution to comply with the act.

The Notification of Rights under the Family Educational Rights and Privacy Act and the Public Notice Designating Directory Information detail students’ rights and the procedures implemented by the university to comply with FERPA. Both notices are published in the Schedule of Classes and are available on the web. Questions concerning the Family Educational Rights and Privacy Act may be directed to the Office of the Registrar.

Academic Assessment
Web: assessment.gmu.edu

Students may be called upon from time to time to participate in focus groups, to complete questionnaires or to contribute in some other way to this process. At any time, students may contact the Office of Institutional Assessment (http://assessment.gmu.edu) with concerns, comments, and recommendations about their educational experiences at George Mason University.

Further, all academic programs at George Mason University have student learning goals that are reflected in the curriculum and in extracurricular opportunities available to students. To find out more about the goals of a specific program, go to http://assessment.gmu.edu and click on “Academic Program Evaluation.”

Student Identification Card
Web: www.gmu.edu/universerv/allunivcard

After registering, each student should obtain a university photo identification card. It must be presented to use the library services and is required for admission to university events and when using university facilities after normal operating hours. It is not transferable and is validated each semester after payment is made for classes. Questions may be directed to the Photo ID Office at (703) 993-1004.

Change of Status and Address
Each student is required to maintain current contact and identifying information at the university, including permanent and local addresses, telephone numbers, student number and legal name. Each student must also maintain the university e-mail account assigned at the time of admission, forwarding to personal e-mail systems as desired. Students are responsible for official communications directed to university e-mail accounts.

Addresses should be updated over the Internet using webGMU. Name and social security number changes require official documentation and must be processed in person at the Office of the Registrar or with the original copy of a notarized request. Please see www.gmu.edu/email for further information about student e-mail and other communication services.

HONOR SYSTEM AND CODE

George Mason University shares in the tradition of an honor system that has existed in Virginia since 1842. The Honor Code is an integral part of university life. On the application for admission, students sign a statement agreeing to conform to and uphold the Honor Code. Students are responsible, therefore, for understanding the provisions of the code. In the spirit of the code, a student’s word is a declaration of good faith acceptable as truth in all academic matters. Cheating and attempted cheating, plagiarism, lying, and stealing of academic work and related materials constitute Honor Code violations. To maintain an academic community according to these standards, students and faculty must report all alleged violations of the Honor Code to the Honor Committee. Any student who has knowledge of, but
does not report, an Honor Code violation may be accused of lying under the Honor Code.

The Honor Committee is independent of the Student Government and the university administration. It is made up of students selected by the student body and has the primary duty of espousing the values of the Honor Code. Its secondary function is to sit as a hearing committee on all alleged violations of the code.

At the beginning of each semester, faculty members have the responsibility of explaining to their classes their policy regarding the Honor Code. They must also explain the extent to which aid, if any, is permitted on academic work. The complete Honor Code is printed below.

**Honor Code**

To promote a stronger sense of mutual responsibility, respect, trust, and fairness among all members of George Mason University, and with the desire for greater academic and personal achievement, we, the members of George Mason University, have set forth the following code of honor.

I. The Honor Committee

The Honor Committee is a group of students elected from the student body whose primary and indispensable duty is to instill the concept and spirit of the Honor Code within the student body. The secondary function of this group is to sit as a hearing committee on all alleged violations of the code.

II. Extent of the Honor Code

The Honor Code of George Mason University deals specifically with *cheating and attempted cheating, plagiarism, lying, and stealing*.

A. Cheating encompasses the following:

1. The willful giving or receiving of an unauthorized, unfair, dishonest, or unscrupulous advantage in academic work over other students
2. The above may be accomplished by any means whatsoever, including but not limited to the following: fraud; duress; deception; theft; trick; talking; signs; gestures; copying from another student; and the unauthorized use of study aids, memoranda, books, data, or other information
3. Attempted cheating

B. Plagiarism encompasses the following:

1. Presenting as one's own the words, the work, or the opinions of someone else without proper acknowledgment
2. Borrowing the sequence of ideas, the arrangement of material, or the pattern of thought of someone else without proper acknowledgment

C. Lying encompasses the following: The willful and knowledgeable telling of an untruth, as well as any form of deceit, attempted deceit, or fraud in an oral or written statement relating to academic work. This includes but is not limited to the following:

1. Lying to administration and faculty members
2. Falsifying any university document by mutilation, addition, or deletion
3. Lying to Honor Committee members and counsels during investigation and hearing. This may constitute a second charge, with the committee members who acted as judges during that specific hearing acting as accusers

D. Stealing encompasses the following:

Taking or appropriating without the permission to do so, and with the intent to keep or to make use of wrongfully, property belonging to any member of the George Mason University community or any property located on the university campus. This includes misuse of university computer resources (see the Responsible Use of Computing Policy section in the "General Policies" chapter). This section is relevant only to academic work and related materials.

III. Responsibility of the Faculty

Professors are responsible, to the best of their ability, for maintaining the integrity of the *learning and testing process, both in the classroom and outside of it, and for fostering conditions of academic integrity*. Faculty members may actively proctor examinations in situations that they believe warrant it.

To alleviate misunderstandings, all professors are required to delineate at the beginning of each semester what constitutes a violation of the Honor Code in their classes. This should include an explanation of

A. The extent to which collaboration or group participation is permissible in preparing term papers, laboratory exhibits or notebooks, reports of any kind, tests, quizzes, examinations, homework, or any other work
B. The extent to which the use of study aids, memoranda, books, data, or other information is permissible to fulfill course requirements and
C. Guidelines on what constitutes plagiarism, including requirements for citing sources

All professors are encouraged to send the Honor Committee a written copy of their Honor Code policies, which are kept on file. These requirements should also be stated before each test, examination, or other graded work to clarify what is permissible.

Faculty members who witness an Honor Code violation should proceed as outlined under Procedure for Reporting a Violation.

IV. Responsibility of the Students

Students should request a delineation of policy from each professor if none is given at the beginning of each semester. Professors should also request an explanation of any part of the policy they do not understand. Students are responsible for understanding their professors' policies with regard to the Honor Code. Students are also responsible for understanding the provisions of the Honor Code.

As participating members of this community, all students have the duty to report to a member of the Honor Committee, within the prescribed time outlined under Procedure for Reporting a Violation, any violations of the Honor Code. This duty is important not only because it enforces the Honor Code, but also because it gives all students the opportunity to express their respect for personal integrity and an honest academic community.

V. Procedure for Reporting a Violation

All students or faculty members witnessing or discovering a violation of the Honor Code should enlist, wherever and whenever possible, one or more corroborating witnesses to the overt act. The accuser(s) (student, faculty, or staff), within 15 working days from date of realization, notifies the Honor Committee.

http://catalog.gmu.edu
The Honor Committee will, within five working days, mail a letter of accusation to the suspected party. This letter is addressed to the accused student’s current mailing address listed with the Registrar’s Office. The letter informs the suspected parties that they have five Honor Committee working days to contact the Honor Committee office and make an appointment to see the committee chair (or his/her delegate), who advises them of their rights and options. The Honor Committee begins an investigation, which does not involve a presumption of guilt on the part of the accused. Any member of the George Mason University academic community who knows of but does not report an Honor Code violation may be accused of lying under the Honor Code.

VI. Counsel for the Accused and Accuser
Counsel for the accused and accuser may be provided by any member of the George Mason University student community, including members of the Honor Committee, but not including students of the School of Law.

VII. Appearance of Witnesses
The Honor Committee may require any member of the university community to appear as a witness before the committee at the time of the hearing. All requests for such appearances are issued by the chair of the Honor Committee, or by the counsel appointed to that case. The appearance of the accuser is required.

VIII. Verdict
To find a student guilty of an honor violation, there must be a four-fifths majority vote (four to one) for a verdict of guilty. Clear and convincing evidence must be presented to find the student guilty.

A student may not be tried more than once for the same offense except when an appeal is granted.

IX. Penalty
If the accused is found guilty of an honor violation, the Honor Committee determines the nature of the penalty by majority vote.

The Honor Committee is not restricted to one kind of penalty but determines one commensurate with the seriousness of the offense. Typical of the range of penalties that may be given are the following:

A. Oral reprimand: An oral statement to the student given by the chair of the hearing. No entry is made on the student’s scholastic record.

B. Written reprimand: A written censure placed in the confidential files of the Honor Committee and in the student’s academic file but not made part of the student’s scholastic transcript records.

C. Nonacademic probation: Exclusion from holding or running for an elected or appointed office in any organization or activity associated with the university. Ineligibility to participate in any activity representing the university on either an intercollegiate or club level and ineligibility to serve as a working staff member of any student organization. This action is noted in the judicial administrator’s file but is not made a part of the student’s scholastic record.

D. Service hours: Library or other supervised university service hours to be completed by a specific time. Upon completion, the hold on the student’s records is removed.

E. Failing grade: Recommendation in writing to the instructor for a grade of F for the work involved, or for the entire course. The student’s permanent record reflects the academic evaluation made by the instructor.

F. Recommendation of suspension from the university for one or more semesters: A student’s scholastic record would read, “Nonacademic suspension from (date) to (date).” The recommendation is made to the vice president for university life.

G. Recommendation of expulsion from the university: A student’s scholastic record would read, “Nonacademic expulsion as of (date).” This penalty is recommended to the vice president for university life only in extraordinary circumstances, such as for repeated offenses.

X. Appeal
A written request for an appeal, detailing new evidence, procedural irregularities, or other sufficient grounds that may have sufficient bearing on the outcome of the trial, must be presented to the chair of the Honor Committee within seven working days after the date on which the verdict was rendered.

The written request is reviewed by at least three voting members who were not involved with the original case. If a new hearing is granted, no voting member from the original hearing may vote in a second or subsequent hearing of the same case.

XI. Keeping of Records
The records of the hearing are kept in the Honor Committee’s files. These records include a tape or a full transcript of the hearing and all evidence presented at the hearing. If the evidence belongs to any person other than the accused, the original is returned to the owner and a copy kept with the records of the Honor Committee.

XII. Composition of the Committee
The Honor Committee is proportionally composed of students from each school and faculty advisor(s), although the latter are nonvoting members. Undecided majors, B.I.S. students, and continuing education students are considered together as a school. The total number of members is as close to one-half of one percent of the student body as possible. Freshmen are appointed in the fall to serve until the following spring election. One or more clerks appointed by the committee from the student body serve as aides to the chair.

The chair of the committee is elected by majority vote of the committee members. For each hearing, five members of the Honor Committee are designated as voting members.

A faculty hearing advisor, acting as a nonvoting member of the committee, sits with and advises the committee at all hearings. The faculty advisor and faculty hearing advisor are chosen by the Honor Committee.

Previous Honor Committee members may serve during the Summer Term.

XIII. Eligibility of Members
Any student who maintains a 2.0 grade point average and is in good standing with the university is eligible for the Honor Committee. A committee member must maintain a 2.0 average to continue in office.

XIV. Election of the Honor Committee
The Honor Committee is elected in the spring semester. The term of office begins upon election and runs until the following spring election.
In the fall semester the chair appoints new members to fill any vacancies that have occurred and to fill the freshman seats on the committee.

XV. The Challenging and Voluntary Withdrawal of a Member of the Committee from Participation in a Particular Hearing

An accused person who challenges the right of any member of the Honor Committee to sit in judgment on him or her must present cause to the chair of the hearing.

The hearing committee then decides the validity of the challenge with the challenged member abstaining from voting. A simple majority decides the validity of any challenge. A successfully challenged committee member must not be present during the hearing.

A member of the Honor Committee who feels prejudiced as to the facts of the case, is a close friend or relative of the accused, or would not be able to render an impartial judgment must withdraw from a specific hearing.

XVI. Provision for Amendments

Upon petition of 20 percent of the student body, amendments to or revisions of the Honor Code may be proposed for ratification. Said amendments and/or revisions are voted on by the student body as a whole. A two-thirds majority of the votes cast is necessary for acceptance of any amendment or revision.

The Honor Committee may also propose amendments to be voted on by the student body as described in paragraph one of this section.

Approved amendments take effect immediately for all new cases. New provisions are not applied to cases initiated prior to the amendments.

STUDENT WORK AND INTELLECTUAL PROPERTY

Copyrightable works, including dissertations and patentable works developed in connection with course work by students who are not university employees are deemed to belong to the student. However, George Mason University may claim copyright ownership of a work or ownership of a patentable invention when extraordinary use of university facilities, personnel, or resources is made in the development of the materials or invention, especially when unrelated to coursework. Ownership and disposition of intellectual property developed by students while employed by the university, including undergraduates and graduate research and teaching assistants, is governed by university policies applicable to university employees generally.

REGISTRATION AND ATTENDANCE

Pre-registration

Pre-registration for the next semester or Summer Term begins after mid-semester of fall or spring semesters, according to priority groups (graduate students, seniors, juniors, etc.). The Registrar's Office assigns each student an "appointment time" which is a specific date and time after which a student may register. The appointment time is based on the number of credits earned and in progress. Thus, appointment times will not be the same for all students within a particular priority group. Students should consult the Schedule of Classes, and 4GMU, (703) 993-4468, for information about their registration date and time.

Registration Procedure

The Schedule of Classes, made available by the Registrar's Office before priority registration each semester, contains written instructions for registration. Courses listed in the Schedule of Classes may be canceled if enrollment is insufficient. The university reserves the right to change the class schedule and adjust the individual section enrollment as necessary.

Registration is normally accomplished using the 4GMU telephone system. However, if a section is closed or if registration into a selected section is controlled, permission to enroll must be obtained from the academic program offering the course. The School of Management has its own process for granting this permission. For all other courses, the student must submit in person to the Registrar's Office a completed and signed Course Permit Form.

Students must be present at the first meeting of every laboratory course (lecture and laboratory) to validate their registration. If students cannot attend the first meeting, they must notify the instructor beforehand if they intend to continue in that section. Otherwise, their names may be stricken from the class roll in both lecture and lab.

Students are responsible for registering properly and paying the deadline. Students should confirm the correctness of their enrollments (including drop and add) by calling 4GMU, (703) 993-4468, or by using webGMU. Incorrect enrollments may subject students to both academic and financial penalties.

Students are responsible for full tuition payment and grades received for all courses in which they are registered unless (1) their registrations are canceled for nonpayment; (2) their registrations are canceled administratively due to suspension, dismissal or termination; (3) the section in which they are registered is canceled, or (4) they drop the course before the tuition liability begins. See the Schedule of Classes for deadlines (p.2).

Changing Registration: Drop/Add (Schedule Adjustment)

Registration changes must be completed within the schedule adjustment period defined below and indicated in the Schedule of Classes. Changes to registration are normally made using the 4GMU telephone system, (703) 993-4468.

The last day for adding a 14-week course is two calendar weeks after and including the first day of classes. The last day for dropping a 14-week course is five calendar weeks after the first day of classes (including the first day). Courses meeting for fewer than 14 weeks have add, drop, and tuition liability dates proportional to their length. These dates are published on the registrar's web site each semester.

All students are expected to enroll by the end of the add period through the official registration procedures. Students will not receive credit for courses unless their names are on the official class rosters and final grade sheets. "Retroactive credits" will not be awarded to students who report that they attended classes but were not on the official rosters. After the date listed in the Schedule of Classes for adding courses, add actions are limited to unusual circumstances beyond the student's control and require approval by the chair of the academic department offering the course.

http://catalog.gmu.edu
All students are expected to drop courses in which they do not intend to continue by the end of the drop period. Registration is not canceled for failure to drop courses properly. Further, registration is not canceled for failure to attend classes unless stated otherwise in the Schedule of Classes.

All classes for which a student is enrolled past the drop deadline will remain part of the official academic record. See Additional Grade Notations—Administrative Failure in the Final Examinations and Grades section. After the date listed in the Schedule of Classes for dropping courses, withdrawal approval is granted only for nonacademic reasons by the student's academic dean. Normally this approval is given for all courses at once, constituting withdrawal from a semester (see Withdrawal from a Semester).

No change of registration transaction is complete until it is processed by the Office of Student Accounts and the Office of the Registrar.

Students will not receive written confirmation of schedule changes and are responsible for checking their schedules on 4GMU or webGMU before the end of the add or drop period to verify that their schedules are correct and that they are properly enrolled. Students will not be allowed to remain in classes unless they are properly enrolled. Students will be responsible, both financially and academically, for all courses in which they remain officially enrolled.

Canceling Registration/Withdrawal
Students who cannot attend classes during the semester for which they have pre-registered should cancel registration using the 4GMU telephone registration system, (703) 993-4468, before the early registration deadline for payment. While students may be dropped from classes for non-payment, especially between the first payment deadline and the beginning of classes, they should never rely on the "drop for non-payment" procedure to remove unwanted course registrations. Students who withdraw after the first week of classes must complete a withdrawal form at the Registrar's Office. See the Drop/Withdrawal Chart in the Schedule of Classes.

Refunds of tuition on and after the first day of classes are made according to the Tuition Liability dates published in this catalog and the Schedule of Classes. Withdrawal after the last day for dropping a course (specified in the Academic Calendar) requires approval by the student's academic dean and is permitted only for nonacademic reasons that prevent course completion.

Withdrawal from a Semester
A student may withdraw from a semester after the end of the drop period without academic penalty only for nonacademic reasons that the student's academic dean approves as sufficient to merit an exception to policy. A student who stops attending classes without the dean's approval receives Fs in all courses. Withdrawal forms are available at the student's academic dean's office.

Upon withdrawal after the drop period, the following notation is made on the student's official transcript: "Withdrew voluntarily for nonacademic reasons."

Academic Load
The minimum full-time load for undergraduate students is 12 credits per semester. For graduate full-time load, see Classification of Students in the Graduate Policies section below. For planning purposes, applicants for admission are asked to indicate their preference for full- or part-time status and for day or evening classes. However, they may freely choose between evening and day sections of courses and may change their full- or part-time status.

Although many students must work to meet living expenses, employment must not take priority over academic responsibilities. Students employed more than 20 hours a week are strongly urged not to attempt a full-time academic load. Students employed more than 40 hours a week should attempt no more than six credits per semester. Students who fail to observe these guidelines may expect no special consideration for academic problems arising from the pressures of employment. Although 12 credits per semester represent a minimum full-time undergraduate load, students wishing to graduate in four years need to carry an average of at least 15 credits per semester. Written approval must be submitted to the Registrar's Office before students can register for more than the maximum allowable credits. The Overload Permission Chart, which declares maximum credits and approval authority for all categories of students, is published in the Schedule of Classes each semester.

Course Prerequisites and Co-requisites
Course prerequisites or co-requisites state requirements for student entry into courses and reflect necessary preparation for attempting the course. It is the student's responsibility to be aware of pre- and co-requisites as stated in the catalog, and to have taken prerequisites recently enough to be of value. A student not meeting the requirements may receive an e-mail reminder, and may be asked to drop the course. Graduate course prerequisites are normally met with a grade of B- or better; undergraduate course prerequisites are normally met with a grade of C- or better. Questions about pre- or co-requisites should be addressed to the academic department or to the instructor of the course.

Repeating a Course
Some courses are annotated in their catalog description as "repeatable for credit." These are courses in which students can receive additional credit for more than one taking of the same course, up to a maximum number of credit hours. Special Topics and Independent Study courses are examples. For all other courses, the following conditions apply:

An undergraduate student who has passed a course with a grade of C- or better is not permitted to repeat the course for credit. An undergraduate student may repeat a course in which a grade of D or below has been earned, subject to restrictions stated for specific courses or by specific departments. Duplicate credit is not earned.

A graduate student who has passed a course with a grade of B- or better is not permitted to repeat the course for credit. A graduate student must obtain permission from the department offering the course to repeat a course in which a grade of C or below has been earned. Duplicate credit is not earned. Each department establishes procedures for granting permission for repeating a course.

When a course is repeated, all credits attempted are used in determination of warning, probation, suspension, termination or dismissal; the transcript shows grades for all courses attempted; and only one grade per course may be presented on the degree application.
Advisor's Permission to Register
All newly admitted students and undeclared undergraduates on academic warning or academic probation are required to obtain an advisor's approval for registration. Undergraduate students in the School of Information Technology and Engineering and in the Department of Biology (including the Medical Technology program) must obtain their advisor's approval for registration each semester. All students are encouraged to consult with their advisors concerning course registration each semester.

Permission to Register as a Graduate Student
Registration for courses in a graduate program is permitted only after the student has been notified of admission. Admitted students are given preference over Extended Studies students through the pre-registration process. Dual registration (e.g., as a graduate student and as an Extended Studies enrollee) is not permitted. The graduate student is responsible for being properly registered and aware of all regulations and procedures required by a program of study. Regulations and degree requirements are not waived nor are exceptions granted because of ignorance of university, college/school/institute, or departmental regulations.

Graduate Course Enrollment by Undergraduates
Courses numbered 700 and above are closed to undergraduates. Undergraduates may enroll in graduate-level courses 500 to 699 only with written permission which must be obtained before registration. Forms are available at the Office of the Registrar. Written permission is waived in those undergraduate programs that request or encourage seniors to take graduate courses to meet undergraduate degree requirements and for undergraduate students admitted to Bachelor's/Accelerated Master's programs.

To enroll in graduate courses for credit applicable to an undergraduate degree, undergraduates must have completed all course prerequisites, have exhausted all upper-level undergraduate courses relevant to their educational objectives, and be able to demonstrate the level of maturity required for graduate courses.

Approval to register for reserve graduate credit (earned credit held in reserve to apply later toward a graduate degree) is given only to George Mason seniors within 15 credits of completion of undergraduate study who have successfully completed all course prerequisites. In addition, this privilege is normally extended only to seniors who have completed at least 12 credits at the university, have a cumulative grade point average of 3.00 or better, and have a major in the department offering the course. Approval for reserve graduate credit is limited to six credits and does not imply approval for admission into a graduate program at the university or that credit so earned will be accepted at another graduate school.

Undergraduates enrolled in graduate courses are eligible to receive only those letter grades applicable to graduate grading. See Grading System, below. Credit for the same course is not given toward both graduate and undergraduate degrees.

Bachelor's/Accelerated Master's Degrees
The University offers a number of Bachelor's/Accelerated Master's Degree programs for academically strong undergraduates with a commitment to research, or to graduate or professional studies. Students admitted into these programs may take a number of graduate courses in their field of study (with permission of their undergraduate and graduate advisors) after fulfilling 90 undergraduate credit hours and fulfilling all prerequisites. Graduate credits completed with a 3.00 GPA or better will give the student Advanced Placement in the Master's Program. Students in an Accelerated Degree Program must fulfill all University requirements for the Master's Degree, including a minimum of 18 applicable graduate credit hours taken after the bachelor's degree has been completed and posted to the student's academic record. Applications and information for specific programs are available in schools and institutes. Admission is competitive and undergraduates are advised to inquire early in their undergraduate careers. Applications must be approved by the Undergraduate Coordinator in the student's major program, the Graduate Coordinator in the graduate school or department, and the relevant graduate associate dean. The university waives the graduate application fee for George Mason undergraduates.

Special Registration for Non-enrolled Students
Degree-seeking students not enrolled in a credit-bearing course, but whose academic department certifies that they are pursuing an activity related to their George Mason enrolled program, can retain active status by registering for Special Registration (SREG 200) for a $45 fee. Written approval from the student's advisor and the academic department chair is required. Special registration allows students to retain their library and computer privileges, to receive a student ID, and to buy a parking decal. Students must have active status to apply for or receive a degree, take an examination, or participate in cooperative education.

Enrolling for Credit without Grade Points
Entire courses normally graded as satisfactory/no credit are annotated in their catalog descriptions, but students may elect to take credit without grade points. Undergraduates may take up to six credits to be graded S/NC; this option applies only to electives outside the major field. Graduate students may elect the S/NC grade option only for courses that do not apply to the degree or certificate requirements. S/NC grading will also be used for courses numbered 998 and 999. See also the section Additional Grade Notations below.

Auditing a Course
Auditing a course requires the permission of the instructor of the course. Audit forms are available at the Registrar's Office. A previously audited course may be taken again for credit in a later term. A student may also audit a course previously taken and passed. A student may not change from credit to audit status nor from audit to credit status after the end of the drop period, as defined above. The usual tuition and fees apply to audit status.

Academic Common Market
The Academic Common Market (ACM) is a cooperative tuition-reduction program agreement among 16 southern states, including Virginia. Students who are not legal residents of Virginia, but who wish to pursue a degree in a selected George Mason program which is not available in their home states, may be able to participate in the ACM and thereby attend George Mason without incurring out-of-state tuition charges. Likewise, legal residents of Virginia may take advantage of programs in other states. Further information about this program is available at the Office of the Registrar.

http://catalog.gmu.edu
Consortium of Universities of the Washington Metropolitan Area

George Mason University is a member of the Consortium of Universities of the Washington Metropolitan Area, which includes American University, The Catholic University of America, Gallaudet University, The George Washington University, Georgetown University, Howard University, Marymount University, Southeastern University, Trinity College, the University of the District of Columbia, and the University of Maryland-College Park. Eligible George Mason students may enroll in courses at any of the consortium institutions. The consortium’s cross-registration arrangement permits students enrolled in eligible degree programs at one consortium member institution to take a course at another member institution.

Participation in consortium cross registration is available to degree-seeking juniors, seniors and graduate students in good standing and currently enrolled at George Mason University. Participation is limited to courses that are approved by the student’s department chair and dean, apply to the student’s program of study, are not offered during that semester at George Mason University, and have space available at the visited institution. Additional restrictions apply. Students may take just one course per semester, with a career maximum of 12 credits for undergraduates and 6 credits for graduate students.

Information and regulations for both outgoing and incoming George Mason University consortium students are available in the Schedule of Classes and on the internet at http://registrar.gmu.edu/consortium_policies.html. Information pertaining to all member institutions is available at www.consortium.org/cross_registration.asp. Contact the Consortium Coordinator, Office of the Registrar, (703) 993-2436, for additional information, registration instructions and access to schedules and catalogs of consortium member institutions.

Attendance Policies

Students are expected to attend the class periods of the courses for which they register. Although absence alone is not a reason for lowering a grade, students are not relieved of the obligation to fulfill course assignments, including those that can only be fulfilled in class. Students who fail to participate (because of absences) in a course in which participation is a factor in evaluation, or students who miss an exam without an excuse, may be penalized according to the weighted value of the missed work as stated in the course syllabus.

Absence for Religious Observances

It is the policy of George Mason University to make every reasonable effort to allow members of the university community to observe their religious holidays without academic penalty. Absence from classes or examinations for religious reasons does not relieve students from responsibility for any part of the course work required during the period of absence. Students who expect to miss classes, examinations, or other assignments as a consequence of their religious observance shall be provided a reasonable alternative opportunity to complete their academic responsibilities. It is the obligation of students to provide faculty with reasonable notice of the dates of major religious holidays on which they will be absent. Faculty should take religious observances into consideration when constructing class schedules and syllabi.

FINAL EXAMINATIONS AND GRADES

Final Examination Policies

Final examinations are normally given at the end of all undergraduate courses. Except in predominantly laboratory courses, exams may not be given during the last week of classes. Exams may not exceed the scheduled length of 2 hours 45 minutes. Changes in location or time of in-class final examinations must be approved by the appropriate department chair and appropriate dean. A professor who is considering the assignment of a take-home examination or significant end of semester paper or project should inform the students at the beginning of the semester. Such assignments should be distributed by the beginning of the last week of classes so that students can coordinate them with preparation for other examinations. Students must not be required to submit examinations before the date of the regularly scheduled examination for a course. Final re-examinations are not permitted.

Absence from Final Examinations

Absence from final examinations will not be excused except for sickness on the day of the examination or for other cause approved by the student’s academic dean/department. The effect of an unexcused absence from an undergraduate final examination shall be determined by the weighted value of the examination as stated in the course syllabus provided by the instructor. If absence from a graduate final examination is unexcused, the grade for the course is entered as F. See Additional Grade Notations below for Absent with Permission.

Grading System

University course work is measured in terms of quality and quantity. A credit normally represents one hour per week of lecture or recitation, or not fewer than two hours per week of laboratory work, throughout a semester. The number of credits is a measure of quantity. The grade is a measure of quality. For grades applicable to graduate courses, see Graduate Academic Standards and Grades section.

The university-wide system for undergraduate grading is as follows:

<table>
<thead>
<tr>
<th>Letter Grade</th>
<th>Grade Points</th>
<th>Undergraduate Courses</th>
</tr>
</thead>
<tbody>
<tr>
<td>A+</td>
<td>4.00</td>
<td>Satisfactory / Passing</td>
</tr>
<tr>
<td>A</td>
<td>4.00</td>
<td>Satisfactory / Passing</td>
</tr>
<tr>
<td>A-</td>
<td>3.67</td>
<td>Satisfactory / Passing</td>
</tr>
<tr>
<td>B+</td>
<td>3.33</td>
<td>Satisfactory / Passing</td>
</tr>
<tr>
<td>B</td>
<td>3.00</td>
<td>Satisfactory / Passing</td>
</tr>
<tr>
<td>B-</td>
<td>2.67</td>
<td>Satisfactory / Passing</td>
</tr>
<tr>
<td>C+</td>
<td>2.33</td>
<td>Satisfactory / Passing</td>
</tr>
<tr>
<td>C</td>
<td>2.00</td>
<td>Satisfactory / Passing</td>
</tr>
<tr>
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</tr>
<tr>
<td>D</td>
<td>1.00</td>
<td>Unsatisfactory / Passing</td>
</tr>
<tr>
<td>F</td>
<td>0.00</td>
<td>Unsatisfactory / Failing</td>
</tr>
</tbody>
</table>

*NOTE: Although a C- is a satisfactory grade for a course, students must achieve a 2.0 for an acceptable semester. See information on academic standing.

Grades below C- are unsatisfactory and consist of two categories: unsatisfactory passing (D); unsatisfactory failing (F). No credit towards graduation accrues from a failing grade or from an unsatisfactory, passing grade that is replaced by a retaken course. See also Repeating a Course in the section Registration and Attendance.
Additional Grade Notations

S/NC (Satisfactory/No Credit). An S grade reflects satisfactory work (C- or better for undergraduates, B- or better for graduates); otherwise, the student receives no credit (NC). S and NC have no effect on the grade point average. Entire courses normally graded S/NC are annotated in their catalog descriptions. Students may also elect to take credit without grade. See Enrolling for Credit without Grade Points in the section Registration and Attendance.

A/B/C/NC. A student successfully completing English Composition and Intro to Literature (ENGL 101) or Composition for Non-Native Speakers of English (ENGL 100) is graded A, A-, B+, B, B-, C, or C-; a student not attaining at least C- in these courses receives no credit (NC). NC has no effect on the grade point average.

IN (Incomplete). The grade of IN (incomplete) may be given to a student who is passing a course but who may be unable to complete scheduled course work for a cause beyond reasonable control. The student must then complete all the requirements by the end of the ninth week of the next semester (not including Summer Term), and the instructor must turn in the final grade by the end of the tenth week. Unless an explicit written extension is filed with the Registrar’s Office by the faculty deadline, the grade of IN is changed by the registrar to an F. Maximum IN extension is to the end of the same semester in which it was originally due. Students who have filed their intent to graduate have only six weeks from the date of degree conferral to resolve any incomplete grade(s) and have the final grade(s) recorded by the Registrar’s Office.

While a grade of IN remains on the transcript, it is treated as an unsatisfactory grade in determining probation, suspension, termination or dismissal. Removal of INs from the transcript may result in retroactive elimination of probation, suspension, termination or dismissal.

IP (In Progress). IP grades may be given in selected courses, including graduate theses, dissertations, practica, and internships. In addition, when the work of BIS 490 or of a course that is graded S/NC or A/B/C/NC is not completed within one semester, a grade of In Progress (IP) may be used. IP has no effect on the grade point average. With the exception of BIS 490, IP remains on the record until the work is completed and a final grade is assigned. An IP in BIS 490 not changed to a final grade by the last day of classes of the next semester (not including Summer Term) is changed by the registrar to F. IP grades will also be awarded in courses numbered 998 and 999 until successful completion, and then they will be changed to S/NC.

AB (Absent with permission). A student who has received permission from the student’s academic dean/director to be absent from a final examination for a cause beyond reasonable control may receive a temporary grade of AB. A rescheduled exam must be administered within 10 business days of the original date of the examination or the AB will automatically become an F. Final determination of academic status is not complete while the AB remains on the transcript.

SP (Special Provision). The grade of SP may be given by the student’s dean to a student who is unable to complete the course requirements because of extraordinary long-term circumstances, such as major illness or military deployment. SP has no effect on the grade point average and remains on the transcript until the work is completed and a final grade is assigned.

FA (Administrative Failure). For students who appear on the official roster and final grade form for a course, but who never attended or stopped attending a course, a grade of FA is noted on internal documents. Official documents contain the official grade of F.

Grade Reports

Mid-term grades are reported for full semester, 100- and 200-level courses at the mid-point of each fall and spring semester. Students are notified through their university e-mail account that mid-term grades are available to them only through webGMU. Mid-term grades are intended to provide feedback to students on their academic progress. They do not become part of the student’s official record; they are not calculated in any grade point average and they do not appear on any official or unofficial transcript.

Semester grade reports are available over the 4GMU telephone system, (703) 993-4468, and on-line through webGMU. Students may print a grade report for their own records, or to issue to a third party, through webGMU. Transcripts of all complete academic work may be ordered at any time with a written request to the Office of the Registrar.

Grade Point Average

Grade point values are assigned to letter grades as indicated in the Grading System table. A grade point score is computed by multiplying the value of a letter grade by the number of credits for the course. For example, a student receiving an A in a three-credit course earns 12 grade points.

Dividing the total grade points earned in a semester by the number of letter-graded credits attempted in that semester gives the current GPA. Current GPA is the measure of academic performance in one semester and affects both the Dean’s List and academic standing. The cumulative GPA is computed by dividing the number of grade points earned in all George Mason University courses by the number of normally graded credits attempted at the university. Cumulative GPA is one of several criteria affecting academic dismissal. Degree GPA is computed from graded courses the student completes at the university and that are applied toward the degree. This GPA is noted on the transcript under the degree conferred. Courses not used in this calculation are noted as excluded on the transcript.

Change of Grade

The conditions and time limits for changes from the temporary grades, IN, IP, AB and SP, to final grades appear in the section Additional Grade Notations.

Once a final grade in a course has been recorded by the Office of the Registrar, it can be changed only in cases of computational or recording error, or pursuant to a successful appeal of grade, as described below. Additional work of any type submitted to improve a grade after the final grade has been assigned and sent to the Office of the Registrar is never accepted.

All changes of final grades must be initiated, approved, and recorded by the last day of classes of the next regular semester (spring for fall grades, fall for spring, and summer term grades).
Academic Policies

Appeal of Grade
Although faculty members are generally the best judges of the performance of students in their classes, there may be instances when a student believes a grade is unfair. In such cases the student should ask the faculty member to reconsider the grade. If the student is not satisfied, an appeal may be made to the head of the unit offering the course (the department chair, institute director, or his/her designee). The chair (or other recipient of the appeal) should ask the student to return to the faculty member who assigned the grade for further consultation.

If a mutually satisfactory agreement is not reached, the student may request that the chair form a committee of three faculty peers of the faculty member who assigned the grade. If the chair believes the student's complaint is not legitimate, this reservation is reported to the chair's supervisor (usually the dean), and no review is conducted unless the dean believes the complaint has merit.

The faculty member or the student may challenge, and have replaced, one of the three members of the committee without giving a reason for the challenge. The committee meets separately with the faculty member and the student to explore the full particulars of the case. A nonparticipating observer of the student's choice may attend the meeting. Every effort is made to avoid an adversarial relationship.

After the committee has reviewed the case thoroughly, it issues to the chair (with a copy to the faculty member) a written recommendation including the reasons for its findings. At this time, the faculty member has an opportunity to take the recommended action, if any. If the matter is not resolved at this point, the chair considers the committee recommendation and makes a recommendation to the dean. The decision of the dean is not subject to further appeal. If the dean decides that a change of grade is appropriate, and the faculty member refuses to make the change, then the dean may direct the registrar to do so.

Grade appeals are not accepted after the last day of classes of the following semester (spring for fall grades, fall for spring and summer grades).

Pending Grade Appeal
In select cases, a student may request a delay from the dean in imposing academic suspension because of a pending grade appeal that could change the student's status. An approved delay allows the student to register.

If the grade appeal is successful, the official transcript is corrected and the student continues in classes as a student in good academic standing. If the grade appeal is not successful, the student is required to stop attending all classes immediately. No record of registration for the academic period appears on a transcript, and the student receives the appropriate refund as of the date of decision.

DEGREE CONFERRAL
Degrees and Degree Components
Degrees and certificates that are awarded by George Mason University are in programs and at levels authorized by the State Council of Higher Education for Virginia. The university confers degrees at the bachelor's, master's and doctoral levels. An academic program may include a degree program and additional majors, minors, or certificates. The university offers no certificate program below the bachelor's level; some post baccalaureate certificates, however, may be awarded concurrently with the bachelor's degree. See the chapter on Programs of Study.

Definitions of Degree Components
Degree program, major/field: A program of study that normally requires at least 30 credits of course work in the specified field. The primary program name (degree and major/field) appears on the diploma.

Track: A second-order component of a degree program approved by the State Council of Higher Education for Virginia.

Concentration: A second-order component of a degree program or a component of a track. Undergraduate concentrations are approved by the unit at the undergraduate level, or by the Graduate Council at the graduate level.

Certificate: A non-degree program complementary to a degree that requires at least 24 undergraduate or 15 graduate credits. Certificates are approved by the school, or college at the undergraduate level, and by the university Graduate Council at the graduate level. The name of a completed certificate program appears on the transcript after the conferral of an undergraduate degree.

Minor: A complement to a bachelor's degree program, normally requiring at least 15 credits in a field other than the student's major.

Option: The choice of a thesis or nonthesis path in graduate programs.

Catalog Requirements for Degrees
All degree candidates may choose to graduate under the terms of the catalog in effect at the time of conferral of the degree. Not all programs and degree components are available in all catalogs. For any one degree, all requirements must be met as stated in a single catalog.

Bachelor's degree candidates who have been continuously enrolled (allowing absences from Summer Terms and/or single semesters) may choose to graduate under the terms of any catalog in effect at or after their admission. Students who have been inactive for five or more years or who have attended another institution without prior approval from their academic dean/director must graduate under a catalog in effect at or after their re-enrollment.

Master's and doctoral degree candidates who have been continuously enrolled may choose to graduate under the terms of any catalog in effect at or after their admission. Students who have been inactive more than one year, however, must graduate under a catalog in effect after they have been granted permission to re-enroll, or must petition their unit dean or director to graduate under an earlier catalog. The final decision rests with the unit dean or director.

Application for Degree
All students should initially declare and then maintain an "expected graduation date" from George Mason through 4GMU, (703) 993-4468. In their final semester, students who expect to complete degree requirements must confirm their intent to graduate through the registrar's web site by the end of the fifth week of classes for that semester. August graduates are processed according to the deadlines for the previous spring semester. Some programs require a paper application, which is due in the Office of the Registrar eight to ten weeks after the first day of classes. Paper appli-
Academic Policies 35

Admissions are obtained through the registrar's web site (http://registrar.gmu.edu). Separate applications for each degree or certificate are required. Additional majors and/or minors, available in bachelor's programs only, also require separate applications and must be earned concurrently with the primary major.

For a degree to be conferred, all course work must be completed, even if the course work is not being applied to the degree. Master's students must complete non-course degree requirements including credit-by-exam, oral exams, theses, scholarly papers, and comprehensive exams prior to the conferral (graduation) date. Doctoral students must have met all requirements well before the conferral date. For detailed deadlines, refer to www.gmu.edu/library/specialcollections/dtwebguide.htm.

Students must have active registration status the semester or Summer Term of graduation; if all course work has been completed, a special registration must be obtained. (See Special Registration for Non-enrolled Students in the Registration and Attendance section.) Degree applications will not be automatically extended if graduation is postponed; students must reapply for each conferral date.

Commencement

Commencement exercises provide an opportunity for students and their families to share in the conferral of academic degrees. Students wishing to participate in commencement exercises should reserve a place for themselves in the academic procession and reserve tickets for their guests through 4GMU, (703) 993-4468. The system will accept reservation two business days after the degree application has been filed.

Bachelor's and master's candidates who declare their intent to graduate in August but who have not yet completed all degree requirements may participate in the commencement ceremony in anticipation of the completion of the degree. Their names are marked with an asterisk identifying them as candidates pending completion of all requirements. Doctoral students may participate only if they have successfully completed all degree requirements including defending and submitting a signed final copy of their dissertation by the deadline. Students who have completed all degree requirements except for a required internship may participate if they will have completed the internship by September 10.

Undergraduate Policies

Classification of Students

Admitted undergraduates are classified as follows: freshman, 0-29 credits completed; sophomore, 30-59 credits completed; junior, 60-89 credits completed; senior, 90 or more credits completed. Full-time undergraduates are classified as those students enrolled in 12 or more credits per semester. Please note: Different criteria for full-time status may apply for tuition, verification, and financial aid purposes. Contact Student Accounts, Registrar, and Student Financial Aid, respectively, for questions regarding student-specific status.

Academic Advising

Admitted undergraduate students should meet regularly with an academic advisor to discuss academic programs, educational goals, and career plans. In conjunction with their advisors, students plan academic programs to meet the general university degree requirements and specific requirements within their major fields. Responsibility for reading the catalog, and knowing and fulfilling the requirements of a specific baccalaureate degree rests with the student. To assist in the advising process, the university provides a computerized analysis of academic progress (a degree audit). Students may access their individualized reports through the university's secure web site (webGMU.edu).

Individual departments establish their own advising processes; students should check with their departments for the appropriate procedures. During their freshman and sophomore years, students in the Honors Program in General Education plan their schedules with Honors advisors. Every department coordinates advising of its honors students through the Honors office (Enterprise Hall, Room 305).

Some departments require that students be advised prior to registration each semester. See Advisor's Permission to Register in the section Registration and Attendance for categories of students who may not register until they have seen an advisor.

Student Academic Affairs and Advising

Web: www.gmu.edu/departments/advising
Student Union Building I, Room 304, MS 2E6
Phone: (703) 993-2470
Fax: (703) 993-2478
E-mail: advisor@gmu.edu

Admitted students who have not yet decided on a major or who are considering a change of major, as well as students with other academic issues, are advised by Student Academic Affairs and Advising.

Students are encouraged to make an appointment for information about general education requirements, programs, policies, procedures, and other academic concerns. Student Academic Affairs and Advising also provides information and guidance for students who are interested in pre-professional programs in the health fields.

Advising is available by appointment Monday through Friday, 9 a.m. until 5 p.m., and Tuesday until 8 p.m., when classes are in session.

Advising upon Entrance into the Upper Division (Junior Standing)

Upon entrance into the upper division, every student should meet with an advisor to adopt a program of study. This meeting should include:

- A review of the requirements for the degree and major the student has chosen
- A review of the student's record including any deficiencies, which must be made up
- A discussion of the career and/or graduate study options open to the student enrolled in such a program
- An opportunity for departmental faculty to evaluate the student's suitability to major in the chosen discipline

This advising session occurs in the semester in which the student will have completed 60 or more acceptable credits. The results are a matter of record, with any approved modifications being entered into the student's computerized degree plan.

http://catalog.gmu.edu
Although an upper-division student who has filed an approved program of study is normally not required to consult again with an academic advisor, it remains the student's responsibility to seek approval for any change to the program, so that the computerized degree plan may be kept up to date. In particular, once a student has completed 60 credits, a change of major requires an extended session with an advisor in the new major, and approval of a new program of study before the change is complete.

A student in lower-division status may change majors by filing a Change/Declaration of Academic Program form with the registrar. These are minimal advising procedures to be followed in all undergraduate segments of the university; individual units may require additional advising sessions.

Medical Sciences Advisory Committee
Phone: (703) 993-2470
The Medical Sciences Advisory Committee reviews qualified candidates for admission to health profession programs in allopathic and osteopathic medicine, dentistry, podiatry, and optometry, and writes a composite letter of evaluation in support of the applicant. The committee comprises university faculty and professional advising staff. Committee members also function as pre-med advisors. Students seeking information about admission to professional medical programs are encouraged to contact the chair of the Medical Sciences Advisory Committee, George Mason University, Student Academic Affairs and Advising, MS 2E6, Fairfax, Virginia 22030-4444.

Academic Standing

Academic Period
Academic Period refers to fall semester, spring semester, or summer term. For determining academic standing, including the duration of academic probation and suspension, an academic period is defined as follows:

Each academic period begins on the 15th day following the last scheduled day of final examinations for the previous period. Each academic period ends on the 14th day after the last scheduled day of final examinations.

Example: Assume that the last scheduled day of final exams for a semester is Monday, December 23. That period then ends on Monday, January 6. The next period begins on Tuesday, January 7.

Consecutive Periods of Enrollment
Consecutive academic periods of enrollment are successive periods (semesters or terms) during which the student was enrolled, regardless of whether there were intervening periods during which the student did not enroll.

Good Academic Standing
A student is in good academic standing unless academically dismissed, suspended, or on probation. An academic warning alone does not deprive a student of good academic standing.

Standard of Academic Performance
Undergraduate students perform acceptably during any academic period in which they earn a current grade point average of 2.000 or higher (1.800 for those in the first or second academic period of the freshman year). In computing the grade point average, grades of FA and IN are counted as F, and the grades AB, IP, NC, S and SP are not counted.

Dean's List
Students in degree status who take at least six credits in an academic period and earn a grade point average for that period of 3.500 or higher merit placement on the Dean's List.

Academic Warning
Students receive an academic warning at the end of any academic period in which they fail to attain a grade point average for that period of 2.000 or better (1.800 for those in the first or second academic period of the freshman year). Note that “warning” refers to a below standard, or unacceptable, academic performance in a semester or term. The warning notation on the student's record may be superseded by a stronger notation of probation, suspension or dismissal if it applies.

Academic Probation
Students who receive two warnings during any four consecutive periods of enrollment are on probation during the academic period of enrollment following the second warning, unless suspension criteria apply.

Academic Suspension
Academic suspension results from two situations. First, a student receiving academic warnings in two consecutive periods of enrollment is suspended. In the case of first suspension, the two consecutive periods are extended to three if the student attempted fewer than 12 credits during either of the first two periods. Second, a suspension also results from receiving a second probation.

A student's first academic suspension is for two academic periods, unless it is imposed at the end of the Summer Term, in which case it is for one semester. A second suspension is for one calendar year: two semesters and a Summer Term. A third suspension results in dismissal.

All notations of academic standing are included in a student's permanent record. Course credits earned at other colleges during the period of suspension from the university (for academic or nonacademic reasons) are not accepted for the degree program.

Effect of Suspension on the Re-enrolled Student
A student re-enrolling after suspension is on probation for one academic period of enrollment. A warning received at the end of that semester or term results in continuation of probation; however, a student will be dismissed at the end of that period if the dismissal criteria (below) apply. A second consecutive warning immediately after returning from a suspension results in a new suspension.

Academic Dismissal
A third academic suspension results in academic dismissal. An undergraduate is also dismissed at the end of any academic period when all of the following occur:

1. The student has received at least one earlier academic suspension.
2. The work done during the just-completed academic period is unacceptable.
3. The student's cumulative grade point average for all work attempted at the university is below a minimum threshold that depends on the number of cumulative quality credits (QHRS) earned at the university plus credits transferred from other institutions or obtained by testing, as follows:
Credits | GPA | Credits | GPA
--- | --- | --- | ---
0-39 | 0.000 | 80-84 | 1.625
40-44 | 1.250 | 85-89 | 1.647
45-49 | 1.333 | 90-94 | 1.667
50-54 | 1.400 | 95-99 | 1.684
55-59 | 1.555 | 100-104 | 1.700
60-64 | 1.500 | 105-109 | 1.714
65-69 | 1.538 | 110-114 | 1.727
70-74 | 1.571 | 115-119 | 1.739
75-79 | 1.600 | 120- | 1.750

For example, a student who transfers 30 credits to George Mason from another institution and has earned 40 credits at George Mason (not including courses graded S [Satisfactory]) must maintain a minimum cumulative grade point average of 1.571 on the courses taken at George Mason.

Effect of Academic Standing on Next Semester's Credit Limit
Undergraduate students who earn a GPA of less than 2.000 in any fall or spring semester, and are still eligible to enroll, may register for a maximum of 13 credit hours their following spring or fall semester. All undergraduate students who are returning from suspension in a fall or spring semester may take a maximum of 13 credit hours and must meet with an advisor before registering.

Effect of Academic Standing on Student Activities
Only students in good academic standing are eligible to hold or run for elective or appointive office in any organization or activity associated with the university, or to compete in any athletic or other activity representing the university on either an intercollegiate or club level, or to serve as a working staff member of any student organization.

A student whose eligibility for an activity requires the completion of a semester will have fulfilled that requirement when the student's publicly scheduled exams are over, unless the student's continued eligibility depends on the grades received. In the latter case, the student will not become eligible until the end of the semester as defined for probation and suspension purposes.

THE UNDERGRADUATE ACADEMIC PROGRAM
Selection of a Major
To plan a sound academic program, the undergraduate should select a degree and major as soon as it is practical, but no later than four weeks before the end of the sophomore year. For declaration of a major, a student should confer with the appropriate advisor or designate of either the new major program or, if undeclared, Student Academic Affairs and Advising. Obtain signatures from both departments in the Change of Major section of the Change/Declaration of Academic Program form, available in the Registrar's Office and in Student Academic Affairs and Advising.

Change of Academic Program
Students who wish to change their academic programs (degree and/or major) should see a faculty advisor or Student Academic Affairs and Advising. Departmental sections of this catalog contain requirements for acceptance into each program. A student not meeting the requirements may appeal to the department chair for an exception.

Once a student has completed 60 credits, a change of major requires a meeting with an advisor in the new major before the change is complete. To file a change of major, signatures of advisors or designates in both the new and former major programs must be obtained on the Change/Declaration of Academic Program form, available in the Registrar's Office.

Credit for More than One Undergraduate Major
A student who desires to graduate with a B.A. degree or a B.S. degree in two or more subjects must meet departmental requirements for the major in each field. See also the section Second Bachelor's Degree.

Students given permission to pursue two or more concurrent majors must complete the Declaration of Second Major section of the Change/Declaration of Academic Program form, available in the Registrar's Office. The applicant must present a detailed program of study for both majors and obtain the authorizing signature from the chair or director of the second major program (and from the dean or director, if required by the college, school, or institute). When required, department chairs and deans/directors must also approve all changes to the programs of study. A student may begin a program at any time that permits its completion before the anticipated graduation date.

Minors
Students may elect minor programs of study in addition to their major fields by completing the Declaration or Change of Minor section of the Change/Declaration of Academic Program form, available in the Registrar's Office. Minors normally require between 15 and 21 credits of study. At least six credits of the minor must be completed at George Mason, and no more than three credits of D in the minor are accepted. Students interested in a minor should consult the college/school/institute chapters and the Program of Study listing in the front of this catalog chapter to determine which minors are offered and their specific requirements.

Baccalaureate Degree Requirements
University General Education Requirements
All undergraduates seeking a baccalaureate degree at George Mason University must complete the University General Education requirements. Please see the catalogue chapter on the university undergraduate general education program for specific details. Additional requirements for specific degree programs can be found in the description of each college or school in this catalog.

English Composition Requirement
The university requires students to complete at least two semesters of English composition. Students enrolled in the Honors Program in General Education or in New Century College learning communities complete the English composition requirement as specified in those programs. All other students, unless they have received equivalent credit through transfer or proficiency examination, must enroll in ENGL 101 (or 100) upon admission and, after meeting its prerequisites, ENGL 302. Students must attain a minimum grade of C- in composition courses to fulfill university degree requirements.

Writing-Intensive Course Requirement
In addition to English composition, and as part of the university's commitment to literacy in all programs, at least one course in each major has been designated "writing intensive." While other courses in the major may require written projects, "writing-intensive" courses emphasize the
process of drafting and revision. Faculty in these courses give constructive comments on drafts of at least one course project, which the students then revise and resubmit, or use for future submissions. Writing-intensive courses are numbered 300 and above. See the description of each major for the specific courses that fulfill the requirement for that major.

Residence Requirements
At least one-fourth of the total credits presented on the degree application must be completed at the university and must include at least 12 upper-level credits (courses numbered 300 or above) in the major program.

Students are expected to complete the final one-fourth of their college study at the university. However, a student of junior standing who has completed 24 credits of upper-level courses, including 12 upper-level credits in the major, may apply to the appropriate dean for permission to complete the remaining degree requirements elsewhere. Such applications must follow the procedures outlined in the section Credit to be Earned at Other Colleges. Permission is granted only in special circumstances, such as moving from the area or enrolling in an accredited professional school.

A student who gains early admission to an accredited professional school or into an approved Bachelor's/Accelerated Master's Degree program may be granted a George Mason bachelor's degree while enrolled in that professional or graduate school if certain conditions are met. In this context, a professional school is defined as a school of dentistry, law, medicine, optometry, osteopathy, or veterinary medicine. Before leaving the university, a student must obtain certification signed by the department chair and the appropriate dean that the residence, general education, and major requirements for the degree have been met. The student also must secure from the dean prior approval of those professional school or graduate courses that are to be applied only as elective credit to the total credit requirement for the bachelor's degree at George Mason.

Additional Academic Requirements
To qualify for a bachelor's degree, a student must have been admitted, and complete at least 120 credits that can be counted towards graduation. The students must fulfill all stated requirements for the specific degree, and must have earned a GPA of at least 2.000 in the courses presented for graduation. An undergraduate may present all courses in which satisfactory grades have been received and up to 12 credits of courses in which D grades have been received. A student may not use a grade of D in BIS 490, however, and may not use more than six credits of D grades in a major or in the BIS core of study, nor more than three credits of D grades in a minor. Some programs may have a more restrictive policy regarding the number of D grades allowable in majors, minors, or certificates. Please refer to the appropriate section of the catalog for further information.

Students seeking a bachelor's degree must apply at least 45 credits of upper-level courses (numbered 300 or above) toward graduation requirements.

A Graduation Appeals Committee in each college or school considers written appeals from students who fail to meet degree or certain area requirements.

Second Bachelor's Degree
A second bachelor's degree may be earned, either concurrently or sequentially. To graduate with two degrees, students must present at least 30 George Mason credits beyond those required by either degree alone.

Students who are concurrently pursuing two bachelor's degrees at George Mason must present a detailed program of study for both degrees and obtain authorizing signatures from the chair or director of each degree program (and from the dean or director, if required by the college, school, or institute). Students may declare the second concurrent degree by completing the Declaration of Second Bachelor's Degree section of the Change/Declaration of Academic Program form, available in the Registrar's Office.

Application for a second bachelor's degree declared after graduation from a first degree must be conducted through the Office of Admissions. Determination of academic standing starts anew for George Mason graduates who return for a second bachelor's degree.

Graduation with Distinction
A student graduates with distinction from the university when at least 60 credits applied toward graduation are earned at George Mason University and the student's grade point average in all work applied toward graduation is at least equal to one of three values:

- 3.500 (with distinction)
- 3.700 (with high distinction)
- 3.900 (with highest distinction)

Graduation with Distinction and Recognition
A student graduates with distinction and with recognition of a distinguished senior project if, in addition to meeting the criteria for graduation with distinction, the student completes a research project or other substantial piece of creative work directed by a faculty member and judged by the student's department to be of distinguished quality. The departmental faculty establishes criteria by which a student graduating with distinction may attempt to receive this recognition.

Graduate Policies
GENERAL INFORMATION
Organization
The Graduate Council is the governing body for all graduate academic policies and procedures. The Graduate Council approves all new graduate programs; authorizes all graduate course work, policies, and degrees conferred by the university; and sets minimum standards for admission to and graduation from any graduate program. These are minimum standards that all programs must meet; individual programs may set and enforce higher standards. The Office of the Provost administers university graduate policies for the Graduate Council.

Graduate Faculty
The graduate faculty consists of all tenure and tenure-track faculty members and other faculty members appointed to the graduate faculty by the provost.
Academic Programs
The University offers certificates, master's and doctoral degrees at the graduate level. There are also a number of bachelor's/accelerated master's degree programs for academically strong undergraduates with a commitment to research. For more information, see bachelor's/accelerated master's degree under Registration and Attendance.

Student Status
Students may access graduate classes and programs according to their status as extended studies, non-degree, or enrolled degree students. See the "Admission" chapter of this catalog.

Full-time Classification of Students
Graduate students enrolled in nine or more credits per semester are always considered full time. Research and teaching assistants may be considered full-time students for some purposes when enrolled in six or more credits per semester. Please note: Different criteria for full-time status may apply for tuition, verification, and financial aid purposes. Contact Student Accounts, Registrar, and Student Financial Aid, respectively, for questions regarding student-specific status.

Change from Non-degree to Degree Status
A student admitted for graduate study in non-degree status may request a change to degree status within the same program. To do so, the student must secure departmental and college/school/institute approval on the college/school/institute's Student Request Form. All admission requirements as normally defined by the student's program for degree status must be met (e.g., official transcripts, letters of recommendation, etc.). If the student intends to use credits earned in non-degree status toward a degree, the credits must be approved on the college/school/institute's Transfer of Credit form.

Removing Provisional Qualifier from Admission Status
For policies concerning students admitted provisionally, see the Graduate Admission Policies section in the "Admission" chapter of this catalog.

Permission to Re-enroll in Graduate Study
Permission to re-enroll in a program must be obtained by all master’s and doctoral students who have failed to enroll in at least one credit of course work for two or more consecutive semesters at George Mason University. A program may allow a student to petition to graduate under any catalog in effect while the student was enrolled. The final decision rests with the unit dean or director. Forms are available from the Office of the Registrar, (703) 993-2441.

Academic Advising
At the time of admission to graduate study, the student is assigned a faculty advisor by the academic program responsible for the student's program of study. Registration for newly admitted graduate students, as well as continuing students, begins with a visit to the student's academic advisor. There the student can obtain information about specific courses and degree requirements and develop an individual program of study. Progress in an approved program of study is the shared responsibility of the student and the advisor. The graduate student is responsible for compliance with the policies and procedures of the college/school/institute and all applicable departmental requirements that govern the individual program of study. Students should consult with their advisors before registration each semester.

STUDY ELSEWHERE
(Applying non-George Mason University credit to graduate academic programs)

Transfer Credit for Work Taken Prior to Admission
Graduate credit earned prior to admission to a certificate, master's, or doctoral program may be eligible to be transferred into the program and applied to the certificate or degree. Transfer of credit requires the approval of the program director and the dean or director of the school/college/institute, who determine whether the credit is eligible for transfer and whether it is applicable to the specific certificate or degree program. Limits on the number of credits that can be transferred derive from the degree requirements given below.

Credit is usually considered for transfer at the request of the student at the time of initial registration as a degree-seeking student. Students must supply official transcripts (plus an official transcript evaluation for transcripts from outside the United States and an English translation for transcripts not in English, if these documents were not supplied in the admission process). Credit transfer requests from students who are admitted provisionally are not considered until they have fulfilled the conditions of their admission and had the provisional qualifier removed from their records.

To be eligible for transfer credit, the credit must be graduate credit earned at another accredited university, earned at another institution and recommended for graduate credit in the American Council on Education guidebook, or earned at George Mason while in a non-degree status or while enrolled through Extended Studies. The credit must have been earned within six years prior to first enrollment as an admitted student in the specific certificate or degree program, and a minimum grade of B (3.0) must have been earned. The course must be applicable toward a degree at the institution offering the course. Extension and in service courses that are not intended by the institution offering the courses to be applied to a degree program are not eligible for transfer credit to George Mason. The credits cannot have been previously applied toward a degree at another institution or at George Mason. Up to three credits previously applied to a degree program at another institution may, however, be transferred into a certificate program at George Mason.

Reduction of Credit
The number of credits required by a doctoral program, M.F.A. program, or master's program of more than 39 credits may be reduced on the basis of a previously earned master's degree. Reduction of credit requires the approval of the program director and the dean or director of the school/college/institute, who determine whether the credits are eligible for reduction of credit, whether the credits are applicable to the degree program, and the number of credits to be reduced. Reduction of credit is limited to a maximum of 30 credits in a doctoral program, 20 in an M.F.A. program, 23 in the M.A. in psychology concentration in school psychology, and derives from the degree requirements given below.

Students requesting a reduction of credit must supply official transcripts (plus an official transcript evaluation for transcripts from outside the United States and an official
translation for transcripts not in English, if these documents were not supplied in the admissions process). Reduction of credit requests from students who are admitted provisionally are not considered until they have fulfilled the conditions of their admission and had the provisional qualifier removed from their records.

There are no time limits on credits used in reduction of credit, and the credits must have been applied to a previous degree. All the other conditions given above for eligibility of transfer of credit apply also to reduction of credits.

Credit by External Exam
Degree credit for satisfactory completion of an external exam is limited to those examinations and achievement levels specifically approved by the Graduate Council.

Credit from Other Institutions After Admission
Students enrolled in a degree program may take graduate courses at another accredited institution and apply these credits to a master's or doctoral degree with prior approval. Approval must be secured in writing from the director of the graduate program and the dean or director of the school/college/institute so that the credits may be transferred into their George Mason degree program. These credits are subject to all the other conditions given above for transfer credit, including limits on numbers of credit that can be taken elsewhere. Permission to take a course elsewhere does not exempt a graduate student from satisfying the degree requirements given below.

Enrolled, degree-seeking graduate students may be eligible to take courses through the Consortium of Universities of the Washington Metropolitan Area. See "Enrolling in Consortium Courses." Credits earned through the Consortium are considered resident (not transfer) credits and are therefore not subject to transfer of credit conditions or limitations.

GRADUATE ACADEMIC STANDARDS AND GRADES

University course work is measured in terms of quantity and quality. A credit normally represents one hour per week of lecture or recitation or not fewer than two hours per week of laboratory work throughout a semester. The number of credits is a measure of quantity. The grade is a measure of quality. The University-wide system for grading graduate courses is as follows:

<table>
<thead>
<tr>
<th>Grade</th>
<th>Points</th>
<th>Graduate Courses</th>
</tr>
</thead>
<tbody>
<tr>
<td>A+</td>
<td>4.00</td>
<td>Satisfactory / Passing</td>
</tr>
<tr>
<td>A</td>
<td>4.00</td>
<td>Satisfactory / Passing</td>
</tr>
<tr>
<td>A-</td>
<td>3.67</td>
<td>Satisfactory / Passing</td>
</tr>
<tr>
<td>B+</td>
<td>3.33</td>
<td>Satisfactory / Passing</td>
</tr>
<tr>
<td>B</td>
<td>3.00</td>
<td>Satisfactory / Passing</td>
</tr>
<tr>
<td>B-</td>
<td>2.67</td>
<td>Satisfactory* / Passing</td>
</tr>
<tr>
<td>C</td>
<td>2.00</td>
<td>Unsatisfactory / Passing</td>
</tr>
<tr>
<td>F</td>
<td>0.00</td>
<td>Unsatisfactory / Failing</td>
</tr>
</tbody>
</table>

*Note: Students are advised that, although a B- is a satisfactory grade for a course, they must maintain a 3.0 average in their degree program and present a 3.0 GPA on the courses listed on the graduation application.

See other sections under Grading System, including Grade Point Average, Additional Grade Notations, Grade Reports, Change of Grade, Appeal of Grade and Pending Grade Appeal.

Academic Warning
A notation of academic warning is entered on the transcript of a graduate student who receives a grade of C, F, or IN in a graduate course.

Academic Termination
Graduate students who are admitted provisionally may be terminated from their academic programs if they fail to meet conditions of their admission in the time limits set at admission. Students admitted provisionally may be terminated upon accumulating either grades of F in two courses or nine credits of unsatisfactory grades in graduate courses. Provisionally admitted students who accumulate 12 credits of unsatisfactory grades in undergraduate courses will also be terminated. (For students admitted provisionally, graduate and undergraduate grades are not combined in the calculation of unsatisfactory credits leading toward termination.) Students may be terminated if they fail to achieve satisfactory progress toward their degree. A letter of termination is sent by the dean or director of the school/college/institute, and notification of academic termination is affixed to the graduate student's official record. Students who are terminated are no longer eligible to take courses in the program, but may apply to another degree program or take courses (in other programs) through Extended Studies.

Academic Dismissal
A graduate student is dismissed upon accumulating either grades of F in two courses or nine credits of unsatisfactory grades in graduate courses. These are minimum standards of academic performance; some programs have higher standards. A student may also be dismissed for failure to meet other program requirements such as doctoral competence examinations. The notation of academic dismissal is affixed to the graduate student's official record. A student who is dismissed may not take additional course work at the university.

Requirements Applicable to All Graduate Certificates
Candidates must satisfy all university certificate requirements and all requirements established by the certificate program faculty. Individual departmental certificate requirements are listed under the respective certificate programs in this catalog.

1. A candidate must earn a minimum of 15 graduate credits.
2. Only graduate courses may apply toward the certificate.
3. A maximum of 3 graduate credits taken at another institution can be transferred into a certificate program.
4. A candidate must have a minimum GPA of 3.000 in course work presented on the certificate application, which may include no more than 6 credits of C or C+. (Grades of C- and D do not apply to graduate courses.) The GPA calculation excludes all transfer courses and George Mason Extended Studies credits not formally approved for the degree.
5. A maximum of two certificates may be conferred as part of a Master's degree.
REQUIREMENTS APPLICABLE TO ALL MASTER'S DEGREES

Candidates must satisfy all university degree requirements and all requirements established by the master’s program faculty. Individual departmental degree requirements are listed under the respective master’s programs in this catalog.

1. A candidate must earn a minimum of 30 graduate credits.
2. Only graduate courses may apply toward the degree.
3. The majority of the credits applied to the degree must be earned at the university (or, in the case of programs offered through joint, cooperative, or consortial arrangements, at the participating institutions).
4. A minimum of 18 credits have to be taken in degree status (after admission to the degree program).
5. A maximum of 6 credits of master’s thesis research (799) or master’s project may be applied to the degree.
6. A candidate must have a minimum GPA of 3.000 in course work presented on the degree application, which may include no more than 6 credits of C or C+. (Grades of C- or D do not apply to graduate courses. The GPA calculation excludes all transfer courses and George Mason Extended Studies credits not formally approved for the degree.)

Thesis and Non-thesis Options

Requirements regarding a thesis vary with the degree program. A number of master’s programs offer both a thesis and non-thesis option. The same quality of work is expected of students regardless of their chosen option. For further information, consult the section on degree requirements under each degree program.

Time Limit

Master’s degree students have six years from the time of first enrollment as a degree-seeking student to complete their degrees. Individual master’s programs may have stricter time limits, which are published in the catalog. Students who are given permission to re-enroll following an absence from the university may not count the six-year time limit as beginning on the date of re-enrollment. Students who will not meet published time limits due to circumstances beyond their control may petition their school, college, or institute for an extension. Failure to meet the time limits, or to secure approval of an extension request, may result in termination from the program.

Master’s Thesis

When a thesis proposal has been approved by the appropriate department, the department chair sends the collegiate dean or director a copy of the thesis proposal, including the approval signatures of the master’s thesis committee members. The student may enroll in thesis research (799) at the beginning of the next semester. Students must register for three credits per semester until they reach the last three required credits. Once they have only three credits remaining, students may enroll for one credit per semester until graduation. To be considered a full-time student, the advisor and department chair must certify each semester that the student is working full time on his or her thesis. Please note: Graduate students must maintain continuous enrollment while writing and submitting a thesis.

The master’s thesis committee is named by the candidate’s department chair, who designates a member of the graduate faculty from that department as the thesis committee chair.

The committee is appointed after consultation with the candidate and the advisor, and consists of at least three persons: two must be members of the graduate faculty from the candidate’s department; one may come from outside the department.

The thesis committee chair is primarily responsible for directing and guiding the candidate’s research and writing activities. The student is responsible for keeping all committee members informed of the scope, plan, and progress of both the research and the thesis.

Students selecting the thesis option should obtain a copy of GMU’s Thesis, Dissertation or Project Guide, which is available in the course materials store in the Johnson Center or on the University Dissertation and Thesis Services web site, www.gmu.edu/library/specialcollections/dtwebguide.htm. Students may register in Thesis (799) only after their thesis proposal has been submitted and approved as prescribed in the guide. Any student not in attendance at the university who is preparing a thesis under the active supervision of a member of the faculty, or who wishes to take an examination, must maintain continuous registration for at least one credit per semester.

Thesis Submission

The original and one copy of the master’s thesis with two original signed cover sheets must be deposited with the college/school/institute dean or director for dean/director’s signature prior to being transferred to the University Libraries. For degree conferral, two copies with cover sheets signed by committee and dean/director of college/school/institute must be submitted to the library by 5 p.m. the last Friday of classes (select the timelines link at http://Registrar.gmu.edu/gradcheck for specific deadline date). This is also the deadline for participation in the May commencement.

REQUIREMENTS APPLICABLE TO ALL DOCTORAL DEGREES

Candidates must satisfy all university degree requirements and all requirements established by the doctoral program faculty. Departmental degree requirements are listed under the respective doctoral programs in this catalog.

1. A candidate must earn a minimum of 72 graduate credits (without master’s degree) or 42 credits (with master’s degree).
2. Only graduate courses may apply toward the degree.
3. The majority of the credits applied to the degree must be earned at the university (or, in the case of programs offered through joint, cooperative, or consortial arrangements, at the participating institutions).
4. A minimum of 36 credits have to be taken in degree status (after admission to the degree program).
5. A candidate must pass a written and/or oral doctoral candidacy (qualifying) exam.
6. A candidate must complete a minimum of 12 credits of doctoral proposal (998) and doctoral dissertation research (999). A maximum of 24 credits of 998 and 999 may be applied to the degree.
8. A candidate must have a minimum GPA of 3.000 in course work presented on the degree application, which may
Academic Policies

include no more than 6 credits of C or C-. (Grades of C- or D do not apply to graduate courses. The GPA calculation excludes all transfer courses and George Mason Extended Studies credits not formally approved for the degree.)

Time Limit

Doctoral students have six years from the time of first enrollment as a degree-seeking student to become advanced to candidacy. Students have five years from the time of advancement to candidacy to graduation. Individual doctoral programs may have stricter time limits, which are published in the catalog. Students who are given permission to re-enroll following an absence from the university may not count the time limits as beginning on the date of re-enrollment. Students who will not meet published time limits due to circumstances beyond their control, may petition their school, college, or institute for an extension. Failure to meet the time limits, or to secure approval of an extension request, may result in termination from the program.

Doctoral Research Skill Requirements

Some doctoral degree programs require demonstration of proficiency in a research skill: a reading knowledge of the research literature in a foreign language, knowledge of a computer language, knowledge of statistical methods, or knowledge of a research tool specific to the discipline. Research skill requirements are included with the degree requirements for the specific doctoral degree.

Where demonstration of research skills is required, certification that this requirement has been met must be completed for advancement to candidacy.

Program of Study

Normally before the end of the second year of graduate study, but no later than consideration for advancement to candidacy, a doctoral student must submit a program of study for approval by the dean or director of his/her college, school, or institute. The program of study must include major courses and supporting courses to be completed, research skills required, subject areas to be covered by the candidacy examination, and a proposed date for the candidacy examination. Program of Study forms are available from each program's doctoral coordinator. Any changes in the programs of study must be documented with an amended Program of Study form.

Advancement to Candidacy

Advancement to candidacy implies that a doctoral student has demonstrated both a breadth and depth of knowledge in the field of study and is capable of exploring problems on the boundaries of knowledge.

The candidacy examination includes a written part and may include an oral part, depending on the particular doctoral program. Doctoral students should consult the degree requirements for each doctoral program to determine whether an oral portion is required, whether it is judged separately or with the written portion, the number of times a failed candidacy examination may be repeated and any time limits for repeating, and any time limits for attempting the candidacy examination.

Before doctoral students may be advanced to candidacy by the unit dean or director, they should have completed all course work required by the program faculty, have been certified in all doctoral research skills required, have passed the candidacy examination, and have been recommended by the doctoral supervisory committee or the program coordinator.

Dissertation Committee

By the time that a doctoral student is advanced to candidacy, the dean or director of the school/college/institute appoints a dissertation committee upon recommendation of the program director. The committee consists of a graduate faculty member (see Graduate Faculty section in this chapter) from the department of the student's field of study and at least two other members of the graduate faculty, one of whom must be from outside the student's department or degree program (for programs not in departments). Additional members may be appointed who are not members of the graduate faculty or who are from outside the university.

Student initiated changes in the composition of the dissertation committee may occur only with the approval of the dean or director of the school/college/institute in consultation with the committee. Such changes may be made for extenuating circumstances only. Faculty may resign from a dissertation committee with appropriate notice by submitting a resignation in writing to the dean or director of the school/college/institute.

Dissertation Registration (998, 999)

Students working on dissertation proposal (998) or research (999) must register for a minimum of 3 credits of 998 or 999 per semester (excluding summers), until only three credits of dissertation remain (as given on the program of study). Once students have 3 or fewer credits remaining, they may register for 1 credit of 998 or 999. Students enrolled in 1 credit may be considered full-time as long as their advisors and department chairs certify each semester that they are working full time on the proposal or dissertation.

All registration for doctoral dissertation research (999) must be planned with the dissertation director and approved by the dean or director of the school/college/institute. Once enrolled in 999, students must maintain continuous registration each semester until graduation, excluding summers. Students who defend in the summer must be registered for at least one credit of 999 in the summer. Individual doctoral programs may require continuous registration beginning with 998.

Registration for dissertation proposal (998) or research (999) must be completed by the end of the schedule adjustment period as published in the Schedule of Classes. If this date is missed, students must register for these courses the following semester. Failing to register on time in a particular semester does not alter the requirement for continuous registration for 999.

Doctoral Dissertation

A dissertation is required for the doctor of philosophy degree and most professional doctoral degrees. The dissertation is a written piece of original thinking that demonstrates doctoral candidates' mastery of the subject matter, methodologies, and conceptual foundations in their chosen fields of study. This is generally achieved through consideration of a problem on the boundaries of knowledge in the discipline.

The director of the dissertation committee is primarily responsible for directing the doctoral candidate's research and guiding the preparation of the written dissertation. After the dissertation committee is appointed, the student should begin discussions with the director to define a suitable problem for the dissertation. Before the student may enroll in doctoral dissertation research (999), the dissertation proposal must be approved by the dissertation committee and evidence of its approval sent to the unit dean or director for
approval. Before that time, the student may enroll in proposal research (998).

Guidelines for the content and general format of the doctoral dissertation may be found in GMU's Guide for Preparing Graduate Theses, Dissertations, and Projects, which is available on the University Dissertation and Thesis Services web site, www.gmu.edu/library/specialcollections/dtwebguide.htm. The guide includes information on the number of copies required and procedures for submission of the dissertation for approval by the dissertation committee and the unit dean or director. Consult your doctoral coordinator to determine which additional reference manuals are appropriate to your discipline.

Doctoral Defense
As soon as all degree requirements have been satisfied, including the completion of the doctoral dissertation, the doctoral candidate may request a doctoral defense. Approval for the defense is given by the doctoral dissertation committee, the department or program chair, and the relevant dean or director of the school/college/institute. Notice of a defense must be circulated to the university community two weeks before the defense date.

The public defense should demonstrate the candidate’s maturity of judgment and intellectual command of the chosen branches of the candidate’s field of study.

At the close of the final defense, the dissertation committee makes final judgments for approving the dissertation. The doctoral candidate is responsible for making all required changes promptly, for submitting the original and required copies, and obtaining signatures. Final approval for the dissertation is given by the doctoral dissertation committee, the department or program chair, and the relevant dean or director of the school/college/institute, all of whom must sign the final copy.

For a dissertation to be approved, all members of the committee must sign. If a committee member refuses to sign the dissertation, the student or any member of the committee may petition the unit dean or director for a review and ruling to resolve the stalemate. The dean or director of the school/college/institute may seek the advice of outside reviewers to provide assessment of the work. The final decision is that of the dean or director and is not subject to appeal.

Dissertation Submission and Fee
Two original copies on 100 percent cotton bond and one photocopied copy of the dissertation must be deposited with the college/school/institute dean or director for dean/director’s signature prior to being transferred to the University Libraries.

For degree conferral, two copies with cover sheets signed by committee and dean/director of college/school/institute must be submitted to the library by 5 p.m. on the last Friday of classes (select timelines link at http://registrar.gmu.edu/gradcheck for specific deadline date). This is also the deadline for participation in the May commencement. To be included in the published program for university commencement program, students must submit copies as described above to the library by April 15.

In addition, submission of the dissertation to University Microfilms International is required; a fee of $55 is paid by the student for this process. All copies of the dissertation must be submitted and all fees paid before the doctoral degree is awarded.

University Dissertation and Thesis Services
University Dissertation and Thesis Services (UDTS) facilitates completion and submission of dissertations, theses, and graduate-level projects for students by helping students meet university requirements and deadlines for submission of their works. The program assists George Mason students in all stages of dissertation, thesis, or project production. UDTS’ web site, www.gmu.edu/library/specialcollections/dtwebguide.htm, provides students with useful tools, such as GMU’s Dissertation, Thesis, or Project Guide, downloadable templates of necessary dissertation/thesis/project elements, forms required for the submission process, and links to related Web sites. UDTS is located in Fenwick Library, Wing 2C (Special Collections & Archives). For more information please contact the University Dissertation/Thesis Coordinator, Robert Vay at (703) 993-2222 or rvay@gmu.edu.
Equal Opportunity and Affirmative Action

Statement on Equal Opportunity

George Mason University is an equal opportunity and affirmative action institution committed to the principle that access to study and employment opportunities afforded by the university, including all benefits and privileges, be accorded to each person—student, faculty, or staff member—on the basis of individual merit and without regard to race, color, religion, national origin, veteran status, disability, sexual orientation, sex, or age (except where sex or age is a bona fide occupational qualification).

George Mason maintains a continuing affirmative program to promote equal opportunity and to identify and eliminate discriminatory practices in every phase of university operations. Furthermore, affirmative action is taken to ensure that opportunities afforded by the university are fully available to persons with disabilities, women, disabled and Vietnam veterans, and minorities. The university makes every reasonable accommodation to enable students or employees with disabilities to undertake work or study for which they qualify.

As required by the Civil Rights Act of 1964, as amended, the university is committed to the broad application of Title IX of the Education Amendments of 1972, Title VI of the Civil Rights Act of 1964, the Americans with Disabilities Act of 1990, Section 504 of the Rehabilitation Act of 1973, and the Age Discrimination Act of 1975.

Students and employees should bring problems or questions regarding equal opportunity (EO), affirmative action (AA), or sexual harassment policies to the attention of their supervisors, academic deans, department chairs, the vice president for University Life, the student ombudsman, the director of Human Resources, a trusted faculty or staff member, the Women’s Studies Research and Resource Center, or the vice president and university equity officer, Mason Hall, Suite D105, (703) 993-8730. Employees with disabilities may contact the ADA specialist in Mason Hall, Room D111, (703) 993-8857 or (703) 993-8787 (TDD). Students with disabilities may contact the Disability Resource Center in SUB I, Room 234, (703) 993-2474.

Conduct within the University Community

The George Mason University community respects and protects the individual dignity, integrity, and reputation of all its members. All students, faculty, and staff must comply with the conventions and regulations of university life that are necessary to maintain order, protect individuals and property, and fulfill the purposes and responsibilities of a university. This includes ensuring our commitment to high standards of civility and decency toward all.

Students enrolling in the university assume an obligation to conduct themselves in a manner compatible with the university’s function as an educational institution. The Code of Virginia (Section 23-9.2:3) confers upon the university
the responsibility for maintaining order within the university and the right to exclude those who are disruptive.

The Office of the Judicial Administrator is administratively responsible for supervising student conduct on campus. A system of courts administers nonacademic discipline. In addition to these courts, the student Honor Committee, described in the "Academic Policies" chapter, is responsible for adjudicating violations of the Honor Code that relate to academic matters. Questions regarding student conduct should be directed to the Judicial Affairs Office, Student Union I, Room 302, (703) 993-2884.

**Student Health Services**

George Mason University's Student Health Services provides high quality health-care services to all currently enrolled students. There is no evaluation fee, but there are minimal charges for most tests and procedures. The staff includes a physician, nurse practitioners and registered nurses, a medical technologist, and various levels of support personnel.

As of January 2002, Student Health Services are offered at all three campuses. Appointments are required for nonemergency services. Please call to make an appointment and for additional information.

On the Fairfax Campus, Student Health Services is located within the Health and Wellness Center in SUB I. The phone number is (703) 993-2831.

On the Prince William Campus, Student Health Services is located in PW 1, Room 202E. The phone number is (703) 993-8374.

On the Arlington Campus, Student Health Services is located in the Truland Building, Room 150 F and I. The phone number is (703) 993-2831.

**Immunization Requirements**

Policy regarding immunization requirements at George Mason University is determined by legislation enacted by the Virginia General Assembly and by recommendations made by the Advisory Committee on Immunization Practice, the Centers for Disease Control, and the American College Health Association. All students born after 12/31/1956 are required to provide documented evidence that they are immunized against certain communicable diseases.

**Required Immunizations:**

- Measles, Mumps, Rubella (MMR)—Laboratory report of a titer documenting immunity is acceptable
- Primary Tetanus, Diphtheria, and Pertussis series with last Tetanus booster within past 10 years
- Polio
- Meningitis—As of March 19, 2001, full-time students in Virginia's public four-year colleges and universities must be immunized against meningococcal disease or must sign a waiver stating that they have received and reviewed information on meningococcal disease and the availability and effectiveness of the vaccine and have chosen not to be vaccinated. If the student is less than 18 years old, the waiver must be signed by a parent or other legal representative.

**Highly Recommended Immunizations:**

Hepatitis B: Series of three injections

At least one month prior to enrollment, records of immunizations are to be sent to the Student Health Center. Student Union Building (SUB) I, 4400 University Drive, MS 2D3, Fairfax, Virginia, 22030. Immunization records can also be faxed to (703) 993-4053. If you have questions, or need additional information, you may check our web site at www.gmu.edu/student/hcs/immm.html or call (703) 993-2836.

**Drug and Alcohol Policy**

(Adopted by the Board of Visitors, May 1990) Revised August 10, 1998

The abuse of drugs and alcohol by members of the George Mason University community is not compatible with the goals of the university. The university attempts to prepare individuals to act responsibly by defining standards of behavior and by providing educational programs to create an awareness of drug- and alcohol-related problems. Those in need of assistance in dealing with drug and alcohol-related problems are encouraged to seek the confidential help of the university’s Substance Abuse Programs and Services located on the Fairfax Campus in the Health and Wellness Center, SUB I, Room 252D.

**Drugs**

1. Use and/or possession of illegal drugs and drug paraphernalia are prohibited on the campuses of George Mason University. Violation of this community standard will be considered a serious offense. Implementation of this policy will be in accord with established university procedures as contained in the University Judicial Code.

2. University Police enforce all applicable local, state, and federal laws in accord with established standing orders, procedures, and guidelines.

3. A judicial review of all reports of drug offenses occurring on campus will be conducted by the university. Actions taken under the auspices of the University Judicial Code will neither prejudice nor be prejudiced by actions taken in the criminal justice system or the management of university housing.

4. Students found responsible for violating the law or regulations involving illegal drugs will be required to undergo an evaluation administered by personnel in the office of the university’s Substance Abuse Programs and Services.

5. The housing status of a resident student found in violation of a campus drug regulation while in a residence hall will be determined by the appropriate housing official. Guests and visitors found responsible for violating a campus drug regulation while in a residence hall will be issued a trespass order prohibiting their presence in any and all residential buildings on George Mason University campuses. This trespass order will be in effect for a minimum of one calendar year.

6. In addition to any action taken by the Office of Housing and Residence Life, the standard sanction for a student’s first on-campus violation involving possession or use of marijuana or possession of drug paraphernalia will be suspension from the university for a minimum of one academic semester. However, the judicial administrator may reduce the sanction to one-year probationary status on the basis of mitigating circumstances and/or recommendations made in conjunction with the evaluation by university personnel in the office of Substance Abuse Programs and Services. Additional educational sanctions may be included in the conditions of probation. Any
future violation of drug and alcohol policies will result in permanent separation from the university.

7. Students found responsible for a violation involving sale or possession of an illegal substance with intent to distribute will be permanently separated from the university.

8. Students found responsible for use or possession of an illegal drug other than marijuana will be suspended from the university for a minimum of one year. To apply for reinstatement after suspension, students must provide evidence of successful participation in a drug treatment program.

Alcohol
1. The possession and consumption of alcoholic beverages is limited to those locations and circumstances authorized by university policy.

2. No alcoholic beverages are permitted in Presidents Park.

3. Students who are 21 years of age or older are permitted to possess alcohol in residence hall rooms except those located in Presidents Park. The quantity of alcohol may be limited by residence hall regulations.

4. No alcoholic beverages may be consumed in public areas of a residence hall. These areas include, but are not limited to, hallways, study rooms, and lounges.

5. All first-time offenses of this policy by residential students (except those involving severe intoxication and/or a police or emergency medical response) will be adjudicated through the housing judicial system. All offenses by nonresident students will be referred to the university judicial administrator.

6. Discipline sanctions related to housing infractions will be primarily educational, but may include a housing assignment change, referral to the university judicial administrator, and/or removal from housing.

7. All cases involving severely intoxicated students and/or a police or emergency medical response will be referred to both the university judicial administrator for disciplinary action and to personnel in the office of Substance Abuse Programs and Services for appropriate evaluation and referral.

8. All students referred to the university judicial administrator will be evaluated by personnel in the office of Substance Abuse Programs and Services. The sanctions imposed in these cases will be designed to offer assistance in overcoming any identified problem(s). While the purpose of the judicial action will be educational and remedial, it may be appropriate to remove the student from campus housing or from the university.

9. The university will encourage parental involvement whenever there is a repeat offense or when the first offense indicates a serious problem. This involvement will be in accord with provisions of the Family Education Rights and Privacy Act.

Notice to All State Employees
The federal Drug-Free Workplace Act requires us to inform all employees of the state that the unlawful manufacture, distribution, possession, or use of a controlled substance is prohibited in the workplace. The workplace consists of any state-owned, controlled, or leased property, or the site where state work is performed. Any employee who violates this prohibition will be subject to disciplinary action up to and including discharge and, at the discretion of management, will be required to satisfactorily participate in a drug abuse assistance or rehabilitation program. Employees must abide by the terms of this prohibition as a condition of employment and must notify their supervisor(s) no later than five (5) days after conviction of any criminal drug statute conviction occurring in the workplace.

—Commonwealth of Virginia

Commonwealth Policies on Alcohol and Drug Use
I. General Laws and Regulations
A. Those who choose to purchase, possess, and consume alcoholic beverages on campus must do so responsibly and must have reached the legal age of 21. All members of the university community (this includes students, faculty, staff, alumni, and their guests) are expected to comply with university-related regulations and federal and state laws regarding the use of alcohol. Compliance also extends to university-sponsored activities held off campus. Students and employees are expected to take personal responsibility for their own conduct when making decisions regarding the use of alcohol.

B. Virginia state law prohibits the purchase, possession, or consumption of beer, 3.2 beverages, wine, or distilled spirits by persons under the age of 21. The law also prohibits purchasing for or serving such beverages to a person under age 21. Underage persons who use or attempt to use a driver's license that has been altered, forged, borrowed from another, or is in any way deceptive in an attempt to obtain prohibited beverages shall have their driver's licenses revoked for a minimum of 30 days, but for not more than one year. Consuming alcohol in non-licensed, public places or offering a drink to another in a non-licensed, public place is also a violation of Virginia law. The sale of alcoholic beverages to an intoxicated person is prohibited. Additionally, it is unlawful for an intoxicated person to purchase or possess alcoholic beverages. While purchase and/or possession by an intoxicated person are misdemeanors, violators are also subject to having their driver's license revoked for one year. If it is illegal to operate a motor vehicle (including mopeds) when a person has a blood alcohol concentration (BAC) of 0.08 percent or higher. Individuals under age 21 who drive with a BAC of more than .02 percent (but less than 0.08 percent) risk having their driver's license suspended for six months and a fine of up to $500 may be imposed. If a person is arrested for driving with a license revoked or suspended under a prior DUI (driving under the influence) conviction, the offender's car is immediately impounded for 30 days. Following conviction, the court can impound the vehicle for an additional 90 days. If the car does not belong to the offender, the owner of the car may petition the court for release of the vehicle. Sobriety spot-checks to detect drunken drivers are legal. Refusing a breath test or having a BAC of .08 percent or higher may result in an individual's driver license being revoked for seven days. There is no longer an option to request a blood test instead of a breath test for an alcohol-related offense. It is illegal to serve alcohol from an unregistered keg. An "unregistered" keg is defined as a common container holding four gallons or more. Only University Din-
ing Services or other authorized entity may serve alcohol from kegs.

C. Possession, use, sale, or distribution of controlled substances (including marijuana), is a violation of federal and state laws and university regulations. The 1988 federal Drug-Free Workplace Act also prohibits the unlawful manufacture, distribution, possession, or use of a controlled substance in the workplace.

D. Students, faculty, staff, and sponsoring organizations found in violation of state and/or university regulations may be subject to disciplinary action, civil action, and/or loss of the privilege to reserve or use university facilities. Disciplinary action for students or student organizations will be conducted in accordance with the George Mason University Judicial System for Student Conduct and civil proceedings may occur in certain situations. University sanctions are intended not to punish individuals, but to provide education and rehabilitation services.

Sanctions vary depending upon the severity of the violation and range from written warnings to expulsion from the university. Most sanctions require the student to be evaluated by personnel in the office of Substance Abuse Programs and Services to assess the severity of alcohol and other drug problems and a referral to arrange community service hours. Employees found in violation of the university’s Drug and Alcohol Policy may be subject to action by the appropriate administrative office.

II. Health Risks

For many people in our society, the use of chemicals is a daily reality. These chemicals include over-the-counter medications, prescription drugs, and illegal drugs such as marijuana, cocaine, and LSD. This also includes legal chemicals such as alcohol, nicotine, and caffeine. Many chemicals have the potential to improve our health and enrich our lives. Yet, many of these chemicals also have the potential to cause serious health problems.

Alcohol is a depressant that slows down brain activity. Like any drug that affects the mind, alcohol has the potential to be abused. Decision-making abilities can be impaired by alcohol use and can lead to negative consequences, such as risky sexual behavior. Drinking alcohol should be avoided, particularly by pregnant women and anyone taking prescription medications or operating a motor vehicle. Long-term or heavy use of alcohol is linked to cancer, heart and liver damage, and other serious illnesses and can lead to tolerance and physical and psychological dependence. Excessive alcohol intake can cause death due to alcohol poisoning. All students and employees are expected to respect those who choose not to drink.

Illicit drugs have more than legal consequences; they have specific health and ethical risks that can cause dangerous consequences and/or unhealthy, dependent behavior. Use of alcohol (or any other drug) in a manner that leads to impairment or intoxication is unhealthy, risky, and should be avoided and discouraged. The potential for health problems can also develop from the use of nicotine or caffeine products.

Those in need of assistance in dealing with alcohol and other drug problems are encouraged to seek the confidential services of resources listed in Section IV.

III. General Regulations for Individuals and Organizations Serving Alcoholic Beverages

A. University regulations prohibit the possession or consumption of any alcoholic beverage on university grounds unless the university has sanctioned the location and/or conditions for possession or consumption (e.g., Bistro). For further information regarding service of alcohol at public and private events, as well as at the Patriot Center, Arlington Campus, and Prince William Campus, please review the comprehensive guidelines for alcohol service available in the office of Substance Abuse Programs and Services.

IV. Campus and Community Resources

Substance Abuse Services and Programs, Fairfax Campus
Health and Wellness Center in Student Union I, Room 252D, (703) 993-3687
Health and Wellness Resource Room, Fairfax Campus
Health and Wellness Center in Student Union I, Room 238, (703) 993-3686
State Employee Assistance Service (SEAS), (804) 786-6741
Alcoholics Anonymous—for campus meetings, (703) 993-3686; for other locations, (703) 281-7501.
Narcotics Anonymous—(703) 281-8638.

The Drug and Alcohol Policy, composed of these four sections, outlines subject matter pertaining to university regulations on substance use and abuse. This policy is distributed annually to all employees and students as a means of informing the campus community of alcohol and other drug laws, health risks, and campus and community resources. University regulations regarding the Drug and Alcohol Policy have been developed by a committee of faculty, staff, and students. This policy statement is available in the office of Substance Abuse Programs and Services in the Health and Wellness Center located in Student Union I, Room 252D. This policy is also distributed through the student and faculty/staff handbooks and the university newspapers, Broadside and the Mason Gazette.

Responsible Use of Computing Policy

I. Scope

The Responsible Use of Computing Policy applies to all academic and operational departments and offices at all university locations, owned and leased. The policies and procedures provided herein apply to all university faculty, staff, students, visitors, and contractors.

II. Purpose

The university provides and maintains computing and telecommunications technologies to support the education, research, and work of its faculty, staff, and students. To preserve the security, availability, and integrity of George Mason computing resources, and to protect all users’ rights to an open exchange of ideas and information, this policy sets forth the responsibilities of each member of the George Mason community in the use of these resources. To accom-
plish these ends, this policy supports investigations of complaints involving George Mason computing abuse, including sexual harassment, and honor code and federal or state law violations.

A user of George Mason's computing resources should be aware that violations of this policy may result in revocation of access, suspension of accounts, disciplinary action, or prosecution, and that evidence of illegal activity will be turned over to the appropriate authorities. It is your responsibility to read and follow this policy and all applicable laws and procedures. If you observe someone violating this policy or another university policy, using George Mason computing resources, you can report it by e-mail to the Security Review Panel (SRP) at stopit@gmu.edu. Many local computing systems have similar e-mail reporting addresses.

### III. Rules of Use

Access to George Mason computing resources is a privilege granted on a presumption that every member of the university community will exercise it responsibly. Because it is impossible to anticipate all the ways in which individuals can damage, interrupt, or misuse computing facilities, this policy focuses on a few simple rules. These rules describe actions that you should avoid and the principles behind them. Each rule is followed by a (not exhaustive) list of examples of actions that would violate the rule.

**Rule 1:** Use George Mason computing resources consistently with the stated priorities.

These priorities are set on the use of George Mason computing resources:

- **High:** All educational, research, and administrative purposes of the university.
- **Low:** Other uses indirectly related to university purposes that have an educational or research benefit, including news reading, web browsing, chat sessions, and personal communications.
- **Forbidden:** Selling access to George Mason computing resources, engaging in commercial activity not sanctioned by the Provost's Office, intentionally denying or interfering with any network resources, including spamming, jamming, and crashing any computer; using or accessing any George Mason computing resource, or reading or modifying files, without proper authorization; using the technology to in any way misrepresent or impersonate someone else; sending chain letters; violating federal or state law, or university policy.

Note: Employees and contractors of the Commonwealth of Virginia may not use George Mason computing resources for recreation or entertainment.

The low-priority uses of George Mason computing should be avoided during the times of peak demand, typically the mid-afternoon to late evening hours. During peak periods, other users may be prevented from doing their high-priority work if you are doing something of low priority. Those users are likely to complain to you or to the SRP if they observe you interfering with their work. Certain activities, such as broadcasting e-mail to very large distributions, will consume large amounts of resources; avoid them.

**Rule 2:** Don't allow anyone to use your account for illegitimate purposes.

Your account username identifies you to the entire international Internet user community. Another person using your account, whether or not you have given permission, will be acting in your name. You may be held responsible for that person's actions in your account. If that person violates any policies, his or her actions will be traced back to your username and you may be held responsible. The easiest way to protect yourself is to protect your password. If you have a legitimate reason to give someone access, keep it strictly temporary, and change your password after that person finishes using your account. Definitely do not give your password to anyone you do not trust. If someone else offers you use of an account that you are not authorized to use, decline. If you discover someone's password, don't use it; report the access of the password to the owner or to stopit@gmu.edu.

**Rule 3:** Honor the privacy of other users.

The university respects the desire for privacy, and voluntarily chooses to refrain from inspecting users' files, except in certain well-defined cases (described below in Section V). System administrators who carry out standard administrative practices, e.g., backing up files, cleaning up trash or temporary files, or searching for rogue programs, do not violate privacy. Examples of privacy violations are given below to assist you to avoid violating the privacy of other users:

- Don't access the contents of files of another user without explicit authorization from that user. Typically, authorization is signaled by the other user setting file access permissions to allow public or group reading of files. Since some systems by default make all files readable to all users and some users don't know this, the file permissions are not reliable. It is always best to ask.
- Don't intercept or monitor any network communications not explicitly meant for you.
- Don't use the systems to transmit personal or private information about individuals unless you have explicit authorization from the individuals affected. Don't distribute such information unless you have permission from those individuals.
- Don't create programs that secretly collect information about users. Software on George Mason computing resources is subject to the same guidelines for protecting privacy as any other information-gathering project at the university. You may not use George Mason computing resources to collect information about individual users without their consent. Note that most systems keep audit trails and usage logs (e.g., for ftp, netscape, and login); these are not secret and are considered normal parts of system administration.

**Rule 4:** Don't impersonate any other person.

Using George Mason computing resources to impersonate someone else is wrong. If you use someone else's account without permission, you may be committing acts of fraud because the account owner's name will be attached to the transactions you have performed. If, while using someone else's account, you communicate with others, you should clearly identify yourself as doing so.

If you send anonymous mail or postings, you should realize that it is normal etiquette to identify that your message is anonymous or is signed by pseudonym. Because policy violators often use anonymous communication to hide their identities, many people give less credence to anonymous communication than to signed communication.
System administrators who receive anonymous complaints, and cannot locate the sender for additional information or clarification may be unable to assist the sender or provide witnesses to support claims of illegal activity.

**Rule 5:** Don’t use George Mason computing resources to violate other policies or laws.

Don’t use George Mason computing resources to commit violations of federal or state laws, or other university policies. Examples are given below to assist you to avoid inadvertent violations. This list is not comprehensive. In case of doubt, contact the Security Review Panel or send e-mail to stopit@gmu.edu.

- Don’t violate copyright laws and licenses. Many programs and their documentation are owned by individual users or third parties, and are protected by copyright and other laws, licenses, and contractual agreements. You must abide by these restrictions; to do otherwise may be illegal.
- Don’t use George Mason computing resources to violate the Honor Code.
- Don’t use George Mason computing resources to attack computers, accounts, or other users by launching viruses, worms, Trojan horses, or other attacks on computers here or elsewhere.
- Don’t use George Mason computing resources to harass or threaten others.
- Don’t use George Mason computing resources to transmit fraudulent messages.
- Don’t use George Mason computing resources to transmit obscene material, or to distribute pornographic material to minors.

All users of George Mason computing resources are subject to all federal and state obscenity laws.

**IV. Schools, Institutes, Centers, and Departments**

George Mason organizational units operate computers and networks to support their missions. The principles of this policy apply to all university organizational units, and any computers owned or operated by the university. Units may set additional local policies and expectations that are consistent with this policy. For example, local units may stipulate that material displayed for public access from their sites should be consistent with their public image and mission. They may set guidelines for format and content of material in home pages, ftp directories, listserve lists, netlists, info servers, and the like, and may appoint an editor or moderator for such material. They may prioritize and prohibit types of use in order to efficiently manage their computing resources.

**V. Electronic Information Environment**

Your personal e-mail, electronic files maintained on university equipment, and personal web pages are part of a unique electronic information environment. This environment creates unique privacy issues that involve federal and state laws as well as university policies. This section provides a starting point in your considerations on how to use this electronic information environment.

E-mail is not secure. It is easily forwarded to a multitude of recipients and may be altered. Intruders to the network may be able to bypass your password protection. Your e-mail may also be accessible under freedom of information laws, and backup computer tapes may contain deleted e-mail for over a year. Mail undelivered for any reason may be copied to the mailbox of a postmaster on the sender or recipient computer. For all of these reasons and others, your expectations of privacy concerning your e-mail and electronic files should take these realities into account.

Most systems have public directories for temporary files. Examples are print spoolers, system-wide web caches, and scratch areas used by document editors. The temporary files stored in these directories are usually restricted to being readable only by the owner. To protect privacy and prevent these directories from overflowing, system administrators empty them regularly. You should never count on these files surviving after you log out.

No user may intentionally read personal files, including those storing e-mail, without the owner's consent. In the event of a lawful investigation of misconduct, law enforcement officials and university officials involved in the investigation may inspect user files and communications. In such a case, the chair of the Security Review Panel (SRP) should be notified immediately, preferably before the inspection occurs. Users whose files have been inspected will normally be notified within 14 days by e-mail or other appropriate means.

The university reserves the right, to the fullest extent permitted by law, to inspect user files and communications for the purposes of investigating allegations of illegal activity or violations of university policies, or to protect the integrity and safety of network systems.

**VI. Web Pages**

The university's official web pages (www.gmu.edu) contain public information about the university's offerings, programs, and promises to students and the public. These pages project the public identity of the university and are its first electronic point of contact with the general public, students, parents, and employers. The university exercises editorial control over the content of its official web pages.

The university is not responsible for information, including photographic images, published on or accessible through personal web pages, including personal home pages. Personal web pages, created and maintained by employees, students, or university-recognized student groups, are the sole responsibility of the person or student group identified by the account. The university does not monitor the contents of these personal web pages. The individual creating or maintaining personal web pages may be held criminally or civilly liable for the materials posted on the web site. For example, an individual who posts obscene material may be subject to criminal prosecution, and an individual who posts copyrighted material might be liable to the owner of the copyrighted material under copyright law.

Personal web pages contain the personal expression of their creators. The contents, including link identifiers, of these pages include academic subjects, hobbies, religion, art, and politics, as well as materials that some viewers may find offensive. Neither the contents nor the link identifiers are reviewed or endorsed by the university. If you feel you might
be offended by material following a link identifier or material on the page itself, you should not continue.

The university will investigate all complaints involving personal web pages, and will remove or block material or links to material that violate federal or state law or university policy.

VII. System Administrators (SAs)
The SAs of various computers on George Mason campuses have special responsibilities. They have been granted extraordinary powers to override or alter access controls, configurations, and passwords, which they should exercise with great care and integrity. SAs manage computers and administer policies, but they do not create policies. Their actions are constrained by this policy and by the policies of local administrative units.

A set of guidelines and standards for all SAs is created and maintained by the SRP. These guidelines will address job descriptions, integrity issues, and standard system administration actions that do not violate privacy. Managers of university units who employ SAs are responsible for ensuring that the SAs comply with and enforce the requirements of this policy and local policy in the systems for which they are responsible. SAs who violate this policy or any local policy, or who misuse their powers, are subject to disciplinary action.

If a SA observes someone engaging in activities that would seriously compromise the security or integrity of a system or network, e.g., intrusions, break-ins, unauthorized service or access denials, or Trojan horses, the SA may take immediate action to stop the threat or minimize the damage. This may include termination of processes, scanning for rogue programs, disconnection from a network, protection and holding of evidence for an investigation, or temporary suspension of an account. Account suspensions must be reported immediately to the SRP. SAs who observe suspected violations of law should immediately alert the University Police.

Should a valid complaint be filed against an SA, the SRP will determine if the SA's action could have been accomplished only by someone with the extraordinary powers of an SA. If not, the SRP will follow the "stop it" procedure to request that the SA refrain from the action in the future; if so, the SRP will forward the latter to the SA's supervisor for appropriate action.

VIII. Security Review Panel (SRP)
This policy establishes a SRP that is responsible for reviewing SAs' decisions, responding to complaints, and periodically reviewing this policy. The SRP consists of three faculty members, one graduate student, one undergraduate student, one Information Technology Unit (ITU) staff member, and one non-ITU system administrator (SA). The SRP members are appointed by the vice president for information technology and services for a term not to exceed two academic years. The SRP chair will be one of the faculty members and will be appointed by the vice president for information technology and services.

SAs will report all violations and their responses to the SRP immediately. Any member of the community can report a violation to the SRP via the stopit mechanism. Upon receipt of a complaint from a user or a SA, the SRP chair will assign one of the members as the case worker for that complaint. The three-step stopit process within which the SRP operates is described below in Part IX.

The SRP is authorized to create subgroups to assist in its mission. An example is a George Mason Emergency Response Team, which coordinates responses to abuses, provides technical assistance on security matters to SAs, and issues security advisories.

The SRP is also responsible for periodically reviewing these policies and recommending improvements and clarifications as needed. All modifications to the policies will be made after full public disclosure and a reasonable period for public comment.

IX. The Stopit Process
The process described here, called "stopit" after a similar process at Massachusetts Institute of Technology, uses a graduated approach to handle violations of this policy. The approach is based on two premises: The vast majority of users are responsible; and most offenders, given the opportunity to stop uncivil or disruptive behavior without having to admit guilt, will do so and will not repeat the offense.

This policy distinguishes between incidents that pose no immediate dangers to persons or to system integrity, and incidents that do. The three-step "stopit" process described below is designed for cases in which there are no immediate dangers.

Incidents posing immediate dangers to persons or systems require immediate action. These include active system break-ins or intrusions, denials of service, and fraud or criminal activity conducted using Masonet resources. In these cases, the responsible SA may take reasonable actions to deal with the threat, such as temporarily disconnecting the system from the network, temporarily suspending accounts, and calling law enforcement officers. The SA taking such actions will notify his or her supervisor and the SRP chair as soon as practicable.

The "stopit" process rests on two foundations:

Wide Distribution of Policy Information
Notices describing the essence of this policy will be displayed in computer labs on George Mason premises; the same information will be given to new users and to each user annually. New users will be asked to sign their agreement to this policy as a condition of activating their accounts.

Standard Reporting Mechanism
The "stopit" e-mail address (stopit@gmu.edu) is monitored regularly by SRP members, who will respond promptly to complaints. Anyone observing harmful or disruptive behavior should report it to the stopit e-mail address or to University Police. The SRP member who responds to a complaint will normally forward it to the SA of the system on which the infraction apparently occurred. That SA will investigate the complaint, determine its validity, and take appropriate actions such as sending the first warning (see below).

The steps of the process are as follows:

STOPIT 1: First Warning
The SRP member handling a case (or SA, if the case is delegated) will send a warning letter to the alleged perpetrators of improper use of George Mason computing resources, harassment, or other uncivil behavior. The letter will have this form:
General Policies

"Someone using your account did [whatever the offense is]." This is followed by an explanation of which policy this behavior violates and why it is a violation. "Account holders are responsible for the use of their accounts. If you were unaware that your account was being used in this way, it may have been compromised. Your system administrator can help you change your password and re-secure your account. If you are aware, then please make sure that this does not happen again."

This warning ensures that the alleged perpetrators are aware that a policy violation may have occurred and that there was a complaint. It offers them a chance to desist without having to admit guilt and a chance to secure their account against unauthorized use.

STOPIT 2: Second Warning

If there is a second offense from an account that received a first-warning letter, the cognizant SRP member will issue a second warning and may require that the account holder come to a mandatory interview. The SRP chair can authorize the temporary suspension of access to the user's account if the individual fails to arrange for a mandatory interview. The user can request a hearing before the full SRP.

STOPIT 3: Disciplinary Procedures

If the previous "stopit" stages do not convince the perpetrators to desist, the matter will be turned over to the appropriate university authority designated for that type of offense. The SRP will make available all information and evidence it has on the case to that authority.

If it appears from the evidence that any federal or state laws may have been violated, the SRP may suspend the account pending the outcome of the university's or law enforcement authorities' investigation.

X. Amendments and Additions

All amendments and additions to this policy are to be reviewed and approved by the Office of the Provost and the Office of the Senior Vice President.

XI. Effective Date

The policies herein are effective October 20, 1997. This administrative policy shall be reviewed annually and revised, if necessary, and becomes effective at the beginning of the university's fiscal year, unless otherwise noted.

Any updates or additions to this information are on the web site www.gmu.edu/srp and take precedence over any printed matter.

Parking Policy

Phone: (703) 993-2710
Student Union II, Room 1014

All faculty, staff, and students who park in lots owned or operated by George Mason University must display a valid decal, or must park in the Parking Deck and pay an hourly or daily rate. The Parking Deck is located on Mason Pond Drive off Patriot Circle. Visitors and guests must park in the Parking Deck or at a meter, unless special arrangements have been made through Parking Services.

Decal enforcement runs from 7 a.m. to 11 p.m. seven days a week. Metered parking is designated for short-term use and is monitored from 7 a.m. to 11 p.m., seven days a week.

Broken meters are considered closed parking spaces, and any vehicles parked in such spaces are subject to citation.

Restricted areas such as yellow curbs, crosswalks, sidewalks, landscaped/baricaded areas, loading zones, handicapped spaces, and fire/emergency lanes are monitored 24 hours a day, seven days a week.

To avoid receiving a substantial fine, students, faculty, and staff should purchase a decal as soon as they drive onto the campus. Three types of parking decals are available: yearly, semester, and summer. Decals may be purchased at the Parking Services sales office, located in Room 1014 in Student Union II. The hours of operation are Monday, Thursday and Friday 8:30 a.m. to 5 p.m., Tuesday and Wednesday 8:30 a.m. to 6 p.m.

Handicapped parking is available at a number of convenient locations at George Mason University facilities. A Department of Motor Vehicles (DMV) handicapped permit must be presented to obtain a George Mason handicapped permit. A DMV permit alone is not sufficient for parking in handicapped spaces in university lots. A visitor with a DMV tag/permit may park in the Parking Deck at prevailing rates. Parking in or blocking access to a handicapped space carries a fine at the prevailing rate.

Some parking lots have designated spaces reserved for faculty/staff or resident students, special permit holders, or for service and repair vehicles. Please read all signs posted at entrances to the parking lots. Complete parking regulations are in the Information Guide available at Parking Services. For additional parking information, call the Parking Services Office at (703) 993-2710.

Motorist Assistance Program (MAP)

Phone: (703) 993-2715

MAP available at the Fairfax Campus from 7 a.m. to 11 p.m., Monday through Sunday. Call the Parking Services MAP line at (703) 993-2715 to access this service. MAP is designed to assist drivers who have minor car problems. Trained MAP personnel are available to help with dead batteries. MAP personnel also can contact locksmith or towing services at the owner's request and expense.

Sexual Assault Policy

The following policy applies to all members of the George Mason University community: students, faculty, administrators, staff, contract employees and visitors.

The university is committed to providing an institutional environment where all persons may pursue their studies, careers, duties, and activities in an atmosphere free of threat of unwelcome and unwanted sexual actions. It strongly condemns sexual offenses, will not tolerate sexual offenders, and supports those who have been victimized.

Sexual assault includes the attempt or act of rape (sexual intercourse without consent by a stranger, an acquaintance, or an intimate), forced sodomy (forced oral or anal sex), or the forced penetration by a foreign object including a finger. Non-penetration sexual assault includes the act of forcing an unwilling person to touch another's intimate parts, groin, breast, or buttocks, or the clothing covering these parts, or forcing an unwilling person to touch another's intimate parts.

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The above acts constitute sexual assault when they are committed against a person's will as evidenced by refusal of consent or through the use of force, threat, or intimidation; or against a person who, by virtue of mental incapacity or physical helplessness, is unable to give or withhold consent. This includes, but is not limited to, incapacity or helplessness caused by alcohol or other drugs. Intoxication of the assailant shall not diminish the assailant's responsibility for the sexual assault.

The university will respond promptly, fairly, and decisively to all reports of sexual assault. Members of the university community accused of these acts will be subject to university disciplinary procedures when the alleged incident has occurred on campus, or when the action has occurred off campus and materially affects the learning environment or operations of the university.

Sexual assaults are serious violations of the university's student judicial code, faculty standards, and university employee policies. They are crimes under state law and punishable by fines and/or imprisonment. In addition, these actions are subject to civil suit for damages.

George Mason University is compliant with the Jeanne Clery Disclosure of Campus Security Policy and Campus Crime Statistics Act (The Clery Act) as amended in 1998, which requires all post-secondary institutions to publish and distribute certain information regarding campus crimes, including reports of campus sexual assault, sexual assault policies, and security programming to all current students, employees, and to any applicant who so requests.

George Mason University shall make 24-hour assistance available to those who have been affected by sexual assault through the Office of Sexual Assault Services.

Sexual Harassment Policy

Sexual harassment is unacceptable conduct and is not condoned in any form at George Mason University. This policy is part of the university's efforts to maintain learning and work environments free from sexual harassment. While this problem can seriously affect all members of an educational community, sexual harassment can be particularly devastating for our student population. A sexual harassment experience can affect a student's emotional well-being, impair academic progress, and even inhibit the attainment of career goals. This problem can likewise affect employees and applicants for both employment and admission to the university in the same manner. George Mason University, therefore, must move to eliminate this problem from the community.

It is generally agreed that what constitutes and defines sexual harassment can vary under particular circumstances and events. Nevertheless, using the definitions of the U.S. Equal Employment Opportunity Commission (EEOC) and the U.S. Department of Education's Office for Civil Rights, the university defines sexual harassment as follows:

Unwelcome sexual advances, requests for sexual favors, and other verbal or physical conduct of a sexual nature constitute harassment when:

- Submission to or rejection of such conduct is made either explicitly or implicitly a term or condition of an individual's academic performance or employment
- Submission to or rejection of such conduct by an individual is used as the basis for decisions about academic evaluation, employment, promotion, transfer, selection for training, performance evaluation, or selection for academic awards or benefits, etc.
- Such conduct has the purpose or effect of creating an intimidating, hostile, or offensive educational or work environment or substantially interferes with a student's academic or an employee's work performance

While the definition quoted above reflects the historical fact that the majority of sexual harassment complaints involve a male harasser and a female complainant (or victim), the definition applies equally to female harassers and male victims as well as same-sex harassment.

George Mason University is committed to eliminating sexual harassment from the campus while ensuring basic protection for all parties. The Office of the Vice President and University Equity Officer (a.k.a. Equity Office) is specifically charged to assist in the investigation and resolution of allegations of discrimination and harassment including sexual harassment. Further, the office exists, in part, to ensure that members of the campus community understand their responsibility to create and maintain an environment free from discriminatory actions and behaviors.

For more information, contact the University Equity Office at (703) 993-8730 or (703) 993-8787 (TDD).

Stalking Policy

(Effective February 1, 1999)

This policy applies equally to all members of the George Mason University community: students, faculty, administrators, staff, contract employees, and visitors.

The university is committed to protecting the right of all individuals to pursue their intellectual, vocational, and personal interests without harassment or interference. The university is also committed to providing an environment in which visitors to and members of the campus community are treated with dignity, respect, and regard for their welfare and learning needs.

George Mason University defines stalking as any behaviors or activities occurring on more than one occasion that collectively instill fear in the victim, and/or threaten his or her safety, mental health, or physical health. Such behaviors and activities may include, but are not limited to, the following:

- Nonconsensual communication, including face-to-face, telephone calls, voice messages, electronic mail, written letters, unwanted gifts, etc.
- Threatening or obscene gestures
- Pursuing or following
- Surveillance or other types of observation
- Trespassing*
- Vandalism*
- Nonconsensual touching*
- These offenses may result in additional criminal charges.

Stalking behavior will not be tolerated. Incidents occurring on or off campus are subject to university discipline when such actions materially affect the learning environment or operations of the university.

Stalking is a crime under Virginia state law. Incidences of stalking outside the Commonwealth of Virginia may be admissible in court if they are relevant to the case and may be punishable as a Class 1 misdemeanor or a felony. Legal
options available to victims of stalking include reporting to the local police, seeking a remedy through civil proceedings, and/or utilizing the campus judicial process.

For more information on stalking issues or this policy, please contact Sexual Assault Services at (703) 993-4364.

**Individuals with Disabilities Policy**
The university is committed to complying with the Rehabilitation Act of 1973 and the Americans with Disabilities Act of 1990 by providing reasonable accommodations for applicants for admission, students, applicants for employment, employees, and visitors who are disabled. Applicants for admission and students requiring specific accommodations for a disability should contact the Disability Resource Center at (703) 993-2474 or the University Equity Office at (703) 993-8730. Applicants for employment and employees should contact Human Resources at (703) 993-2600 or the University Equity Office. Students and employees are responsible for providing appropriate documentation and for requesting reasonable accommodation in a timely manner.

**Other Regulations**

**Weapons**
The unauthorized possession, storage, display, or use of any kind of ammunition, firearms, fireworks, explosives, air rifles, air pistols, or other lethal instruments are prohibited on university property. Any questions regarding this regulation should be directed to the chief of police at (703) 993-3840.

**Smoking**
Smoking is not permitted in any building on campus.

**Bicycles/Skateboards**
Bike racks are provided at various on-campus locations for the convenience of students who bike to and from campus. For resident students, there are bike racks in the residential complexes.

Bikes and skateboards are not permitted on sidewalks, stairs, ramps, footpaths, or grassy areas of the campus or inside university buildings.

**Pets**
No pets, except those assisting people with disabilities, are permitted in university buildings at any time. In addition, pets that are on campus grounds must be on a leash and under supervision at all times.

**Solicitors and Salespeople**
Solicitors and salespeople, except on official business with the university, are not permitted on the campus without prior approval of the University Services Office.
University Academic Programs and Resources

University Libraries

(703) 993-2250
Web: http://library.gmu.edu

Administration
John G. Zenelis, University Librarian and Associate Vice President, IT
Fenwick Library, A227

Administrative and Professional Faculty

Resources and Services
Resources and services of the George Mason University Libraries are housed in Charles Rogers Fenwick Library and the George W. Johnson Center Library on the Fairfax Campus, the Arlington Campus Library, and the Prince William Campus Library. (The School of Law Library at Arlington is administered separately.) The combined holdings of George Mason's libraries, including the law library, total 1 million books and bound journal volumes; nearly 12,000 current serial subscriptions; 2.56 million microform units; 354,000 government documents; 219,000 maps; 25,000 multimedia materials; 400 electronic databases (including several thousand online journals); and significant holdings of manuscripts, special collections, and archives. All of the libraries support instruction, learning, research and service, and outreach activities of students and faculty.

George Mason's integrated library information system provides an online public access catalog, circulation, electronic reserves, and library processing services. The library information system can be used in the libraries, from campus locations on the network, or through the World Wide Web from off-campus locations. The University Libraries' web site, http://library.gmu.edu, offers access to a variety of networked digital resources and electronically mediated services, including virtual reference service.

The library liaison program to academic departments and programs supports a variety of cooperative and collaborative activities. Liaison librarians work with academic departments and programs to develop print collections and electronic resources, as well as offering introductory and advanced information literacy competency instructional sessions, and advanced reference and research consultation services to students and faculty.

Through membership and active participation in local, regional, and national library consortia, the George Mason University Libraries are able to better respond and meet the

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needs of the University’s growing and diverse academic and research programs. Current inter-institutional affiliations include:

- **VIVA**: The Virtual Library of Virginia Program (a Commonwealth of Virginia funded electronic resources and resource sharing program for public higher education institutions)
- **Washington Research Library Consortium** (whose membership also includes American, Catholic, District of Columbia, Gallaudet, George Washington, and Marymount universities)
- **Association of Southeastern Research Libraries** (includes the 36 largest university libraries in a ten-state region)
- **Center for Research Libraries** (the Chicago, IL, based “research library” for research libraries whose multi-million volume holdings are comprised of specialized and uniquely held materials in North America)
- **International Online Computer Library Center**, whose extensive computerized system and network facilitate national and international library resource sharing activities

The Libraries provide an inter-campus delivery service for students and faculty requesting materials held at another George Mason campus library. Materials not held in the George Mason libraries can be obtained by direct borrowing from WRLC institution libraries via the Consortium Loan Service, interlibrary loan, or through commercial document delivery services when required.

Expanded academic support services of the University Libraries also include:

**University Copyright Assistance Office**
- Johnson Center, Rooms 120, 121
- Phone: (703) 993-2562, 3158, or -2427
- Fax: (703) 993-4116
- Web: [http://library.gmu.edu](http://library.gmu.edu)

The copyright office provides guidance and assistance on copyright and fair use issues. The office staff advise the university community regarding copyright in areas such as classroom teaching and technology, online courses, distance education, university publications, university web sites, networked library collections and related services, electronic course reserves, and electronic database licensing. Copyright-related workshops are offered on a regular basis.

**University Dissertation and Thesis Services (UDTS)**
- Web: [www.gmu.edu/library/specialcollections/dtwebguide](http://www.gmu.edu/library/specialcollections/dtwebguide)
- UDTS assists George Mason students and academic units in the dissertation, thesis, and graduate-level project process by helping students meet all university requirements and deadlines for submission of their works. The UDTS Web site provides useful tools such as the university’s Thesis, Dissertation, or Project Guide, which contains downloadable templates of necessary elements; forms required for the submission process, and links to related Web sites. UDTS also assists graduate students through individual consultation and informational workshops.

**Statistical Support Services**
- Fenwick Library Government Documents Microfiche Room
- Phone: (703) 993-3417
- Web: [http://library.gmu.edu/srs](http://library.gmu.edu/srs)
- This office provides expert consultation services for students and faculty who need assistance with statistical software packages (quantitative and qualitative research design analysis).

**Fenwick Library**
- Phone: (703) 993-2240
- Fenwick is the main research library in the university library system. Fenwick holds most of the Libraries’ book collections across disciplines, as well as current and bound journals, microforms, special collections and archives materials, federal and Virginia government documents, and maps. Instruction and reference classes are available in information search strategies, sources, and information technology. Additionally, publicly accessible computer workstations and data ports for laptop use enable access to the Libraries’ electronic resources and associated services. Services available at Fenwick Library are provided by the Periodicals/Microforms, Circulation, Reference, Interlibrary Loan/Document Delivery, Special Collections & Archives, and Collection Management Services departments.

**Johnson Center Library**
- Phone: (703) 993-9060
- The library is part of the George W. Johnson Center integrated learning environment. Electronic access to scholarly information is complemented by a print reference collection, multimedia collections, and a growing circulating book collection comprised of core texts and readings supporting the foundational and interdisciplinary emphases in the university’s undergraduate curriculum. The Johnson Center Library especially supports interdisciplinary programs such as the Honors Program and New Century College through its collections and outreach programs. The library also holds designated discipline-based circulating book collections. The Johnson Center Library serves as the center for multimedia collections and services for the university library system. This library also provides course support through reserve materials (electronic, print and media) for students and faculty on the Fairfax Campus. The Libraries-wide electronic reserves service is also managed at this library. A collection of periodicals (foreign newspapers and general interest magazines and journals), and a leisure reading collection round out the Johnson Center Library’s collections and services.

**Arlington Campus Library**
- Phone: (703) 993-8818
- The library is a full-service research facility supporting the teaching and research needs of George Mason faculty, students and staff on this campus. Consistent with the Arlington Campus’ distinct areas of academic specialization at the graduate level, the library’s collection emphasizes public policy, international commerce, economics, education, and nonprofit organizations management. The Arlington Campus Library holds a core of reference materials, and is a depository of European Union documents. Library staff provides reference assistance and instruction for students, faculty, and staff in identifying and using resources. Although “physical” library holdings continue to grow, a critical component of the Arlington Campus Library service is an emphasis on being a “virtual” library, with many of its resources and services available online.

**Prince William Library**
- Phone: (703) 993-8340
- This rapidly growing library supports faculty and students in the programs and courses offered at the Prince William Campus, including education, biotechnology, computer science, health, fitness and recreation resources, and administration.
of justice. The library provides access to all George Mason University library information technology systems and electronic resources. The library emphasis is on instruction and assistance with the use of electronic resources and computing applications. Notable holdings of the library include the concentrated holdings of scientific journals in bioscience and biomedicine. The library is fostering partnerships to provide information services to the rapidly expanding corporate and technology presence in Prince William County.

University Scholars Program

Administration
Student Academic Affairs
Johnson Center, Room 245
Peggy O. Chalker, Ph.D.
V. Ann Lewis, M.A.

University Scholars

Each year George Mason University awards four-year scholarships to top high school graduates who have shown superior academic achievement, leadership ability, and an exemplary record of school and community service. The University Scholars reside in a common residence hall their first year and share the University Scholars Center. Together the scholars form a dynamic learning community within the university known as the University Scholars Program.

The program draws to George Mason a special caliber of student who is actively involved in all facets of academic and student life. In addition to excelling in their respective academic areas, the scholars have repeatedly emerged in a variety of student leadership positions and service-related activities.

Intellectual dialogue is fostered between scholars, professors, and George Mason administrators through stimulating seminars, discussion groups, cultural activities, service projects, internships, campus events, and participation in organizations that complement the scholars’ academic experiences. The peer interaction, faculty guidance, and academic focus of the University Scholars Program reflect George Mason’s commitment to providing a stimulating and supportive environment that encourages academic excellence and personal growth.

University Courses

University (UNIV) courses are special academic seminars that appeal to a wide range of majors among undergraduate students. University courses are designated as transitional, interdisciplinary honors, and special topics courses. They are limited in size to encourage interaction between students and specialized faculty. Because of the interdisciplinary nature of the courses, they sometimes can be applied toward the satisfaction of general education requirements.

University Transitions Courses

The University Transitions course series assists students with their transition through the various stages of college. University 100 (UNIV 100) focuses on academic skills, campus resources, and personal adjustment issues for the first year student. Many UNIV 100 sections relate to specific academic majors. UNIV 200 is a select topics course focusing on transition issues for sophomore students. UNIV 300, assists new transfer students with their transition to George Mason University. UNIV 400, for senior students, focuses on the transition from college to “life after college” with an emphasis on professional development, graduate school preparation, and life management issues.

University Interdisciplinary Honors Seminars

The University Interdisciplinary Honors Seminars are offered exclusively to students who have demonstrated strong academic performance. They are developed to give high-ability freshmen and advanced-standing students the opportunity to study with a senior professor in a small classroom setting. The Freshman Seminars (UNIV 190) are open to eligible first-year students and are taught exclusively by the Robinson Professors. Qualified students with 30 or more credits are invited to participate in the UNIV 390 seminars, which are taught by Robinson Professors and other distinguished faculty scholars.

University Special Topics Courses

Upper-level university courses are open to all students unless specific prerequisites are indicated. They are usually repeated offerings.

The following are regularly offered university courses:

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>UNIV 301 Great Ideas in Science</td>
<td>3</td>
</tr>
<tr>
<td>UNIV 441 AIDS: Its Impact in Our Society</td>
<td>3</td>
</tr>
</tbody>
</table>

International Programs and Resources

Global Connections (International Degrees)
Web: www.gmu.edu/global

Strategically located in the national capital region, George Mason University is rich in international knowledge and expertise. A wide range of research, consulting, mediation, and exchange activities, as well as a student body drawn from many countries and cultures, serve to link the regional with the global. The university encourages internationalization and globalization throughout the curriculum, and offers a variety of academic programs that focus specifically on international or global issues. The university also provides a wide variety of activities and services for international students here and opportunities for students to study abroad.

Academic programs focused specifically on international and global issues include the following:
B.A. in Communication, with a concentration in international and intercultural communication (Communication Department)
B.A., B.S. in Geography (Geography and Earth Science)
B.A. in Government and International Politics, with a concentration in international and comparative politics (Public and International Affairs Department)
B.A. in Russian Studies (Modern and Classical Languages)
B.A. in Foreign Languages, with concentrations in French and Spanish (Modern and Classical Languages)
M.A., Ph.D. in Conflict Analysis and Resolution (Institute for Conflict Analysis and Resolution)
M.Ed. in Curriculum and Instruction, with concentrations in multilingual/multicultural education, foreign language education, and teaching English as a second language
M.A. in Foreign Languages, with concentrations in French and/or Spanish, or in Spanish/bilingual-multicultural education (Modern and Classical Languages)
M.A. in History, with concentrations in comparative world history and modern European history (History and Art History)
M.A. in International Commerce and Policy (School of Public Policy)
Interdisciplinary minors in Asia-Pacific studies, contemporary Europe, global systems, linguistics, and study of the Americas
Minors in French, German, Latin, Russian, and Spanish; and international/comparative studies
Undergraduate certificate in teaching English as a second language
Graduate certificates in global trade management; international business planning; international health; international market analysis; managing international commerce; science, technology, and the global economy; and teaching English as a second language.
See the Global Connections web site for new developments in this area: www.gmu.edu/global.

Study Abroad: Center for Global Education (CGE)
Phone: (703) 993-2154
Web: www.gmu.edu/departments/cge/
CGE functions as the hub for international educational activities at George Mason University. It offers short-term intersession, semester- and year-long exchange and honors programs, and intensive language courses for all members of the academic community and the public. CGE hosts international visitors to the university and is the depository of all Memoranda of Understanding concerning educational exchange signed between George Mason University and institutions abroad.

Center for Field Studies
Phone: (703) 993-1740
Web: www.ncc.gmu.edu/Ncc2000/courses/cfs/welcome.html
The center was created to oversee and coordinate field projects and promote and facilitate teaching, research, and study outside of the campus community. Its primary site for outreach activities is the Bahamas Environmental Research Center.

Resources for International Students and Scholars

English Language Institute (ELI)
Phone: (703) 993-3660
Fax: (703) 993-3664
Web: eli.gmu.edu
E-mail: ELI@gmu.edu

Administration
Kathryn Trump, M.A., Director, Krug Hall, Room 202
Mei-Ling Huang, M.A.
John Pope, M.A.
ELI provides quality instruction in English as a second language, aimed at developing language and academic skills, as well as cultural awareness necessary for successful academic, personal, and professional life. ELI offers two programs: the Intensive English Program which serves international students who have come to the United States to study English in preparation for academic study at an American college or university; and the Support Services Program, which provides programs for non-native English speaking students newly admitted to George Mason University and other international members of the Mason community. In addition to the Intensive English Program and the Support Services Program, ELI provides contract services to private corporations, embassies, and government agencies.

Office of International Programs and Services (OIPS)
Phone: (703) 993-2970
Web: www.gmu.edu/students/oips
OIPS provides immigration assistance to international students, visiting scholars, faculty and staff, and offers programs and activities that focus on intercultural themes for the entire university community.

International Student Umbrella (ISU)
Phone: (703) 993-2898
e-mail isu@gmu.edu
Web: www.gmu.edu/org/isu
ISU consists of a variety of international student organizations that coordinate educational and social activities to promote cross-cultural understanding and international awareness.

Office of Continuing Professional Education (OCPE)
Fairfax Campus Office of Continuing Professional Education
Krug Hall, Room 211
Phone: (703) 993-2109.
Web: www.ocpe.gmu.edu
Prince William Campus Professional Development Office
Phone: (703) 993-8335
Herndon Office and Training Center
Phone: (703) 733-2800

Administration
Janet Niblock, Executive Director, Krug Hall, Room 211
OCPE serves as George Mason University’s initial point of contact and referral for the business and professional community and responds to all professional development and continuing education inquiries, requests, and needs. Supported program activities include the following:
- Contracted academic credit programs
- Non-credit public programs and seminars
- Professional certificate programs
- Continuing education units (CEUs)
- On-site contract training programs
- Special professional development events and programs
- Special workforce development programs
- Training center facilities

http://catalog.gmu.edu
Courses are typically delivered through classroom settings, but increasingly through electronic modes such as video conferencing and the Internet.

OCPE offices are strategically located at the Fairfax Campus in Krug Hall, at the Prince William Campus, and at the Center for Innovative Technology (CIT) in Herndon.

Current continuing education program information, offerings, and capabilities can be reviewed on line at www.ocpe.gmu.edu.

As the front office, the Krug Hall office serves as the primary point of inquiry and referral. It facilitates, promotes, and administers the delivery of contract credit courses and other specialized professional programs. This office also administers the award of CEUs, which are nationally recognized standard units of measure earned for satisfactory completion of qualified programs of continuing education. OCPE provides this service to all George Mason academic groups that deliver non-credit professional development programs. Call (703) 993-2109.

The Prince William Campus Professional Development Office facilitates a variety of open enrollment and contract programs (both noncredit and credit) that support the needs of the programs at the Prince William Campus. Programs are targeted to meet the professional development needs of the business community of the Prince William area, as well as Northern Virginia local and state government communities. Call (703) 993-8335.

The Herndon office and training center, located in the Center for Innovative Technology (CIT) in Northern Virginia’s high-tech corridor, facilitates a variety of professional development programs targeted to the area’s business and federal government organizations. This office reaches out to the business community by designing, marketing, and delivering non-credit training courses and in-depth certificate programs. Public seminars and customized contract training programs are targeted to respond to the needs and interests of managerial, technical, and professional employees in private, nonprofit, and public organizations located in Northern Virginia and Washington, D.C. Call (703) 733-2800. The CIT is located at 2214 Rock Hill Road, Herndon, near the intersection of the Dulles Toll Road and Route 28.

New Professional Studies, M.A./M.S.

Administration
Tojo Thatchenkery, Director
Finley, 206B

The Master of New Professional Studies program was established in 1996 to provide graduate education for working professionals. The highlights of this innovative interdisciplinary degree are as follows:

Meeting the needs of the working professional. The course activities are designed to adapt to the demands of working professionals with a variety of obligations. Through innovative use of information technologies and flexible course scheduling, participants are able to balance the demands of work with an intensive learning experience.

Linking theory and practice. The degree incorporates action-oriented group learning as a way to integrate theory and practice. Grouped into teams, candidates are immersed in the practical problems of organizations and at the same time engage each other through collaborative technologies. By dealing with practical organizational issues, participants gain deeper insight into how complex organizations work and how to affect them.

Building a learning community. The program produces a tightly integrated learning experience and focuses on building a learning community. Participants will work on projects as teams and will gain an understanding of how to develop team-based organizations.

Integrating collaborative technologies. Collaborative technology skills developed early on are used throughout the degree program. They enable a high degree of collaboration and interaction between students.

New Professional Studies is an umbrella degree program with six tracks:
- Bioinformatics
- Biotechnology
- Forensic Biosciences
- Organizational Learning
- Teaching
- Transportation Policy, Operations, and Logistics

Four core courses (12 credits) are common to all tracks:
- MNPS 700 The New Professionalism: Theory and Practice
- MNPS 702 The New Professional as Reflective Practitioner
- MNPS 703 Technology and Learning in the New Professions
- MNPS 704 Research Methodologies in the New Professions

The remaining elective courses (21 credits) are selected from participating disciplines. For information about the forensic biosciences, biotechnology, and bioinformatics tracks, see the School of Computational Sciences; for the organizational learning, and the transportation policy, operations, and logistics track, see the School of Public Policy; for the teaching track, see the Graduate School of Education.

Reserve Officers’ Training Corps (ROTC)

Phone: (703) 993-2707
Fax: (703) 993-2708

Administration
Lieutenant Colonel Maurice L. Guyant
Director, Military Science Department
South P.E. Module, Room F28

Army ROTC

The U.S. Army ROTC program at George Mason is an elective program of instruction and training that offers qualified students the opportunity to earn a commission as an officer (second lieutenant) in the U.S. Army, Army National Guard, or U.S. Army Reserve, while pursuing a baccalaureate degree as a full-time student. The program emphasizes student learning and participation in applied leadership, leadership theory and assessment, decision making, management skills,
time management, ethics and military law, logistics, military roles and national objectives, strategic and tactical planning and principles, and basic military knowledge and skills.

Enrollment

Enrollment in military science (MLSC) courses is open to all students. Freshmen classes (MLSC 100 and 101), sophomore classes (MLSC 200 and 201), and junior classes (MLSC 300 and 301) are awarded 1 credit each. Senior classes (MLSC 400 and 401) are 3 credits each and count toward degree completion as elective credit. No service obligation is incurred by enrolling in Army ROTC. Courses can be dropped or added, just as any elective course at George Mason.

The four-year program is organized into two successive phases—the Basic Course and the Advanced Course. For students seeking the opportunity to earn a commission as an officer, several entry methods and participation strategies can be used. A minimum of four semesters must remain in the student’s academic curriculum to complete commissioning requirements; these semesters may be part of either an undergraduate or graduate level degree. Course descriptions appear under Military Science (MLSC) in the Course Descriptions chapter of this catalog.

Basic Course Curriculum

The Basic Course curriculum is a four-course series (MLSC 100, 101, 200, 201), usually taken in the freshman and sophomore years. Each Basic Course class awards 1 academic credit. The Basic Course trains students in the types of topics listed above as well as such applied topics as map reading, land navigation, first aid, physical fitness and health, writing, briefings, and more. Each lecture class meets once a week for 80 minutes. Textbooks are provided free of charge to all enrolled students. Uniforms and equipment are also issued (lent) to students at no cost. While only one section is listed per MLSC class, small sections or individual tutorials are offered when scheduling conflicts exist.

The George Mason Army ROTC program has numerous experiential aspects. MLSC LAB 201, Leadership Laboratory, encompasses several different activities. Students enrolling in any ROTC lecture class must enroll in the required, nongraded lab section. Only the ROTC director can dismiss LAB 201 enrollment in certain circumstances (such as scheduling conflicts).

All LAB 201 sections meet as a combined unit on Tuesdays, 3 to 4:20 p.m. During this time, the unit trains in a variety of hands-on, practical military tasks ranging from drill and ceremonies to squad and platoon tactics. Upperclass cadets lead drills and training as part of their leadership training and experience.

Other experiential aspects of LAB 201 include field training exercises (FTXs) and physical training (PT). Participation in one FTX per semester is required and involves some type of training on a weekend day at a nearby military base. PT classes are conducted every Monday, Wednesday, and Friday from 7 to 8 a.m., at the Field House. Physical training for Basic Course students can be waived in certain circumstances; Army PT standards must be met no later than the beginning of the junior year.

Over the four-year program, there are progressive requirements for meeting physical fitness standards, weight limits, and leadership positions. Much emphasis is placed on cadets to meet established academic standards. A student must maintain an overall GPA of at least 2.0 to participate in and complete ROTC.

Army ROTC also organizes numerous optional adventure and social events including, rappelling, orienteering, and helicopter orientations. A battlefield visit is offered every year, and a formal Military Ball is offered during the spring semester. The unit has an organized Color Guard and a Ranger Challenge Club. Airborne and Air Assault training, among other Army formal schools, is available to enrolled cadets. Enrolled students typically become progressively more involved to enhance their training, develop esprit de corps, and take part in social aspects of the program.

Advanced Course Curriculum

The Advanced Course consists of a four-course series (MLSC 300, 301, 400, 401) taken during the junior and senior years. MLSC 300 and 301 award 1 credit each, while MLSC 400 and 401 are 3 credits each. Normally, Advanced Course cadets contract to become commissioned officers, and thus incur a service obligation upon graduation and commissioning. An active duty tour is not guaranteed, although most cadets receive and receive active duty tours upon graduation. ROTC also offers guarantees of entering either the Army Reserve or Army National Guard to students so inclined.

The 300-level courses emphasize squad and platoon leadership, tactics, and preparation for the National Advanced Leaders Camp (NALC). NALC is a five-week training and evaluation activity required for contracted students. Cadets attend NALC in the summer between their junior and senior years. A salary, travel expenses, and room and board are all provided during camp. NALC is a critical part of the ROTC program that students must pass to receive a commission.

There are also professional military education requirements: contracted cadets must take and pass courses in written communications, computer literacy, and military history. These courses come from the general course offerings of the university and may also fulfill the student’s general education or academic major requirements at the same time.

Because all students may enroll in ROTC classes, students wishing to take an upper-level course have to declare their intentions when seeking enrollment approval from the ROTC director or instructor. Prerequisites exist for upper-level courses (see the “Course Descriptions” chapter).

“Noncontract” students who wish to take MLSC 400 and 401 must have junior or senior standing in their majors and meet the appropriate prerequisites. Course requirements will be established between the ROTC director and students to tailor the class to the students’ interests and needs.

The 400-level courses are considered to be the “transition to lieutenant” phase. The courses focus on staff operations, logistics, military law, and ethics. Seniors are expected to organize and attend an additional one-hour staff and training meeting per week as part of their leadership experience and duties. Planning and implementation of training becomes the primary focus for seniors in LAB 201.

Methods for Completing Program and Earning a Commission

Students may enter Army ROTC to seek and earn a commission as a second lieutenant upon graduation by several methods:
• A student can complete the four-year program.
• The freshman and sophomore classes may be compressed into the sophomore year.
• A veteran may enter directly into the junior year (when academically aligned as a junior).
• A sophomore student may attend a five-week Leaders Training Camp (LTC) between the sophomore and junior years to gain experience equivalent to the Basic Course.
• A special four-semester program is available to nursing majors in which LTC is not required.

Students who complete the ROTC program may take up to two years to complete their baccalaureate studies, and education delays for graduate study also may be approved for graduating cadets before commissioning. Graduate students and resident aliens who become U.S. citizens by a certain time may become commissioned officers.

Scholarship Programs

Two- and three-year ROTC scholarships are available to sophomores and freshmen in all majors on a competitive basis (minimum 2.500 GPA to apply and under age 27 when graduating, unless they are active duty veterans). Scholarships pay 100% of tuition, a book allowance ($450/year), and a stipend of at least $300/month during the school year, all tax free. A student does not have to be enrolled to apply, and there is no service obligation incurred when applying.

A two-year Reserve Forces Duty scholarship is available that guarantees reserve duty upon graduation and commissioning (no active duty tour). Contact the ROTC director to determine eligibility. Four-year scholarships are available for high school students, but they should apply by December 1 of their senior year for a scholarship that would start in the fall semester of their freshman year. Call the ROTC Director for details.

Many students participate in ROTC as non-scholarship cadets. A non-scholarship cadet cannot contract to receive a commission until the junior year. For the junior and senior years, non-scholarship contracted students receive the monthly stipend for the school year.

The George Mason Army ROTC “Patriot Battalion” began in 1981, achieved independent status in 1983, and frequently conducts training jointly with Georgetown University and the University of Maryland Army ROTC.

Air Force ROTC

Administration
AFROTC Detachment 330
2126 Cole Student Activities Bldg.
University of Maryland
College Park, MD 20742-1021
(301) 314-3242
Web: www.inform.umd.edu/afrotc

Enrollment
The Air Force Reserve Officers’ Training Corps (AFROTC) provides two programs for college men and women to earn a commission as a second lieutenant in the U.S. Air Force while completing their university degree requirements. To enter the AFROTC program, students should contact (301) 314-3242 or www.inform.umd.edu/afrotc. George Mason students register for the appropriate courses through the consortium office located on the fourth floor of Enterprise Hall. Attendance at courses, located at the University of Maryland, is mandatory. Cadets among George Mason cadets are usually available.

Four-Year Program
This program is comprised of a General Military Course (GMC) and a Professional Officer Course (POC). The first two years (GMC), normally for freshmen and sophomores, give a general introduction to the Air Force and its various career fields. Students enrolled in the GMC program incur no obligation and may elect to discontinue the program at any time. The final two years, the POC concentrate on the development of leadership skills and the study of U.S. defense policy. Students must compete for acceptance into the POC. Students enrolled in the last two years of the program receive $1,000 per semester and $150 per month, tax free.

Students in the four-year program who successfully complete the first two years of the program and are accepted into the POC program must attend four weeks of field training at a designated Air Force base during the summer after their sophomore year of college.

Two-Year Program
This program is normally offered to prospective juniors but may be taken by seniors and graduate students. The academic requirements for this program are identical to the four-year program, and students receive the same benefits (approximately $4,000 annually). During the summer preceding entry into the program, all candidates must attend five weeks of field training at a designated Air Force base. Students should start the application process as soon as possible—not later than the summer before attending field training.

Scholarships
AFROTC scholarship programs provide eight-, six-, and four-semester scholarships to students on a competitive basis. Scholarships are available in many fields and are based on merit. Those selected receive tuition, lab expenses, incidental fees, and a book allowance, plus a non-taxable monthly allowance of $150.

Any student accepted by George Mason University may apply for these scholarships. AFROTC membership is required to receive an AFROTC scholarship.

AFROTC Awards
AFROTC cadets are eligible for numerous local, regional, and national awards. Many of these awards include monetary assistance for school.

Oak Ridge Associated Universities

Christopher T. Hill, Vice Provost for Research
ORAU Councilor for George Mason University
Phone: (703) 993-2270
Monnie E. Champion, ORAU Corporate Secretary
Phone: (865) 576-3306
Web: www.orau.org
Since 1993, students and faculty of George Mason University have benefited from its membership in Oak Ridge Associated Universities (ORAU). ORAU is a consortium of 85 colleges and universities and a contractor for the U.S. Department of Energy (DOE) located in Oak Ridge, Tennessee. ORAU works with its member institutions to help their students and faculty gain access to federal research facilities throughout the country; to keep its members informed about opportunities for fellowship, scholarship, and research appointments; and to organize research alliances among its members.

Through the Oak Ridge Institute for Science and Education (ORISE), the DOE facility that ORAU operates, undergraduates, graduates, postgraduates, as well as faculty enjoy access to a multitude of opportunities for study and research. Students can participate in programs covering a wide variety of disciplines including business, earth sciences, epidemiology, engineering, physics, geological sciences, pharmacology, ocean sciences, biomedical sciences, nuclear chemistry, and mathematics. Appointment and program length range from one month to four years. Many of these programs are especially designed to increase the numbers of underrepresented minority students pursuing degrees in science- and engineering-related disciplines. A comprehensive listing of these programs and other opportunities, their disciplines, and details on locations and benefits can be found in the ORISE Catalog of Education and Training Programs, which is available at www.orau.gov/orise/educ.htm, or by calling either of the contacts above.

ORAU's Office of Partnership Development seeks opportunities for partnerships and alliances among ORAU's members, private industry, and major federal facilities. Activities include faculty development programs, such as the Ralph E. Powe Junior Faculty Enhancement Awards, the Visiting Industrial Scholars Program, and various services to chief research officers.
University General Education

Web: www.gmu.edu/departments/provost/gened/
Phone: (703) 993-8770
Sheryl L. Beach, Associate Provost for General Education
Office of the Provost

University General Education Requirements

All undergraduates seeking a baccalaureate degree at George Mason University must complete the University General Education requirements. Additional requirements for specific degree programs can be found in this catalog in each college or school chapter.

The General Education Mission At George Mason University

The mission of George Mason University’s General Education Program is to educate, liberate, and broaden the mind, and to instill lifelong love of learning. In conjunction with each student’s major program of study and other electives, minors, or certificates, this program seeks to produce graduates with intellectual vision, creative abilities, and moral sensibility, as well as the skills to assure a well-rounded and useable education.

The General Education Program seeks four specific goals:

1. General education courses should first ensure that all undergraduates develop skills in information gathering, written and oral communication, and analytical and quantitative reasoning.

2. General education courses should expose students to the development of knowledge by emphasizing major domains of thought and methods of inquiry.

3. General education courses should enable students to attain a breadth of knowledge that supports their specializations and contributes to their education in both personal and professional ways.

4. General education courses should encourage students to make important connections across boundaries (for example: among disciplines; between the university and the external world; between the United States and other countries).

Summary of University-Wide General Education Requirements

Effective fall 2001. Course list reflects approved courses as of press time. Please consult the George Mason web site www.gmu.edu/departments/provost/gened/index.html for additional courses approved for University General Education. List will be updated periodically as needed.

http://catalog.gmu.edu
A. Foundation Requirements

Written Communication (6 credits: 3 lower, 3 upper)
ENGL 100 or 101, 302
Oral Communication (3 credits)
COMM 100, 101, 104
Information Technology (3 credits)
IT 103; or CS 112 and one of the following: CS 105, ENGR 107, PHIL 112 (IT Ethics, 1-2 credits)
Quantitative Reasoning (3 credits)
IT 250; MATH 106, 108, 110, 111, 113, 115, 125; STAT 250

B. Core Requirements

Synthesis Requirement

Written Communication (6 credits: 3 lower, 3 upper)

U.S. History (3 credits)
HIST 100
Western Civilization (3 credits)
HIST 120
Social and Behavioral Science (3 credits)
ADJ 100; ANTH 114, 120, 135; ECON 100, 103, 104; GEOG 103; GOVT 101, 103; LING 326; PSYC 100, 211, 231; SOAN 190; SOCI 101; WMST 200

Global Understanding (3 credits)
ADJ 405; ANTH 302, 304, 306, 309, 311-313, 331-333, 385; ARTH 203, 319, 320, 380, 382-385; CEIE 100; COMM 305, 456; DANC 118; ECON 360, 361, 380, 390; ENGL 349, 350; GEOG 101; GOVT 132, 133, 149; HIST 125, 130, 251, 252, 261, 262, 271, 272, 281, 282, 328, 329, 356, 364, 387, 459, 460; MUSI 103, 431; RELI 100, 211, 212, 213, 315, 341, 374, 490; RUSS 353, 354; SOCI 332; SPAN 322; THR 359; WMST 100

Natural Science (7 credits)
Non-Lab (3 credits):
BIOL 305; CHEM 101, 102, 201, 202; GEOG 102; UNIV 301
Lab (4 credits):
ASTR 111, 112, 113, 114; BIOL 103, 104, 213, 303, 304, 306; CHEM 103, 104, 211, 212, 251; EVSC 110, 111; GEOL 101, 102; PHYS 103, 104, 160, 243, 244, 245, 246, 260, 261, 262, 263

C. Synthesis Requirement

Synthesis (3 upper level credits)
One Course

TOTAL ........................................................................... 43 credits

Category Goals and Requirements are described below.

University-Wide General Education

Category Goals And Requirements

A. Foundation Requirements:

Written Communication
Goal: Courses emphasize written communication as a way of thinking and discovering ideas and meanings, as well as expressing them. Students must develop basic writing skills at the freshman level in English 101 (100 for ESL students) and build on those skills in English 302. In addition, at least one course in a student's major must be "writing-intensive."
Required: English 101 (or 100), 302, and an approved writing-intensive course in the major.

Oral Communication
Goal: Students develop the ability to use oral communication as a way of thinking and learning as well as sharing ideas with others. Courses in oral communication will provide students with the ability to express themselves in public or group settings. Students should gain an understanding of the cultural, psychological, political and practical significance of communication, with special emphasis on the role of communication in a free society. Through oral presentations, group discussions, and critically assessing public messages, students will come to understand various modes of communication, and will improve their oral communication skills. They should also learn how to support and defend their positions, how to respond to different communication situations, and how to clearly organize and develop ideas. By developing an understanding of the importance of communication in society, students will also learn to respect the freedom of expression of all members of the community.
Required: One approved course; increased emphasis on oral communication in appropriate General Education courses.

Quantitative Reasoning
Goal: Student will develop the ability to use and critically evaluate numerical information, and to create and critique logical arguments using quantitative reasoning. Courses in the "Quantitative Reasoning" category are intended to give students the capability to reason quantitatively through exposure and practice grounded in important problems and ideas. To ensure skills, a basic proficiency established through a test is required before attempting courses that satisfy this requirement. Students who demonstrate a higher proficiency level may choose among an approved set of courses that develop quantitative reasoning, while those with basic proficiency are only required to satisfy this requirement with the particular course Math 106, designed to advance students to the higher proficiency level.
Required: Math 106; or if the student has achieved an appropriate placement score on quantitative skills, one of the following: Math 108, 110, 111, 113, 115, 125 or IT/STAT 250. (Students are assumed to have achieved satisfactory completion of the high school math required for admission.)

Information Technology
Goal: Students will be expected to:
1. possess a command of basic software and hardware concepts, terminology and functions, and file/data structures, and will be expected to
2. use appropriate electronic tools in order to do the following:
a. Data organization and search, e.g., databases, web browsers, search engines;
b. data analysis, e.g., spreadsheets, GIS, Statistical software;
c. data presentation and communication, e.g., text, electronic slides, web pages, graphs, presentation software, HTML, word processing, e-mail.

3. In addition, students are required to have classroom experience in, knowledge of, and appreciation for fundamental ethical issues relating to IT and our changing world. These issues may include, but are not limited to, computer security, privacy laws, public policy issues and professional codes of ethics, intellectual property issues, copyright, security, and financial data.

Required: Passing one approved three-credit course to meet all IT requirements, or completion of an appropriate combination of courses, proficiency examinations and/or modules.

B. Core Requirements

Literature
Goal: Courses in the literature category foster understanding and appreciation of the aesthetic, cultural, historical, and intellectual aspects of major literary works through critical analysis. Students will identify, analyze, write about, and discuss aspects of theme, plot, central idea, narrative, audience, perspective, figurative language, and the relationship between structure and ideas.

Required: One approved course.

Arts
Goal: Students develop an understanding of the aesthetic and intellectual components of the arts through either critical analysis of major artistic works or through creative work of their own. Courses in the arts category are intended to give students knowledge and understanding of the arts through critical and/or historical analysis, theory, and/or practice. Arts courses provide distinctive modes of thought, ways of working, and avenues for student achievement, and establish a foundation for ongoing intellectual and artistic development. Some courses will emphasize the development of artistic technique, problem solving and the creative/interdisciplinary process, and others will focus on developing aesthetic sensibility and understanding historical and cultural contexts.

Required: One approved course.

Natural Science
Goal: Courses in this category are intended to provide students with an understanding of natural science. The critical approach of the scientific method, the relation of theory and experiment, the use of quantitative and qualitative information, and the development and elaboration of major ideas in science are addressed.

Required: Two approved science courses; a course offering an overview of the principles of physics, chemistry and life sciences will be one of the two courses required of some students. At least one course will have laboratory experience.

U.S. History
Goal: Course enables students to develop an understanding of the institutions and traditions of our society from its founding documents, values, and institutions—onward to the present. Attention to the processes of historical analysis will be fundamental to the course.

Required: One required course.

Western Civilization
Goal: Course covers the period of western civilization from the Greek and Roman civilizations to the contemporary era. Students will develop awareness and understanding of a major civilization that has influenced thought, culture and politics in the United States and in the world.

Required: One required course.

Global Understanding
Goal: Courses in the “Global Understanding” category examine some of the principal global issues and concerns that shape our world today. After completing a course from this category, students will be able to analyze (that is, identify the causes and consequences of change in) significant global issues. While some courses may deal with a specific global problem, institution, or issue, others may focus on a specific area or region outside the contemporary Western world by incorporating specific comparisons of several cultures. All courses in this category help students develop an understanding of global issues as well as an awareness of how these issues are perceived and dealt with in different cultural and historical traditions and, where relevant, by different formal and informal institutions throughout the world. That is, these courses stress the interconnectedness, difference, and diversity that are central to understanding and operating in a global society.

Required: One approved course.

Social and Behavioral Sciences
Goal: Courses in this category are intended to provide students with an understanding of the social and behavioral sciences. Students will be engaged in reasoning using the methods of the social and behavioral sciences, including the scientific method, the use of quantitative and qualitative information, and the analysis of empirical observations in relation to theory. The development of major ideas in social science is also addressed in this category.

Required: One approved course.

C. Synthesis Requirement

Synthesis
Goal: Students will engage in the connection of meaning and the synthesis of knowledge. Synthesis courses may link issues in the student’s major to wider intellectual and community concerns. Other courses might be interdisciplinary. This course may be a capstone course in the major. This component also requires students to demonstrate advanced skills in oral and written presentation before a faculty panel. This demonstration will build not only on the communication and synthesis experience of the third year, but also on the recurrent attention to these skills in the whole General Education program, from the foundation courses onward.

Required: One approved upper-division course.

English Composition Requirement
The university requires students to complete at least two semesters of English composition. Please see the catalog section on Academic Policies for specific details.
University General Education

Writing-Intensive Course Requirement
In addition to English composition and, as part of the university's commitment to literacy in all programs, at least one course in each major has been designated "writing intensive." Please see the catalog section on Academic Policies for specific details of this university requirement. See the description of each major for the specific courses that fulfill this requirement in that major.
Web: cas.gmu.edu
Phone: (703) 993-8720

Departments and Colleges
- Biology
- Chemistry
- Communication
- Economics
- English
- Environmental Science and Policy
- Geography
- History and Art History
- Mathematical Sciences
- Modern and Classical Languages
- Philosophy and Religious Studies
- Physics and Astronomy
- Psychology
- Public and International Affairs
- Social Work
- Sociology and Anthropology
- New Century College

Interdisciplinary Programs
- Community College Education, D.A.
- Cultural Studies, Ph.D.
- Honors Program in General Education
- Interdisciplinary Studies, M.A.I.S.
- Mason Topics
- Russian Studies, B.A.

Interdisciplinary Minors
- African American Studies
- Ancient Mediterranean Art and Archaeology
- Asia-Pacific Studies
- Bioinformatics
- Contemporary Europe
- Film and Media Studies
- Folklore and Mythology
- Global Systems
- Latin American Studies
- Linguistics
- Multimedia
- Nonprofit Studies
- North American Studies
- Urban and Suburban Studies
- Women's Studies

Minors
- Administration of Justice
- American Government
- Anthropology
- Art History
- Astronomy
- Biology
- Chemistry
- Classical Studies
- Earth Systems Science
- Economics
- Electronic Journalism
College of Arts and Sciences

- English
- French
- Geographic Information Systems
- Geography
- Geology
- German
- History
- International/Comparative Studies
- Latin
- Legal Studies
- Mathematics
- Math for Undergraduates in the School of Management
- Philosophy
- Physics
- Psychology
- Public Policy and Management
- Religious Studies
- Russian
- Sociology
- Spanish
- Telecommunications

The College of Arts and Sciences (CAS) is the largest and most diverse academic unit within the university. Its teaching and research activities encompass the liberal arts—the humanities, the sciences, and the social sciences. In addition to the degree programs within its 16 departments and New Century College, the college also offers many innovative interdisciplinary minors, majors, and graduate degrees. Undergraduate students in the college attain both breadth, through a broad distribution of courses in general education, and depth, through a major field of study. Special opportunities for students include the Honors Program in General Education, honors programs within selected majors, internships and co-ops, travel abroad, and research experiences. Many undergraduates go on to graduate school and professional schools in medicine, law, and the ministry, and to pursue careers in public service, nonprofit organizations, and the private sector. Graduate students in the college engage in more specialized study at the master's and doctoral levels, which prepares them for first or second careers or job advancement, and provides personal enrichment. Through its programs, the college exposes students to principles of sound reasoning and judgment, while providing the skills for understanding and using information and technology.

Faculty members in the college are committed to teaching that is grounded in scholarship and research. They strive to make their students rigorous thinkers and clear communicators, while encouraging experimentation with new approaches and ideas. Students are thus prepared for their role as informed citizens in a complex, global society; they will be able to learn and, therefore, adapt to an ever-changing world.

Administration
Daniele C. Struppa, Dean
Donna Fox, Assistant Dean for Undergraduate Academic Affairs
Kristin F. Samuelian, Assistant Dean for the Undergraduate Student Experience
Tere Linehan, Director of Development
Susan Swett, Director of CAS Graduate Admissions

Doris A. Bitler, Associate Dean for Undergraduate Academic Affairs
Vikas Chandhoke, Associate Dean for Research
James K. Conant, Associate Dean for Finance
Dee Ann Holisky, Associate Dean for Academic Programs
Richard Klimoski, Associate Dean for Outreach
Janette Muir, Associate Dean for New Century College
Walter Rankin, Deputy Associate Dean for Undergraduate Academic Affairs

Graduate Degree Programs
The college offers 18 master's degrees, including a Master of Public Administration and a Master of Fine Arts in Creative Writing, and 7 doctoral degrees. The requirements for each degree are described in the sections that follow.

Undergraduate Degree Programs
The undergraduate degree consists of course work in university-wide general education, course work in a major area of study, and electives. The college offers 19 bachelor of arts (B.A.) degrees, 13 bachelor of science (B.S.) degrees, and a bachelor's of individualized study (B.I.S.). To earn a bachelor's degree, students must complete 120 credits, of which at least 45 must be in upper-level courses (numbered 300 and above). At least one course at the 300 or 400 level must be designated “writing intensive.” All entering students who have not yet satisfied the university-wide general education requirement in quantitative reasoning are required to take the math placement test prior to enrollment.

Students are strongly advised to consult the "Academic Policies" chapter for information concerning university-wide general education requirements for undergraduate degrees.

College-Level Requirements
The baccalaureate degree is designed to

- provide students with a broad knowledge of the world,
- develop in students the ability to think both conceptually and critically,
- acquaint students with many different methods of inquiry, and
- provide students with the skills to continue intellectual growth throughout their lives.

Because these goals can be achieved in many ways, students may select from a range of courses for completing them. But education involves more than fulfilling requirements. Students' selection of courses should not only deepen their knowledge of things that interest them, but also expand the range of those interests. The courses enable students to link the present to the past, their culture to other cultures, and what is, to what could be. Learning to make these connections increases their ability to understand and enjoy the world in ways they may not yet imagine.

Bachelor of Arts
The bachelor of arts degree is designed to provide students with a breadth of knowledge as well as the necessary skills to make the in-depth study of a major truly meaningful. In addition to the university-wide general education program, students pursuing a bachelor of arts degree must complete the coursework below. Except where expressly prohibited, a course used to fulfill a college-level requirement may also be used simultaneously to satisfy other requirements (university-wide general education requirements, college-level requirements, or requirements for the major).
1. Literature: 3 credits (in addition to the university-wide requirement, for a total of 6 credits of literature)
   This may be fulfilled by any course in literature at the 200 level in English, by designated courses at the 300 level or above in Modern and Classical languages, or by PHIL 253.
2. Philosophy or religious studies: 3 credits
   This may be fulfilled by any course in philosophy or religious studies (PHIL, RELI).
3. Social science:
   a. for majors in mathematics and science: 3 credits (in addition to the university-wide requirement for a total of 6 credits of social science)
   b. for majors in humanities and social science: 6 credits (in addition to the university-wide general education requirement for a total of 9 credits of social science, of which not more than 6 may be in a single discipline)
   This may be fulfilled by any course in ADJ, ANTH, ECON, GEOG (except GEOG 102 or 309), GOVT, PSYC, or SOCI.
4. Natural science: 1 credit (in addition to the university-wide requirement for a total of 8 credits, which must be fulfilled by an approved two-semester laboratory science sequence in a single science). (This may not be fulfilled by BIOL 124 and 125 or by EVSC 205 and 206.)
5. Foreign language: 0-12 credits
   Students must demonstrate intermediate-level proficiency in one foreign language. The foreign language requirement is fulfilled by completion of one foreign language course at the 202 level or above or by a satisfactory score on an approved proficiency test. International students should consult the CAS Student Academic Affairs Office about a possible waiver of this requirement.
6. Non-Western culture: 3 credits
   A course used to fulfill the university-wide general education global understanding requirement may not be simultaneously used to satisfy this college-level requirement. A course used to fulfill this requirement may be used simultaneously to fulfill any other requirements (university-wide general education requirements, college-level requirements, or requirements for the major).
   This may be fulfilled by any of the following courses:
   ANTH 114, 300, 301, 302, 304, 305, 306, 311, 313, 332
   ARTH 203, 319, 320, 380, 381, 382, 383, 384, 385, 482
   DACN 118
   ECON 361
   FREN 451
   GEOG 101, 316, 325, 330
   GOVT 328, 332, 333, 432
   MUSI 103
   RELI 211, 212, 313, 314, 315, 337, 374, 490
   RUSS 353, 354
   Students who can document having attended a native school in a non-Western country for at least four years may request a waiver from this requirement through the CAS Undergraduate Academic Affairs Office.

Requirements for each major are listed in the departmental sections that follow.

Bachelor of Science
The bachelor of science degree is designed to provide students with a more intensive approach to the core technical questions of their majors. This curriculum therefore has a reduced number of courses in humanities and social sciences in comparison with the bachelor of arts degree to allow students to achieve greater depth in their majors. Students pursuing a bachelor of science degree in CAS must complete the university-wide general education program plus one additional credit of natural science (for a total of 8 credits), which must be fulfilled by an approved two-semester laboratory science sequence in a single science. (This may not be fulfilled by BIOL 124 and 125 or by EVSC 205 and 206.) Requirements for each major are listed in the departmental sections that follow.

Physical Education Courses
Activity courses offered by the Health, Fitness, and Recreation Resources Department cannot be counted toward the credits required for a degree in the College of Arts and Sciences.

Teacher Licensure
Students who wish to become teachers should consult the section, "Professional Licensure" in the Graduate School of Education chapter and attend an Information Session during their sophomore year. Information Sessions for teacher licensure are offered every month. Call (703) 993-2892/4648, e-mail gseinfo@gmu.edu, or consult the website at gse.gmu.edu for more information.

Minors
A student may elect to take a minor in addition to his or her major field of study. Minors require between 15 and 21 credits, at least six credits of which must be completed at George Mason. No more than three credits with a grade of D may be applied to a minor. Students interested in earning a minor should complete the appropriate section of the Change/Declaration of Academic Program form.

Biology
Web: gmu.edu/departments/Biology
Phone: (703) 993-1050

Faculty
Professors: Ernst, Lawrey, Shaffer, Skog, Soyfer (Distinguished University Professor)
Associate professors: Adamkewicz, Andrykovitch, Birchard, Bradley, Christensen, Litchfield, Rockwood, Royt (chair), Torzilli
Assistant professors: Fryxell, Grant
Visiting assistant professors: Beck, Coss
Visiting instructor: Cressy

Course Work
The Biology Department offers all course work designated BIOL and MTCH in the Course Descriptions chapter of this catalog.

http://catalog.gmu.edu
UNDERGRADUATE PROGRAMS

The B.A. and B.S. in Biology provide a sound liberal education with substantial experience in quantitative and analytical thought, along with preparation for a related profession. In addition to ensuring the strong background necessary for graduate study in the many fields of biological science, the broad range of courses available at George Mason allows students to develop careers in many areas, including secondary school teaching, environmental management, microbiology, molecular biology, biotechnology, genetics, and natural history. Alternatively, students may prepare for postgraduate studies in medicine, dentistry, veterinary medicine, wildlife management, fisheries biology, or marine science. The department also offers a B.S. in Medical Technology. Additional information can be found at the Biology Department's website at gmu.edu/departments/Biology or by contacting the Biology Department, David J. King Hall, Room 3005, (703) 993-1050.

Advising

All biology and medical technology majors must have an advisor's permission to register each semester. See the Biology Department's website for more information.

Residence Requirement for Transfer Students

Students majoring in biology are required to complete 16 credits in the major at the 300 and 400 levels at George Mason University.

Biology, B.A.

In addition to satisfying the university-wide general education requirements and the requirements for a B.A. degree in the College of Arts and Sciences, candidates must complete the following. (Through the course work below, biology majors satisfy the university-wide general education requirements in natural science, quantitative reasoning, and information technology proficiency.)

1. Thirty-two credits of biology, including BIOL 213, 303, 304, 305, 306, 307, 311, 492 (or 494)
2. Eight credits of chemistry: CHEM 103, 104 or 211, 212
3. Six credits of STAT 250 or IT 103
4. Six credits from the following: ASTR 103, 111, 113; GEOL 101, 102; PHYS 243, 245

Students expecting to enter graduate or professional school are strongly urged to complete MATH 113 and 114. Organic chemistry and PHYS 243, 244, 245, and 246 are recommended.

Biology, B.S.

In addition to satisfying the university-wide general education requirements for the B.S. degree, students majoring in biology must complete the following. (Through the course work below, biology majors satisfy the university-wide requirements in natural science, quantitative reasoning, and information technology proficiency.)

1. Forty-four credits of biology, including BIOL 213, 303, 304, 305, 306, 307, 311, and 492 (or 494)
2. Thirteen credits of chemistry: CHEM 211, 212, 313, 315
3. One of the following options:
   a. CHEM 314 and 318 (five credits)
   b. One chemistry course at the 300 or 400 level (three credits)
   c. GEOL 101 and 102 (eight credits)
4. Eight credits of physics: PHYS 243, 244, 245, 246
5. At least six credits from the following: MATH 110, 111, 113, 114, or STAT 250
6. Three credits of computer skills: IT 103

Students are encouraged to consult with a biology faculty advisor to determine which option best meets his/her career goals. Students who wish to take biochemistry must take BIOL 483/583 to receive credit toward the major in biology.

Concentration in Biotechnology

The biotechnology concentration consists of a selection of courses that provide essential skills to students seeking employment in the field or who wish to include an applied component in their undergraduate training in biology.

In addition to satisfying the university-wide general education requirements for the B.S. degree, students majoring in biology with a concentration in biotechnology must complete the following. (Through the course work below, they satisfy the university-wide general education requirements in natural science, quantitative reasoning, and information technology proficiency.)

1. Twenty-five credits in biology, including BIOL 213, 303, 304, 305, 306, 307, 311, 492 (or 494)
3. Laboratories associated with courses are required.
4. ** Subject to approval by program coordinator.
5. Eight credits in chemistry, including CHEM 211, 212, 313, 314, 315, 318
6. Eight credits of physics: PHYS 243, 244, 245, 246
7. At least six credits from the following: MATH 110, 111, 113, 114, or STAT 250
8. Three credits of computer skills: IT 103

Policy on the Use of Organisms in Classes

1. Direct observations of actual organisms are considered an essential part of learning biology at all levels.
2. Direct observations of organisms may involve the use of living or preserved specimens, dissections of organisms or parts of organisms, and microscopic examination of organisms or parts of organisms. All use of live animals conforms to National Institutes of Health Guidelines for the Use and Care of Laboratory Animals.
3. Activities specified above may be a required part of a course and thus serve as a basis for grading in the course. Any questions about the administration of this policy should be directed to the course coordinator or instructor.

Writing-Intensive Requirement

The university requires all students to complete at least one course designated as writing intensive in their majors at the 300 level or above. Students majoring in biology fulfill this requirement by successfully completing BIOL 307. Students not taking BIOL 307 at George Mason should consult the biology undergraduate coordinator for a course to fulfill this requirement.
Honors Program in Biology

Biology majors who have completed 16 credits of math and science, including BIOL 213, with a GPA of 3.000 or higher, are eligible to enter the departmental honors program. Transfer students who have an incoming GPA of 3.100 in math and science and a B or better in BIOL 213 are also eligible. To graduate with honors in biology, a student is required to maintain a minimum GPA of 3.000 in math and science and to earn a GPA of at least 3.500 in at least three semesters of BIOL 494 Honors Seminar. For more information, contact the departmental honors advisor at (703) 993-1050.

◆ Minor in Biology

Candidates for the minor in biology must complete 19–20 credits in biology, including BIOL 213, 303, 304, and either 307 or 311, in addition to one other 3–4 credit biology course at the 300, 400, or 500 level.

◆ Minor in Bioinformatics

A minor in bioinformatics is an interdisciplinary program consisting of required courses in biology, computer science, and statistics. Candidates for the minor in bioinformatics must complete 19-20 credits distributed as follows:

1. BIOL 482 (with prerequisites BIOL 213, 305, 306)
2. BIOL 580
3. CS 112, 211, and 310
4. One course in statistics: STAT 250/IT 250, STAT 244, or BIOL 312

Premedical, Predental, and Preveterinary Students

Students planning to enter medical, dental, or veterinary schools may choose to major in biology. These students should meet with one of the Biology Department's health sciences advisors in their second semester for assistance and information about the university’s Health Sciences Advisory Committee.

Because schools in the health sciences vary both in their philosophies and in their specific requirements, it is wise for students to become aware of such information well in advance of applying for admission. Although specific requirements vary, most programs do require applicants to complete at least one year of biology. Students who decide not to major in biology should take BIOL 213 and 303. Other requirements generally include organic chemistry (CHEM 313, 314, 315, and 318 or 320) and a year of physics (PHYS 243 through 246). A course in calculus is required by some and highly recommended by others. Admission requirements can generally be met by either a B.A. or a B.S. degree.

Teacher Licensure

Students who wish to become teachers should consult the Professional Licensure section in the Graduate School of Education chapter and attend an information session during their sophomore year. Information Sessions for teacher licensure are offered every month. Call (703) 993-2892/4648, e-mail gseinfo@gmu.edu, or consult the web site at gse.gmu.edu for more information.

Biology for Nonmajors

Students who are not majoring in science or mathematics and wish to fulfill their natural science requirement with a two-semester laboratory sequence in biology should enroll in BIOL 103 and 104. With permission of the instructor, nonmajors may enroll in BIOL 213 and then take one of the following: BIOL 303, 304, or 305/306 to complete their requirement. Chemistry, physics, and mathematics majors should consult their faculty advisors to determine which biology courses to take.

Medical Technology, B.S.

This program requires the equivalent of three years of full-time preprofessional study at the college level preceding a senior year of professional education in an affiliated school of medical technology. All affiliated schools are accredited by the National Accrediting Agency for Clinical Laboratory Sciences (NAACLS).

Responsibility for applying to schools of medical technology and gaining admission rests with the students. However, guidance is provided by the medical technology program director in the Biology Department. Admission to schools of medical technology is selective. Candidates should strive for strong academic standing. Students who fail to gain admission to a NAACLS-approved school are unable to complete the degree program. Such students may transfer to a biology major without loss of credits.

Application to medical technology schools should be initiated about a year before the desired entrance date. This fact, coupled with the large number of required courses in the preprofessional curriculum, makes it imperative that students in the program consult regularly with their faculty advisors. All medical technology majors and prospective majors are urged to enroll in MTCH 200 as early as possible. This course provides information on the profession and on the educational demands placed on candidates.

Students should be aware that the senior year spent off campus requires the following special interpretation of university policies. Transfer students must present at least 16 credits of 300–400 level biology or chemistry taken at George Mason. Students may present no more than six credits of D grades in the biology and chemistry courses required in the three years of preprofessional study. No unsatisfactory grades may be presented for courses in the senior year of professional study. Transfer students entering with more than 35 transfer credits are often unable to complete the preprofessional phase of their program in the usual three years of full-time study.

Senior students are registered at the university through special procedures. For details, consult the program director.

In addition to satisfying the university-wide general education requirements for the B.S. degree and completing MTCH 200, candidates must present the following courses in their preprofessional programs. (Through the course work below, majors satisfy the university-wide general education requirements in natural science, quantitative reasoning, and information technology proficiency. Because of the extensive professional education requirements stipulated by The Commission on Allied Health and Education Accreditation (CAHEA), students majoring in medical technology are exempt from the university-wide general education requirement in the fine arts.)

1. Biology: a minimum of 20 credits, including BIOL 213, 303, 305, 306, 311, 452, 453
2. Chemistry: a minimum of 18 credits, including CHEM 211, 212, 313, 314, 315, 318
3. Mathematics: a minimum of 6 credits (STAT 250 recommended; MATH 106 not applicable)
4. Computer skills: IT 103

Students are encouraged to elect additional basic science courses during their preprofessional years. Recommended are BIOL 380, 465, 483, 484, 485; CHEM 321; and PHYS 243, 244, 245, 246.

Professional study during the senior year involves clinical education at an affiliated school of medical technology. Thirty credits of course work are required, including MTCH 243, 244, 245, 246.

Educational articulation program

Medical Laboratory Technician (MLT) Articulation Program
A special program is available for MLTs who are graduates of associate degree programs. This program provides substantial credit for the scientific and clinical aspects of the associate degree, but requires that the student meet the clinical requirement for national certifying examinations through approved work experience. For details, contact the program director.

Major in Medical Technology as a Second Bachelor's Degree
While the standard program for medical technologists is three years on campus followed by a fourth year at a clinical affiliate (3 + 1), many students elect to complete a bachelor's degree before entering the clinical program (4 + 1). Students who have completed a B.S. in Biology or Chemistry at George Mason and then undertake a fifth year at a clinical affiliate may be eligible for a second bachelor's degree with a major in medical technology. Students wishing to receive the second degree must apply before entering their fifth year. For further information, contact a medical technology advisor.

Biology Club and Premedical Honor Society
The Biology Club functions as both a social and informational network for all interested students. In addition, it serves the Biology Department by sponsoring a seminar program and working at university functions.

Alpha Epsilon Delta Zeta Premedical Honor Society is a national student support group providing professional school tours, educational programs, and lectures on health topics and on the professional school admissions process to students interested in health-related fields such as medicine, dentistry, optometry, and veterinary medicine. Active membership is awarded to students who have completed at least three semesters with a minimum scholastic GPA of 3.000. Associate membership is also available.

Accelerated Master's Degree in Biology
Qualified undergraduates may be admitted to an accelerated master's program and obtain both a B.S. and M.S. within five years. This program is open only to those students who wish to pursue the master's degree concentrations in microbiology or molecular biology. Students admitted to this program may take graduate courses after completion of 90 undergraduate credits, and up to six credits of graduate work may be used in partial satisfaction of the requirements for the undergraduate degree. If students earn at least a 3.0 in these classes, they are granted advanced standing in the master's program and must then complete an additional 24 credits to receive the master's degree. All other master's degree requirements must be met.

Students with an overall GPA of at least 3.0 may apply for provisional acceptance to the accelerated master's program after completion of BIOL 213, 303, 304, 305/306, 307, 311; CHEM 315 and 318; or after completion of 75 undergraduate credits including BIOL 494. Three letters of recommendation, including one from a prospective thesis or project advisor, are required.

After completion of 120 credits and completion of all requirements for the bachelor's degree, at which time students are awarded a bachelor's degree, accelerated master's students must submit scores on the Graduate Record General and Biology Subject Examinations in order to have the provisional qualifier removed. Ordinarily, students should receive a minimum combined score of 1100 on the verbal and quantitative portions of the general test and be at least in the 50th percentile on the subject examination.

GRADUATE PROGRAMS

Biology, M.S.
The master's of science in biology provides advanced training for college graduates or professionals employed in teaching and research. The program in biological sciences permits specialization in traditional areas of study such as animal behavior, botany, ecology, animal physiology, and vertebrate zoology. Concentrations in microbiology, molecular biology, or systematics and evolutionary biology are also available. An interdisciplinary concentration in bioinformatics and computational biology (BCB) is designed to accommodate biologists as well as qualified nonbiologists.

Admission Requirements
Applicants must have a bachelor's degree in biology or its equivalent, except for those interested in the BCB, where competency in computer science and an undergraduate degree in any natural science, mathematics, engineering, or computer science is desirable. A GPA of 3.0 in biology or in the last 60 credits of undergraduate study is required. Students must also submit three letters of recommendation and scores on the Graduate Record General Examination. Successful applicants generally have at least 1100 on the verbal and quantitative sections of the GRE (1200 for the BCB). Except for the BCB, scores on the GRE subject examination in biology are required. Successful applicants generally have a subscore of more than 60 (40th percentile).

Degree Requirements
Candidates for the M.S. in Biology must complete at least 30 graduate credits, including BIOL 690, which is typically taken during the first semester. The concentration in bioinformatics and computational biology requires 35 credits.

Students have the option to write a thesis (3 to 6 credits of 799) or a project (one to three credits of 798). The difference between the two options is the depth and sophistication of the work. Whereas a thesis normally involves original research and independent acquisition and interpretation of data, a project may be employment-related research, a comprehensive report resulting from an internship, or a publication-quality scientific paper. At the conclusion of the program,
students pursuing the project option must successfully complete written and oral comprehensive examinations. Students pursuing the thesis option must defend their theses and present their results in a public seminar.

**Program in Biological Sciences**
The program in biological sciences is for students who wish to specialize in an area not covered by the concentrations described below. Admission is contingent on acceptance by an advisor.

**Requirements**
1. 1 credit of BIOL 690
2. 2 credits of BIOL 695
3. 1–6 credits of BIOL 798 or 799
4. 21–26 credits of electives in BIOL or related areas as approved by the student's advisor

**Concentration in Microbiology**

**Requirements**
1. 1 credit of BIOL 690
2. 2 credits of BIOL 695
3. 1–6 credits of BIOL 798 or 799
4. 4 credits of BIOL 583
5. 6 credits of BIOL 501 and 556
6. 2–4 credits in molecular techniques (1 course)
7. 7–14 credits of electives

**Concentration in Molecular Biology**

**Requirements**
1. 1 credit of BIOL 690
2. 2 credits of BIOL 695
3. 1–6 credits of BIOL 798 or 799
4. 4 credits of BIOL 583
5. 9 credits of BIOL 568, 579, 584
6. 2–4 credits in molecular techniques (1 course)
7. 3 credits in bioinformatics
8. 1–8 credits of electives

**Concentration in Systematics and Evolutionary Biology**

**Requirements**
1. 1 credit of BIOL 690
2. 2 credits of BIOL 692 or 695
3. 1–6 credits of BIOL 798 or 799
4. 3 credits of BIOL 574
5. 6 credits of BIOL 695 and BIOS 767
6. 2–4 credits in molecular techniques (1 course)
7. 3–4 credits in organismal biology
8. 6–14 credits of electives

**Concentration in Bioinformatics and Computational Biology**
The interdisciplinary concentration in bioinformatics and computational biology encompasses the use of computation in biological research and hence is designed to serve students who wish to gain expertise in both computational methods and biological research. Faculty members from the departments of Biology, Chemistry, Physics and Astronomy, and Mathematical Sciences; the School of Information Technology and Engineering; and the School of Computational Sciences contribute to instructional and research components of the concentration. Prospective students are encouraged to contact potential faculty advisors appropriate to their interests. Admission is contingent on acceptance by an advisor. A list of faculty with relevant interests is available through the individual departments and schools.

**Requirements**
An advisory committee and the student work together to develop a program of study that best meets the student's background and interests. At least one member of the committee must be from the Biology Department. The student must submit a program of study to the program coordinator for approval within the first 12 credits of course work and must complete a minimum of 35 graduate credits.
1. At least 7 credits of computational sciences including CSI 601, 602, 603, 604, and INFS 614
2. At least 9 credits of bioinformatics including BIOL 580 and any CSI courses numbered between 730 and 739
3. At least 7 credits of biotechnology and molecular biology chosen from BIOL 568, 575, 578, 668
4. At least 12 credits in an individual program focus, including BIOL 690, 695, and 798 or 799.

**Biosciences**

**Faculty**

Adamkewicz, Ascoli, Barreto, Birchard, Blackwell, Bradley, Brindle, Born, Butler, Chandhoke, Christensen, Chroniak, Coss, Davies, DeJong, Dworzecka, Emerson, Ernst, Fletcher, Flinn, Foster, Fryxell, Geller, Gillevet, Given, Gluckman, Grant, Greffenstette, Harbour, Isbister, Jamison, Jonas, Kafatos, Kelso, Lawrey, Lebovitz, Litchfield, McKenney, Morowitz, Olds, Rockwood, Royt, Sauer, Schiff, Shaffer, Skog, Sleigh-Ritzer, Smith, So, Soyfer, Talbot, Torzilli, Vaisman, Willett, Williams

**Course Work**
The Biosciences Program offers all course work designated BIOS in the "Course Descriptions" chapter of this catalog.

**GRADUATE PROGRAM**

**Biosciences, Ph.D.**
The Ph.D. in biosciences is an interdisciplinary program with concentrations in neuroscience, functional genomics, bioethics, astrobiology, and systematics and evolutionary biology. The program draws on faculty from eight departments, the Krasnow Institute, and the School of Computational Sciences. The Ph.D. in biosciences is designed to train students as research scientists for careers in private industry and academia. It integrates advances in basic knowledge with technological and computational skills required for addressing complex problems in the biosciences. Faculty partner with The National Institutes of Health; Biotechnology firms, INOVA Hospital System; NASA; The Carnegie Institution; The Smithsonian and The Kennedy Institute of Ethics. Students are expected to complete research internships.
The academic component is a three-tiered structure. The first provides a set of four core courses designed to advance research skills across all disciplines. This is followed by four-five core courses in the selected concentration and elective courses. The first two levels are designed to be completed in approximately two years including the comprehensive exam which propels the student to candidacy status. The third level focuses on research and culminates in a dissertation.

Admission Requirements

In addition to materials required of all applicants for graduate study, the following is also required.

1. A minimum 3.25 GPA in previous coursework, with significant training in the biological sciences
2. Three letters of recommendations from faculty members or individuals who have firsthand knowledge of the applicant's academic or professional capabilities
3. A statement of purpose consistent with the research interests of at least one faculty member in the program
4. Graduate Record Examination (GRE) taken within the past five years prior to the date of application submission
5. An interview may be required

For full consideration for fall admission, applications should be submitted by March 1. Under unusual circumstances, applications may be considered for spring admission.

Strong candidates who lack prerequisites may be admitted provisionally. Such students will be required to complete missing prerequisites and earn a 3.25 GPA in the core courses.

Students who have not taken a course in basic biochemistry will be required to complete one prior to BIOS 701.

Degree Requirements

Candidates for the Ph.D. in biosciences must complete a minimum of 72 graduate credits.

1. Core courses: 12 credits in BIOS 701, 702, 703, 704
2. Concentration: 12–16 credits required courses for one concentration (see below)
3. Elective
4. Qualifying exam
5. Dissertation proposal and research 12–24 credits in 998, 999

Upon admission to the program, each student is assigned an advisor from the biosciences faculty. The advisor may be changed by mutual consent of student and advisor or by petition to the program director and the dean. With the advisor, students adopt an individual program that focuses on a specific area of research.

By the end of the fourth semester of course work, the student assembles a dissertation committee of four graduate faculty members with representation from at least two academic departments. The committee and the concentration director approve the program of study.

Upon near completion of course requirements, students take a qualifying examination with a written and an oral component. At the discretion of the committee, the written qualifying examination may be retaken once in an instance the student's performance was deemed below satisfaction. Upon successful completion of the qualifying examination and all other coursework, students will be recommended for advancement to candidacy by the committee and concentration coordinator.

After advancement to candidacy, students are eligible to enroll in dissertation (998, 999). Students must present their dissertation results to their graduate committee and in a seminar and defend the dissertation publicly.

For students entering the doctoral program with a master's of science degree, the number of credits required may be reduced by a maximum of 30 with the approval of the advisor and the concentration director. Graduate credits taken previously and not used toward another degree may be transferred, subject to the approval of the advisor, concentration director, and the dean.

**Concentration in Neuroscience**

This concentration prepares students for significant contributions in an academic or research setting. Major emphases on modeling, functioning of small neuronal ensembles, neurochemistry, addiction, and behavioral neuroscience.

**Requirements**

1. 12 credits in BIOS 721, 722 (PSYC 702), 723, 724 (PSYC 531)

**Concentration in Functional Genomics**

This concentration prepares students for significant contributions in an academic or industrial career. Areas of emphasis include microarray analysis, cancer genomics, molecular studies of the mechanisms of toxicology and mutagenesis, and biotechnology.

**Requirements**

All students must take the following 15 graduate credits as their concentration courses:

1. 15 credits in BIOS 740, 741, 742, 743, and 744

**Concentration in Bioethics**

This concentration provides students with an emphasis on the pragmatic implications of bioscience research, development, and application. It draws from law, ethics, management, policy, and science.

**Requirements**

All students must take the following 15 graduate credits as their concentration courses:

1. 15 credits in BIOS 780, 781, 782, 783, 880

**Concentration in Systematics and Evolutionary Biology**

The concentration in systematics and evolutionary biology emphasizes modern molecular approaches that take advantage of the recent growth in genomics and bioinformatics. Modern systematics uses structural, chemical, and genetic information to construct phylogenetic trees that portray links to other organisms by descent from common ancestors.

**Requirements**

All students must take the following 13–16 graduate credits as their concentration courses:

1. 1–3 credits in BIOS 760
2. 12 credits in BIOS 762, 765, 767

**Concentration in Astrobiology**

The concentration in astrobiology studies the origin and evolution of life and the distribution of life in the universe. Students in this concentration specialize in either the biological or the physical aspects of astrobiology.
To be admitted to this concentration, students must have a background in astronomy, calculus, microbiology, organic chemistry, and a general proficiency with computers. Students who are deficient in any of these areas may be accepted provisionally into the concentration until they have acquired the necessary background.

Requirements

All students must take the following 15 graduate credits in their concentration courses

1. 15 credits in BIOS 710 (ASTR 710), 711, 787, 788, and 713

Chemistry

Web: gmu.edu/departments/chemistry
Phone: (703) 993-1070

Faculty

Professors: Blaisten-Barojas (School of Computational Sciences), Cozzens, Foster (chair), Mose, Mushrush, Statlick
Associate professors: Chen, Davies, Davis (associate chair), Honeychuck, Hussam, Schrefels, Slayden
Assistant professors: Born, Hatton, Roberts
Affiliate research professors: Field, Khan

Course Work

This department offers all course work designated CHEM in the Course Descriptions chapter of this catalog.

UNDERGRADUATE PROGRAMS

Chemistry, B.A.

This program, when coordinated with the necessary courses in education, meets requirements for teacher licensure (see below). It also meets requirements for entrance to medical and other professional schools.

In addition to satisfying the university-wide general education requirements and the requirements for the B.A. degree in the College of Arts and Sciences, students majoring in chemistry must complete the following. (Through the course work below, majors satisfy the university-wide general education requirements in natural science and quantitative reasoning.)

2. Eleven credits of math and statistics: MATH 113, MATH 114, and STAT 250
3. Eight credits of physics: PHYS 243–246
4. Four credits of biology BIOL 213

Chemistry, B.S.

This program is approved by the American Chemical Society; students completing this program are certified to the society. Students planning professional careers in chemistry should choose this degree.

In addition to satisfying the university-wide general education requirements for the B.S. degree, students majoring in chemistry must complete the following. (Through the course work below, chemistry majors satisfy the university-wide requirements in natural science and quantitative reasoning.)

1. Fifty-two credits of chemistry: CHEM 211, 212, 313, 314, 315, 318, 321, 331, 332, 336, 337, 350, 422, 423, 441, 445, 463, and three credits of electives in chemistry
2. Fourteen credits of math: MATH 113, 114, 213, 214
3. Eight to twelve credits of physics: PHYS 243–246 (8 credits) or PHYS 160, 260–263 (12 credits)

Concentration in Biochemistry

Students planning professional careers in biotechnology, biological chemistry, molecular biology, biotechnology, or other biomedically related fields with a chemistry emphasis should choose this program instead of the traditional B.S. in Chemistry. The program also meets the requirements for entrance to medical and other professional schools.

In addition to satisfying the university-wide general education requirements for the B.S. degree, students majoring in chemistry with a concentration in biochemistry must present the following. (Through the course work below, they satisfy the university-wide requirements in natural science and quantitative reasoning.)

1. Fifty-two credits of chemistry courses: CHEM 211, 212, 313, 314, 315, 318, 321, 331, 332, 336, 337, 350, 422, 423, 441, 446, 463, 465
2. Fourteen credits of math: MATH 113, 114, 213, 214
3. Eight to twelve credits of physics: PHYS 243–246 or PHYS 160, 260–263
4. Four credits of biology BIOL 213

Writing-Intensive Requirement

The university requires all students to complete at least one course designated as writing intensive in their majors at the 300 level or above. Students majoring in chemistry fulfill this requirement by successfully completing CHEM 336 and 337.

Honors Program in Chemistry

Chemistry majors who have completed the prerequisites for CHEM 455 and 456 Honors Research in Chemistry and have maintained an overall GPA of at least 3.00 in mathematics and science courses are eligible to enter the departmental

http://catalog.gmu.edu
honors program. To graduate with honors in chemistry, a student is required to maintain a minimum GPA of 3.00 in mathematics and science courses and successfully complete the two semesters of CHEM 455 and 456 with a minimum GPA of 3.50.

♦ Minor in Chemistry
The Department of Chemistry offers a minor in chemistry. The program requires 16 credits of chemistry at the 300 level or above.

♦ Certificate in Environmental Chemistry
The Department of Chemistry offers an undergraduate certificate program in environmental chemistry. The program consists of 35 credits of course work that deals directly with environmental studies. To receive the certificate a student must hold a baccalaureate degree in any major or be receiving one from George Mason at the time they receive the certificate. Substitutions from the following list of required courses are allowed but require permission from the environmental chemistry certificate director: BIOL 377; CHEM 313, 314, 315, 318, 321, 331 or 333, 505, 554; EVPP 301, 454; STAT 344.

To optimize employment and graduate school opportunities, students are encouraged to take additional courses in natural science, computer science, and environmental law.

Premedical, Predental, and Preveterinary Students
Students planning medical, dental, or veterinary careers may meet the requirements of these professional schools by majoring in chemistry. Such students should consult with the premedical advisor for chemistry.

Chemistry Club
The Chemistry Club provides a social and informational network for students. It serves the Department of Chemistry by sponsoring informational programs and allowing students to work at university events.

Teacher Licensure
Students who wish to become teachers should consult the Professional Licensure section in the Graduate School of Education chapter and attend an information session during their sophomore year. Information sessions for teacher licensure are offered every month. Call (703) 993-2892/4648, e-mail gsedinfo@gmu.edu, or consult the web site at gse.gmu.edu for more information.

GRADUATE PROGRAM
The Department of Chemistry offers an M.S. in Chemistry with a research project (thesis option) or an all-course-work program (nonthesis option). The Ph.D. in all branches of chemistry is available through the Ph.D. in Environmental Science and Public Policy, while an area of concentration in computational chemistry is available through the Ph.D. in Computational Sciences and Informatics program offered in conjunction with the School of Computational Sciences.

Chemistry, M.S.
The M.S. in Chemistry provides advanced training for recent college graduates, professionals in teaching, and technical workers in research organizations who have an interest in chemistry.

Admission Requirements
To be considered for admission to degree status, a student must have a bachelor’s degree in chemistry or a related field from an accredited institution and must meet the general admission requirements for graduate study.

Admission is based on a departmental evaluation of the applicant's background as evidenced by transcripts and letters of recommendation. A resume must be submitted by each applicant who received the bachelor’s degree more than five years before the date of application. Each student must present evidence of computer literacy before completing 12 graduate credits.

Degree Requirements
Students may elect to complete a thesis or a project. The thesis option is for students planning to pursue a doctoral degree or to begin or continue a career in chemical research. The nonthesis option is for those seeking to go on to professional school, teach chemistry in secondary schools, or pursue other careers in which advanced work in chemistry is necessary or advantageous.

A student in the thesis option is required to complete 30 credits of graduate work, including 6 credits of thesis CHEM 799. The thesis is based on research that must be preapproved by the thesis or advisory committee, appointed during the first semester of registration in CHEM 799. A student who selects the thesis-option must defend the thesis at an oral exam (following submission of the first approved draft of the thesis) and present an exit seminar. A student in the nonthesis option is required to complete 32 credits of graduate work and pass qualifying exams in four areas of chemistry.

All students must complete 12 credits in core courses in chemistry (physical chemistry and one in each of three different areas chosen from analytical, biological, environmental, inorganic, and organic chemistry) and at least 3 credits of Graduate Seminar CHEM 690. Minimum credits for each option are as follows:

<table>
<thead>
<tr>
<th>Thesis Option</th>
<th>Nonthesis Option</th>
</tr>
</thead>
<tbody>
<tr>
<td>Core curriculum 12</td>
<td>12</td>
</tr>
<tr>
<td>Electives in chemistry 3</td>
<td>9</td>
</tr>
<tr>
<td>Electives in chemistry or related fields 6</td>
<td>6</td>
</tr>
<tr>
<td>CHEM 670 2</td>
<td>2</td>
</tr>
<tr>
<td>CHEM 690 3</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 799 6</td>
<td>-</td>
</tr>
<tr>
<td>Total credits 30</td>
<td>32</td>
</tr>
</tbody>
</table>

Core courses (CHEM 513, 521, 614, 624, 633, 646, 651, 663, and 732) may also be taken as electives beyond the 12-credit requirement. CHEM 500 and 501 may not be applied toward the M.S. degree. CHEM 502 through 510 may be applied toward the M.S. degree only with prior written approval of the department.

Chemistry, Bachelor's/Accelerated Master's Degree
The five-year Bachelor's/Accelerated Master's Degree program leads to a research-based M.S. degree following satisfactory completion of 144 credits. It allows academically strong undergraduates with a commitment to research to obtain a B.S. and a M.S. degree within five academic years.
plus the summer of the last year. On completion of this program, a student will be exceptionally well prepared for entry into a professional school or a Ph.D. program in chemistry or a related discipline. Well-prepared students can enter this program after completion of 90 credits and can enroll in graduate courses when they have successfully completed the prerequisites. This flexibility makes it possible for students to complete some of their graduate classes during their junior and senior years. Consult the department for details on the program.

Communication

Web: gmu.edu/departments/comm
Phone: (703) 993-1090

Faculty
Professors: Boileau, Decker, Friedley, Lont (chair), Manchester, Taylor
Associate professors: Akwule, Finn, S. Muir, Rowan
Assistant professor: Bethea, Gibson
Visiting assistant professor: Forbes, Mellen
Visiting instructors: M. Dickerson, Du, Fahema, Miller, R. Smith, Tomasovic, Sisk
Adjuncts: Bridge, Caron, Chaaban, Clarke, N. Dickerson, Doyle, Elliott, Eves, Farrill, Gladis, Gray, Hansche, Holsumbake, Kahn, Kehoe, Klein, Korn, LeValley, Lincoln, Mangus, Mathison, Mattox, M' Bayo, Nadler, Nwokafor, Piland, Riley, Rogers, Roller, Siegel, Singer, Slagle, Spencer, Traynham, Van Zummeren, Wood

Course Work
The Communication Department offers all course work designated COMM and TELE in the Course Descriptions chapter of this catalog.

UNDERGRADUATE PROGRAM

■ Communication, B.A.

Study in communication prepares students for graduate study or entry-level positions in fields such as international and intercultural communication, interpersonal and organizational communication, journalism, media production and criticism, persuasive and political communication, and public relations.

In addition to satisfying the university-wide general education requirements and the requirements for the B.A. degree in the College of Arts and Sciences, students majoring in communication must complete 36 credits in communication:

1. Fifteen credits of required communication courses, each with a minimum satisfactory grade or better: COMM 250, 300, 301, 302, and 420

2. Twelve credits selected from an approved concentration (see below). A list of courses in each concentration is available on the department web site and in the department. With the approval of their advisor and the associate chair, students may construct an individualized concentration. Students must declare a concentration before they earn 90 or more credits. Transfer students with 60 or more credits are encouraged to declare a concentration by the end of their first semester at George Mason.

3. Nine credits of communication electives

Of the 21 credits in 2 and 3, 12 must be at the 300–400 level and the total may include no more than 10 credits from the following courses: COMM 140, 141, 142, 143, 145, 148, 157, 340, 341, 342, 343, 345, 346, 348, 349, 450, 451, 452, 499. Also, the total may include no more than 6 credits of internship (COMM 450). No more than 9 credits of internship (COMM 450 and/or GOVT 450) may be applied toward the 120 credits required for graduation.

Approved Concentrations

International and Intercultural Communication

Interpersonal and Organizational Communication

Journalism

Media Production and Criticism

Persuasive and Political Communication

Public Relations

Individualized Concentration

All students are encouraged to participate in one of the communication activities: Broadside, debate, forensics, GMview, Mason Cable Network, or WGMI. Many students include an internship during their senior year as a way of gaining practical experience with national and international businesses, associations, or government agencies.

Writing-Intensive Requirement

The university requires all students to complete at least one course designated as writing intensive in their majors at the 300 level or above. Students majoring in communication fulfill this requirement by successfully completing COMM 300.

Honors Program in Communication

Communication majors who have completed 80 credits with an overall minimum GPA of 3.500 and a minimum GPA of 3.500 in communication courses are eligible to enter the departmental honors program. Candidates for the honors program must have successfully completed or be enrolled in COMM 250, 300, 301, and 302. Students who meet the criteria for admission are invited to submit a proposal for an honors thesis. If the proposal is approved, they are admitted to the honors program. To graduate with honors in communication, students must complete COMM 499 Independent Study in Communication and an honors section of COMM 420, maintaining a minimum GPA of 3.500 in these courses and an overall minimum GPA of 3.500. For more information, contact the director of the honors program in Communication.

Minors

The department coordinates the minors in electronic journalism and in telecommunications (see below) and participates in several interdisciplinary minors: film and media studies, multimedia, and women's studies. For a description of these minors, see the Interdisciplinary Minors section of this chapter.

Teacher Licensure

Students who wish to become teachers should consult the Professional Licensure section in the Graduate School of Education chapter and attend an information session during their sophomore year. Information sessions for teacher licensure are offered every month. Call (703) 993-2892/4648, e-mail gseinfo@gmu.edu, or consult the web site at gse.gmu.edu for more information.

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GEORGE MASON UNIVERSITY

College of Arts and Sciences

Minor in Electronic Journalism
Electronic Journalism provides a foundation in journalism with a focus on the writing style and research techniques unique to broadcast, online, and computer-assisted reporting. Students must complete 18 credits distributed as follows.
1. Four required courses: COMM 303, 351, 361, 475
2. Two electives (six credits) chosen from COMM 203, 352, 353, 399*, 435, 450*, 454, 455 (*if topic or internship is approved by department)

GRADUATE PROGRAMS

Communication, M.A.
The M.A. in communication offers students a solid preparation for working in a professional environment where effective communication is key to success. Students designate specific areas of interest and explore links among theory, application, and community.

Admission Requirements
In addition to the Application for Graduate Study and supporting materials required by the university, applicants should present the following:
1. 3 letters of recommendation from a person directly knowledgeable with the applicant’s professional and academic competence (at least one from an academic source)
2. Scores on the Graduate Record Examination or Miller’s Analogy
3. A 500-word essay addressing the area of communication in which the applicant is interested
4. A GPA of 3.00 or better in the last 60 credits of their bachelor’s degree

Students admitted provisionally must achieve a 3.25 GPA in the first 12 credits of graduate course work. If they fail to do so, they will be terminated from the program.

Degree Requirements
Candidates for the degree must successfully complete 33 credits of graduate course work, distributed as follows.
1. 3 required core courses (15 credits): COMM 504, 605, 634, 635, and 650
2. 4–5 electives (12–15 credits) chosen from COMM 506, 530, 551, 590, 601, 602, 631, 636, 652, 653, 655, 656; and 694, 696, or 697 (students may apply only one of these courses toward their degree)
3. 3 credit capstone course COMM 798 or 3–6 credits of thesis COMM 799
Up to 6 credits of electives may be taken in other departments, with approval of advisor.

The Department of Communication coordinates the concentration in Video-Based Production within the Master of Arts in Interdisciplinary Studies (M.A.I.S).

Telecommunications Faculty
Akwule, Finn, Kelley (director), Lont, Ruth, Wang

UNDERGRADUATE PROGRAM

Minor in Telecommunications
In its broadest sense, telecommunications includes technology (software and hardware), policy issues (national and international), mass media, and management. No longer can computer technologists sit alone working on code; they must be able to manage technical and nontechnical people, understand policy issues, and present technical material to others in the corporate setting. The required and elective courses in this minor provide a solid introduction to the work world of telecommunications.

To receive a minor in telecommunications, students must complete 18 credits distributed as follows. A grade of C or better is required in all courses applied to the minor. See the program director for a current list of electives and for further information.
1. Four required courses: COMM 104, COMM 202, TELE 350, TELE 450
2. Two electives (six credits) chosen from the following:
   - CS 105 Computer Ethics and Society
   - COMM 320 Business and Professional Communication
   - COMM 450 Internship (in a telecommunications-related organization)
   - COMM 554 Telecommunications Policy and Regulation
   - COMM 556 Global Communications
   - ENGL 410 Technical and Report Writing
   - GOVT 359 Computers in Public Management

GRADUATE PROGRAM

Telecommunications, M.A.
Because telecommunications is both a technological and a humanistic endeavor, the M.A. in Telecommunications is an interdisciplinary program that includes courses in engineering, law, management, education, and communication. The program is designed for telecommunications professionals, persons who wish to change careers and move into a telecommunications-related field, and others whose interests, talents, or curiosity bring them into contact with the world of telecommunications.

Admission Requirements
In addition to university requirements for admission to graduate study, applicants should submit the following:
1. A GPA of 3.00 or better in the last 60 credits of their bachelor’s degree
2. Three letters of recommendation from persons directly knowledgeable of the applicant’s professional and academic competence (one from an academic source)
3. A 500-word essay addressing an important, substantive issue in telecommunications

Advising
With guidance from a faculty advisor, students choose from a wide variety of courses available at the university to tailor course work to their particular interests and needs. Choice of an area of concentration also depends on the student’s undergraduate preparation. A student advising form, which outlines the student’s degree plan and serves as a guide, should be completed and submitted by the student soon after admission to the program. For more information about the program, contact the Telecommunications Programs Office at (703) 993-1314.

http://catalog.gmu.edu
Degree Requirements

Students must complete a minimum of 30 credits of approved graduate course work, including 15 credits of core courses and 15 credits in one of nine concentrations: educational technology; information systems; international telecommunications; management, organization, and policy; network technologies and applications; production theory and practice; telecommunications systems engineering; telecommunications systems modeling; and wireless communication.

1. Four courses (12 credits) chosen from the following:
   - COMM 655 Theories of Visual Communication in Telecommunications
   - TCOM 500 Modern Telecommunications
   - LAW 181 Telecommunications Law and Regulations
   - PUBP 726 Telecommunications Policy
   - TELE 730 Telecommunications Management

2. TELE 750 Coordinating Seminar (3 credits)

3. Fifteen credits in a concentration

   Educational Technology
   - One required course (three credits): EDIT 611
   - Four electives (12 credits) chosen from: EDCI 705, EDIT 526, 704, 730, 732, 750, 752 or up to six credits from 571, 572, 573, 574, 575, 593, 771, 772

   Information Systems
   - Three required courses (nine credits): INFS 501, INFS 515, INFS 590
   - Two electives (six credits) chosen from: INFS 601, 612, 614; ECE 542, SWSE 619, 632

   International Telecommunications
   - One required course (three credits): COMM 656
   - Four electives (12 credits) chosen from: COMM 506, 554, 605; ITRN 500, 603, 604, 605, 612, 710, 711, 712, 716, 730, 731, 737, 750, 754, 757, 768, 769, 772; PUAD 504, 634, 636, 701, 731, 732, 739

   Management, Organization, and Policy
   - Management, Organization, and Policy
   - One required course (three credits): TELE 730 (taken as one of the 4 core courses)
   - Five electives (15 credits) chosen from: COMM 506, 601; ECON 600, 602; LRNG 583, 714, 720; MBA 613, 623, 635, 663, 678, 711, 712, 724, 725, 732, 734, 736; PSYC 532; PUAD 505, 610, 620, 621, 634, 636, 732, 739; PUBP 775

   Network Technologies and Applications (see concentration requirements under the M.S. in Telecommunications in the chapter of the school of information technology and engineering)

   Production Theory and Practice
   - Two required courses (six credits): COMM 656, 655 (taken as one of the 4 core courses)
   - Four electives (12 credits) chosen from: COMM 506, 554, 602, 635, 636, 694, 696, 697; EDCI 705; EDIT 563, 564, 611, 704, 750; ENGL 503, 505, 613, 670; VIT 676; COMM 590 (when topic is approved for this concentration)

   Telecommunications Systems
   - Two required courses (six credits): ECE 542, TCOM 500 (taken as one of the 4 core courses)
   - Four electives (12 credits) chosen from: CS 571; ECE 513, 528, 535, 546, 563, 565, 567, 630, 633, 642, 643

Telecommunications Systems Modeling (see concentration requirements under the M.S. in Telecommunications in the chapter of the School of Information Technology and Engineering)

Wireless Communications (see concentration requirements under the M.S. in Telecommunications in the chapter of the school of information technology and engineering)

Certificate Programs

The M.A. in Telecommunications program in the Department of Communication offers three graduate certificates: International Telecommunications; Telecommunications Management, Organization, and Policy; and Telecommunications Production Theory and Practice. The M.S. in Telecommunications program in the School of Information Technology and Engineering offers three additional certificates in Network Technologies and Applications; Telecommunications Systems Modeling; and Wireless Communications.

Admissions Requirements

Students can earn a certificate as part of their work towards a M.A. or M.S. in Telecommunications or as a goal in itself. Students currently in a master's program who decide to receive a certificate should fill out a secondary degree application. Students not currently in a degree program can apply to the certificate program using the application for graduate studies. The admission requirements for the certificates below are the same as for the M.A. in Telecommunications. Certificate students may later apply for admission to one of the master's degree programs, but should be aware of the master's degree requirement that 18 credits have to be taken after admission to the master's program.

Certificate Requirements

To receive a certificate, students must complete 15 graduate credits as specified below, earning a minimum grade of 3.00 in each course. Students pursuing one of the master's degrees may use the coursework to fulfill both the certificate requirements and the concentration requirements of the respective degree program.

Students may not transfer courses earned at another institution into any of the six certificate programs.

Certificate in International Telecommunications

1. 3 required courses: COMM 656, ITRN 730 and 772
2. 2 electives chosen from COMM 506; PUAD 504, 732, 739; ITRN 773 or 769

Other electives may be possible with approval of the advisor.

Certificate in Telecommunications Management, Organization, and Policy

1. 3 required courses: TELE 730, COMM 635, PUAD 781
2. 2 electives chosen from PUAD 502, 680, 739; MBA 663, 711, 734, 736, 663, 678

The MBA courses are open to degree-seeking students only. Other electives may be possible with approval of the advisor.
Certificate in Telecommunications Production Theory and Practice
1. 2 required courses: COMM 655 and EDIT 730
2. 3 electives chosen from COMM 602, ENGL 670, EDIT 750, and COMM 590 (when topic is approved for this certificate)

Other electives may be possible with approval of the advisor.

Community College Education
Web: dacce.gmu.edu

Faculty
Agee, Fathe, Johns, Kettlewell, Kuhta, Muir, Salmon

Course Work
This program offers all course work designated CTCH in the Course Descriptions chapter of this catalog.

GRADUATE PROGRAMS
Community College Education, D.A.
The Doctor of Arts in Community College Education (DACCE) prepares students to be leaders in undergraduate education. In addition to expertise in a selected disciplinary or interdisciplinary knowledge area, graduates of this program are proficient in four core areas related to undergraduate education: scholarly activity related to teaching and learning; effective integration of technology in the teaching and learning process; pedagogy appropriate to the discipline; and program and curriculum design, development, and assessment. With this background and the guided practical experience provided by internships, students are prepared to lead their institutions to respond to the changing needs of 21st century students.

Admissions
Students are accepted for the fall semester only. The deadline for receipt of all application materials is February 15. In addition to meeting admission requirements for graduate study at George Mason, applicants to the D.A. in Community College Education should have a master’s degree and submit a writing sample appropriate to the academic discipline (knowledge area), three letters of recommendation, and a resume. While a GRE score is not required, it represents valuable support for admissions decisions.

In the required goals statement, students should indicate a knowledge area related to their teaching field, chosen from a list of participating departments and programs (see the program web site). Additional credentials or an interview may be required for admission by the faculty in the knowledge area. Applications are reviewed by the faculty in the DACCE program and in the knowledge area.

Degree Requirements
Candidates for the D.A. in Community College Education must complete a minimum of 60 credits beyond the master’s degree, distributed as follows:
1. 24 credits in a knowledge area
2. 18 credits in the education core: CTCH 601, 602, 604, 605 plus 6 credits chosen from CTCH 602, 606, 607, and approved electives
3. 6 credits of internships (CTCH 885)
4. 12 credits of dissertation (CTCH 998, 999)
Within the 60 credits, a minimum of 6 credits need to be in courses with a technology-focus. These include the required CTCH 603, courses in the knowledge area, or electives in the education core, as approved by the program director.

Knowledge Area
Substantial work in a knowledge area is essential to the leadership in curriculum expected of students earning the DACCE. Given the dynamic nature of the community college and the growth of programs in nontraditional fields, the choice of a knowledge area and relevant course work should be guided by the student’s developing interests and a vision of the student’s role as a community college educator. While many DACCE candidates take their 24 knowledge area credits exclusively in one discipline or department, candidates are encouraged to think broadly and in terms of multiple disciplines and to work with their advisors to choose appropriate courses from more than one discipline/department.

Education Core
The 18-credit core of education courses is designed to develop leaders in undergraduate education. The program emphasizes a broad knowledge base in teaching as well as course work in the history and philosophy of the community college and in instructional technology. These courses concentrate on scholarship and practice in the fields of teaching and learning, instructional technology, and program and curriculum design and assessment.

Internships
Students participate in two-three-credit internships to learn skills applicable to college-based teaching and higher education administration or policy. Internships provide an important educational experience that complements the classroom-based course work. Students doing an internship should have completed a minimum of 9 credits of core requirements, including CT 601, 3 credits in the knowledge area, and have an approved program of study. Internships must be approved by the advisor and the Internship Coordinator; they require a minimum of 200 hours of work for 3 credits and participation in an internship seminar.

Program of Study
Working with an advisor, students develop a program of study that outlines the courses that will be used to fulfill the degree requirements. The program of study is approved by the advisor and program director, and any modifications require the student to file a revised program of study.

Candidacy Exams
Students must pass candidacy exams to demonstrate a breadth and depth of knowledge in both the knowledge area and the education core. To be eligible to take a candidacy exam, students need to have completed all course work in the specific area, to be in good standing (have a minimum cumulative GPA of 3.0); and to be registered for at least one credit. The competency exam for the education core is a written exam administered by the DACCE program. The knowledge area exams are administered by the liaison in the knowledge area; each area has its own exam guidelines.

Students who do not pass a candidacy exam in either area have until the last day of the next semester (published in the
Schedule of Classes) to retake it. (For students who take exams in the summer months this will be the published date for fall semester.) Students who do not retake the exam by this deadline or who do not successfully complete the candidacy exam the second time will be terminated from the program.

Advancement to Candidacy
Once students complete all course work, pass candidacy exams, and have an appointed dissertation committee, they are, with the recommendation of the committee, advanced to candidacy by the dean.

Dissertation
In the dissertation, students demonstrate an ability to conduct original research that contributes new knowledge or a reinterpretation of existing knowledge to the area of investigation. This research can be theoretical in nature, focusing on pedagogy, the knowledge area, or a combination of both. Students who focus their dissertation in the knowledge area must include at least one chapter which shows how the results of the dissertation research may be applied to undergraduate education. Dissertations may also be practice-oriented, focusing on new and replicable ways of teaching within the knowledge area.

To register for dissertation proposal (998), students need to have an approved program of study and must have completed at least one of the two internships, all other course work, and the candidacy exams in both the core and the knowledge area. To register for dissertation research (999), students must have completed the second internship. Students enrolled in 999 are required to submit evidence of progress to the dissertation advisor and the program by the last day of classes each semester (as published in the Schedule of Classes) (e.g. a draft of a chapter or a brief, descriptive report of research activities). Students showing successful progress will receive a grade of "IP." Those that do not will receive an "IN."

Students are required to take at least 3 credits of proposal research (998) and 9 of research writing (999). They must have at least 12 credits of 998 and 999 combined, and no more than 12 credits of 998 and 999 combined may be applied to the doctoral degree. Once enrolled in 999, students must maintain continuous enrollment each semester until the dissertation is completed. Unless defending in summer, students do not need to be registered during the summer sessions.

Certificate Requirements
Students must complete 18 credits distributed as follows.
1. 15 credits of CTCH 602, 604, 605, 605, 885
2. 3 credits of elective chosen in consultation with an advisor and with the approval of the program director

CTCH 602 may be waived by the program director for candidates with over three years of teaching experience in higher education.
CTCH 885 should be in teaching, but with the approval of the program director, another guided practice may be substituted.
A maximum of 3 graduate credits taken at another institution may be transferred to the Certificate Program with the approval of the program director and dean.

Cultural Studies
Web: gmu.edu/departments/cultural
Phone: (703) 993-2851

Faculty

Course Work
The Cultural Studies program offers all course work designated CULT in the Course Descriptions chapter of this catalog.

GRADUATE PROGRAM

Cultural Studies, Ph.D.
This doctoral program, the first of its kind in the United States, unites selected faculty members from 10 departments to serve students contemplating careers in scholarship and practice. Cultural studies is an emerging field of interdisciplinary inquiry, arising in response to dramatic historical and social changes. As the focus on cultural process transforms an entire range of disciplines in both the humanities and social sciences, scholars are embracing new conceptions of culture and new methods for its study.

George Mason's Ph.D. in Cultural Studies is distinctive in several respects. Similar programs in other universities are usually departmentally based (in English, history, sociology, or communication), emphasizing either the humanities or the social sciences. By contrast, the cultural studies program at George Mason explicitly seeks to link the social sciences and the humanities, combining methods of interpretation and explanation to explore the production, distribution, and consumption of cultural objects in their social contexts. With particular focus on theory and method in crafting this linkage, the program engages contemporary issues
of nationality, class, race, and gender, while opening its scope to all forms of culture—past and present.

Admission Requirements

Students who already have an M.A. in a relevant field are eligible to apply to the Ph.D. in Cultural Studies program. Students with only a bachelor's degree should apply to a master's program in one of six departments that have established feeder programs in cultural studies: English, Sociology and Anthropology, History and Art History, Philosophy and Religious Studies, Modern and Classical Languages, or Economics. All these feeder programs culminate in CULT 802 as a capstone seminar. Students may, if they choose, apply simultaneously to the Ph.D. in Cultural Studies, so that faculty members may review their academic promise and the suitability of their interests to the program. Especially strong candidates with bachelor's degrees may be admitted into the doctoral program on a conditional basis, depending on their performance in the M.A. program, particularly in CULT 802.

In addition to materials required of all applicants for graduate study at George Mason, applicants to cultural studies should submit the following:

1. Scores on the GRE (general test is required; subject tests are optional)
2. Three letters of recommendation from individuals who can judge the applicant's scholarly potential
3. A statement of purpose
4. A writing sample

Degree Requirements

As with all doctoral programs, the emphasis in this program is on the development of intellectual mastery and professional competence. The most important requirements in the program are comprehensive exams and the completion of a doctoral thesis that reflects the student's ability to do original interdisciplinary work that meets professional standards. Each student is required to demonstrate proficiency in at least one foreign language before being permitted to defend the doctoral dissertation proposal.

Candidates for the Ph.D. in cultural studies must complete 48 credits beyond the M.A. degree distributed as follows:

1. Core requirements (nine credits):
   - CULT 802 Histories of Cultural Studies
   - CULT 806 Research Seminar in Cultural Studies
   - CULT 808 Colloquium (three semesters)
2. Theory (three credits), selected from the following:
   - CULT 810 Culture and Political Economy
   - CULT 814 Gender and Sexuality
   - CULT 820 After Colonialism: Race, Ethnicity, Nationalism
3. Methodology (three credits):
   - Under the guidance of faculty advisory committees, students select from departmental graduate offerings (600 level or above) a course in a relevant methodology in which they are not already trained.
4. Topic requirement (three credits), selected from the following:
   - CULT 812 Visual and Performatve Culture
   - CULT 816 Science/Technology
   - CULT 818 Social Institutions
5. Field requirement (18 credits; two fields of 9 credits each)
   - Under the guidance of faculty advisory committees, students select two fields that point topically and theoretically toward teaching interests, dissertation research, and related forms of professional development. Students select relevant courses from departmental graduate offerings (600 level or above), independent study courses, theory or topic courses not used to fulfill the requirements above, and special topics courses. Students also are required to take a three-credit directed readings course, CULT 870, in each field. Students demonstrate competence in each field by producing a field statement that consists of a comprehensive, critical literature review.
6. Comprehensive (Qualifying) Examination
   - The written field statements and an oral comprehensive exam based on them constitute the qualifying examination. On successful completion of this requirement, students are advanced to candidacy.
7. Dissertation research (12 credits; 998, 999)

Economics

Web: gmu.edu/departments/economics
Phone: (703) 993-1151

Faculty

Distinguished professor emeritus: Buchanan
Professors: Bennett, Boudreaux (chair), Congleton, Cowen, Crain, Heiner, McCabe, Rowley, Smith, Snavely (emeritus), Stratmann, Tullock, Vaughn, Wagner, Williams
Associate professors: Boettke, Houser, Levy, Meyer, Reid, Thorbecke, Wiest, Wilson
Assistant professors: Caplan, Hanson, Menes, Ramirez
Instructor: Rustici

Course Work

The Economics Department offers all course work designated ECON in the Course Description chapter of the catalog.

UNDERGRADUATE PROGRAMS

Economics, B.A.

This program is designed primarily for those students with a stronger interest in the liberal arts. It is appropriate for students who prefer a less quantitative degree program and may be especially appropriate for students planning to attend law school or graduate programs in business or public administration.

In addition to satisfying the university-wide general education requirements and the requirements for a B.A. degree in the College of Arts and Sciences, candidates must complete the following:

1. Thirty-six credits of economics courses, including ECON 103, 104, 306, 311 and 24 credits of economics electives at the 300 and 400 level (ECON 103 and 104 fulfill 6 credits of university and CAS general education requirements in social science.)
2. DESC 210 or STAT 250 and 350
3. MATH 108 (fulfills the university quantitative reasoning requirement)
4. IT 103 (fulfills the university information technology proficiency requirement) No more than six credits with a grade of D in economics courses may be applied to the required economics courses. No more than 12 credits with a grade of D (combined economics and other courses) may be applied to the B.A. degree. Note that some economics courses may fulfill the university-wide general education global understanding requirement and the CAS non-Western culture requirement. Check with the departmental advising office for more information. See the departmental advising office to learn how economics majors fulfill the university-wide general education synthesis requirement.

Economics, B.S.
The B.S. degree program is designed for those students who desire a more technical program with a stronger emphasis on economic and quantitative analysis. This program is especially appropriate for students who anticipate a career as an economic analyst in government, consulting, trade associations, or other private-sector positions that emphasize economic research and analysis. The requirements are also appropriate for students planning postgraduate education in economics or in more quantitative business administration programs.

In addition to satisfying the university-wide general education requirements and the requirements for a B.S. degree in the CAS, candidates for the B.S. in Economics must complete the following:

1. 39 credits of economics courses, including ECON 103, 104, 306, 311, 345 and 24 credits of economics electives at the 300 and 400 level. (ECON 103 and 104 fulfill 6 credits of the university and CAS general education requirements in social science.)
2. STAT 362 or ACCT 203
3. DESC 210 or STAT 250 and 350
4. MATH 113 and 114 (fulfills the university-wide general education quantitative reasoning requirement)
5. IT 103 (IT 103 fulfills the university-wide general education information technology proficiency requirement)
6. Eight credits of a laboratory science sequence (fulfills the university-wide general education natural science requirement)

If ECON 340 (Mathematical Economics) is chosen as one of the economics electives, students need not take MATH 114. However, MATH 114 is strongly recommended for students considering graduate school in economics because it is required for admission to most graduate programs. An additional calculus course beyond MATH 114 is also advisable for students considering graduate study in economics. No more than six credits with a grade of D in economics courses may be applied to the required economics courses. No more than 12 credits with a grade of D (combined economics and other courses) may be applied to the B.S. degree.

Note that some economics courses may fulfill the university-wide general education global understanding requirement and the CAS non-Western culture requirement. Check with the departmental advising office for more information. See the departmental advising office to learn how economics majors fulfill the university-wide general education synthesis requirement.

Writing-Intensive Requirement
The university requires all students to complete at least one course designated as writing intensive in their majors at the 300 level or above. Students majoring in economics fulfill this requirement by successfully completing ECON 320, 345, 360, or 365.

Minor in Economics
A minor in Economics consists of 21 credits in economics: ECON 103, 104, 306, and 12 credits of economics electives at the 300 or 400 level. A minimum of nine hours of upper-level economics course work must be taken at George Mason University. With the permission of the department chair or undergraduate coordinator, a course in a closely related field may be substituted for 3 credits of economics electives. A course in statistics is highly recommended: DESC 210, STAT 250, or STAT 344 may substitute for up to 3 credits of economics electives.

Teacher Licensure
Students who wish to become teachers should consult the Professional Licensure section in the Graduate School of Education chapter and attend an information session during their sophomore year. Information sessions for teacher licensure are offered every month. Call (703) 993-2892/4648, e-mail gseinfo@gmu.edu, or consult the web site at gse.gmu.edu for more information.

GRADUATE PROGRAMS
Economics, M.A.
The M.A. in Economics strengthens students’ knowledge of economic theory and improves their skills in applying the theory to economic problems. Graduates of the program are qualified to read and judge other research and to conduct their own, either individually or as members of research teams in government or business. They are also prepared to write policy analysis articles. Students who plan to pursue a Ph.D. in Economics should apply directly to the doctoral program.

Admission Requirements
1. Undergraduate degree, which does not have to be in economics, from an accredited institution
2. Satisfactory completion of intermediate microeconomics and macroeconomics
3. MATH 108 or equivalent. All students must complete at least one semester of calculus before enrolling in any graduate courses. Students entering the master’s program should be familiar with basic statistics as well.
4. GPA of 3.000 in the last two years of undergraduate work and in all economics courses
5. Satisfactory scores on the GRE; subject exam is optional
All applicants must submit two letters of recommendation and a brief personal statement explaining their interest in the program. The application deadline for the fall semester is May 1 and for the spring semester, November 1.

Degree Requirements
1. 30 graduate credits in economics distributed as follows:
   Three required courses (9 credits): ECON 611, 615, 812
   Seven elective courses (21 credits) in economics; ECON 630 (Mathematical Economics and ECON 535 Survey of Applied Economics are strongly recommended.)
The 21 credits of electives may be chosen from any of the fields offered by the department. Students may receive departmental permission to substitute up to 6 credits of electives taken outside economics in closely related fields. Students may also elect the thesis option, which offers 6 credits for independent research and writing under the supervision of a faculty member in lieu of 6 credits of electives.

2. Passing grades on comprehensive examinations in micro- and macroeconomics (Examinations are offered twice each year.)

Although the university does not guarantee the availability of courses every semester, a typical first-year sequence includes ECON 611, 630, and an elective in the fall; ECON 615, 812, and an elective in the spring. If possible, part-time students should arrange their work schedules to take two courses per semester in the first year. Master's degree students must enroll at the Arlington Campus for their core theory courses.

Economics, Ph.D.

The Ph.D. in Economics prepares students for careers in academia, business, and government. The core courses of the program train students in modern theory and quantitative techniques. The field courses stress the application of theory to relevant economic problems. Dissertation work requires students to master and apply the skills of original research. The department emphasizes publishing, and many students have had articles accepted for publication in professional journals while in the graduate program. Research in the Department of Economics covers a broad spectrum, from problems of immediate policy importance to fundamental questions of economic and social organization.

Admission Requirements

1. Undergraduate degree, which does not have to be in economics, from an accredited institution.

2. Satisfactory completion of intermediate microeconomics and macroeconomics.

3. One year of calculus and one year of statistics; one semester each of matrix algebra and econometrics.

4. GPA of 3.000 in the last two years of undergraduate work and in all economics courses.

5. Satisfactory scores on the GRE; subject exam is optional.

Applicants must submit two letters of recommendation and a brief personal statement explaining their interest in the program. The application deadline for students desiring financial aid is February 1. The deadline for all other students for the fall semester is April 1. The department accepts doctoral students only for the fall semester.

Degree Requirements

Students are required to pass 72 credits of course work, of which no more than 24 may be dissertation credits. Students must pass comprehensive examinations in microeconomics and macroeconomics. In addition, students must pass field examinations in two of the fields listed below. Examinations are normally given in August and January. Students who enter with a master's degree in economics may have their credit requirement reduced by up to 30 credits at the discretion of the department. Credit is not given for comprehensive and field examinations from other universities.

Students may receive departmental permission to substitute up to 6 credits of electives taken outside economics in closely related fields.

All doctoral students must take a year of microeconomic theory (ECON 611 and 812), a year of macroeconomic theory (ECON 715 and 816), mathematical economics (ECON 630), and econometrics (ECON 637). Also required are two courses (beyond the other required courses) in each of the student's two chosen fields in preparation for field examinations.

A typical first-year program of study for a full-time doctoral student includes ECON 611, 630, and 715 in the fall; ECON 637, 812, and 816 in the spring; and micro and macro comprehensive examinations in August. A typical second-year program includes Field 1 and Field 2 in the fall; Field 1 (continued) and Field 2 (continued) in the spring; and field examinations in August.

If possible, part-time students should arrange their work schedules to take two courses per semester in the first year.

Doctoral students may not enroll at the Arlington Campus for their required theory and mathematics courses.

Subject to course availability, the department offers examinations in the following fields of study:

- Austrian Economics
- Constitutional/Institutional Economics
- Experimental Economics
- Industrial Organization
- International Trade and Finance
- Law and Economics
- Monetary Theory
- Public Choice
- Public Finance

English

Web: gmu.edu/departments/English
Phone: (703) 993-1160

Faculty

Professors: Bausch, Baxter, Bergmann, L. Brown, Brunette, Cheuse, D’Andrea (Robinson Professor), Forche, Foster, Hodges, Irvine, Jann, Kelley, Klappert, Lathbury, Melosh, Nadeau, Pankey, Shreve, Smith, Thais

Associate professors: Albanese, Burr, Foreman, Fuchs, Gallehr, Goodwin, Henry, Holisky, Irving, Jones, Kaplan, Kaufmann, Keaney, Kuebrich, Lowry, McKenzie, Matz, O’Connor, Owens, Radner, Rutledge, Story, Sypher, Tichy, Weinberger, Yocom

Assistant professors: Amireh, Clark, Hawk, Roan, Shuitka, Trafton, Yadov

Visiting assistant professors: Atkinson, Berg, DeNys, Fischer, King, Koch, Meeks, Melito, Michals, Miller, Nichols, Samuelian, Scott, Taciuch, Thompson, Vogt, Williams, Young, Zawacki

Visiting instructors: Beach, George, Grogan-Barone, Mahoney, Raffel, Saunders, Secrest

Adjuncts: Carter, Casal, Craver, Crouch, DeFazio, Farrington, Fowler, George, Guss, Humbertson, Jacobs, Johnston, Kaufman, Kuhta, Leith, McCarthy, Moody, Nanian, Patterson, Redondo, Rubin, Salmon, Surette, Tracy, Vincent, Weinstein

http://catalog.gmu.edu
Course Work
The English Department offers all course work designated ENGL and LING in the Course Descriptions chapter of this catalog.

Related Courses
Courses offered by other departments are occasionally cross-listed with English and given the ENGL course designator; such courses may be counted toward the English major.

UNDERGRADUATE PROGRAMS

English, B.A.
In addition to the university-wide general education requirements and the college-level requirements for the B.A. degree in the College of Arts and Sciences (CAS), English majors must complete 30 credits (nine courses) in English beyond ENGL 302. Students must achieve an average GPA of 2.000 in the courses counting toward the English major. The 30 credits are distributed as follows:

1. Six credits of ENGL 325 Dimensions of Writing and Literature, with a minimum grade of C
2. Twelve credits in one of the following concentrations: (See the English department for requirements for each concentration.)
   - Contemporary World Literature
   - Creative Writing
   - Culture Studies
   - The Development of Modern Literature
   - Drama
   - Fiction
   - Film and Media Studies
   - Folklore, Mythology, and Literature
   - Linguistics
   - Medieval and Renaissance Literature
   - Nonfiction Writing and Editing
   - Poetry
3. Twelve credits of core courses, distributed as follows:
   a. Three credits in literature before 1800 (may simultaneously satisfy a concentration). This requirement is satisfied by ENGL 335/336, 400, 401, 402, 404, 405, 431, 440, 443, 450, 471, 472, 473, and 474, and by special topics courses as approved by the department.
   b. Three credits in literature before 1915 (may simultaneously satisfy a concentration). This requirement is satisfied by courses listed under (a) above; by ENGL 370, 406, 407, 423, 425, 436, 452, 453; and by special topics courses as approved by the department.
   c. Three credits in non-canonical or minority literature (may simultaneously satisfy a concentration). This requirement is satisfied by ENGL 333, 334, 369, 370, 371, 439, 491, 492, 493, and by special topics courses as approved by the department.
   d. Three credits of an elective above ENGL 302

Students should consult with an English Department advisor to learn about ways in which the university-wide general education requirements can also satisfy either college-level requirements or the English major. Graduating majors participate in assessment of the degree by preparing a dossier of writing done in their upper-level courses.

Comparative Literature Emphasis
The Departments of English and Modern and Classical Languages offer a B.A. in English with an emphasis in comparative literature. This program permits the student to combine the study of literature in English with the study of one or more foreign literatures and with cross-cultural literary study. It requires 10 courses above ENGL 302, distributed as follows:

1. Two courses in English and/or American literature
2. Two courses in a literature other than English or American literature, with selected reading in the original language
3. Three courses designated as comparative or world literature courses by the Comparative Literature Committee. These courses include ENGL 431, 436, and 437; CLAS 390; and appropriate special topics courses in CLAS, FREN, GERM, RUSS, and SPAN
4. CL 300 Introduction to Comparative Literature
5. One course in literary criticism: ENGL 494, ENGL 551, FREN 381, or SPAN 311, as appropriate to the student's focus
6. CL 514 Theories of Comparative Literature

Students should consult with their advisors to design a program of study on a specific genre, period, issue, or other cross-cultural topic.

For more information, contact the departments of English and Modern and Classical Languages.

Writing-Intensive Requirement
The university requires all students to complete at least one course designated as writing intensive in their majors at the 300 level or above. Students majoring in English fulfill this requirement by successfully completing ENGL 325.

English in a Double Major
Students interested in designing a double major are encouraged to discuss their plans with their English advisors and the director of undergraduate programs in English.

Honors Program in English
To qualify for graduation with honors, students must complete the honors course sequence, receive a 3.500 GPA in all courses counted toward the major (including their honors courses), and have the written work judged of distinguished quality by a faculty committee. Honors courses may simultaneously satisfy concentration and distribution requirements in the major.

Students may satisfy the honors course sequence in several different ways:

1. A student may take two sections of ENGL 414 Honors Seminar and submit the work from both courses for consideration.
2. A student may take one section of ENGL 414 Honors Seminar and take ENGL 415 Honors Thefts Writing Seminar in conjunction with another advanced literature or cultural studies course of the student's choosing, submitting just the honors thesis for consideration.
3. A student in the creative writing concentration may take one section of ENGL 414 Honors Seminar and write a creative honors thesis in ENGL 416 Honors Independent Study, submitting just the honors thesis for consideration.
4. A student in the nonfiction concentration may take ENGL 416 Honors Independent Study in conjunction with an advanced course in nonfiction writing, and complete a nonfiction thesis as part of ENGL 415 Honors Thesis Writing Seminar, submitting just the honors thesis for consideration. See the English Department for application procedures and other information.

♦ Minor in English

A minor in English provides students with a sound introduction to the field of literary studies and also allows them to select a set of courses that accords with their individual interests. Prerequisites for the minor in English are the 6 credit university-wide general education requirement in literature and 18 credits above ENGL 302. Students must take ENGL 325 (6 credits), either three courses in a concentration listed under the English major or three courses that satisfy the core requirements for the major (9 credits), and an elective (3 credits).

The minor must be approved by the English Department undergraduate advisor before graduation. Students must achieve a GPA of 2.000 in courses counting toward the English minor.

♦ Interdisciplinary Minors

The department coordinates or co-coordinates the interdisciplinary minors in film and media studies, folklore and mythology, and linguistics. See the Interdisciplinary Minors section of this chapter for more information.

♦ Certificate in the Teaching of English as a Second Language (TESL)

The TESL certificate prepares undergraduate students to teach non-native speakers of English in the United States or abroad. It is an 18-credit program that combines linguistic theory, second-language acquisition theory, and ESL teaching methods.

Admission Requirements

Undergraduates interested in the TESL certificate must complete three credit hours of LING course work in the English Department and apply before they have completed six credits of LING course work. Students must apply to the English Department by filling out a Change/Declaration of Academic Program form. This request must be approved by one of the linguistics faculty members. Applicants must also submit a 1,000-word writing sample, a one-page goals statement, and a recent George Mason transcript.

The TESL certificate may be pursued concurrently with any undergraduate major, and, with the approval of an advisor in the major, some courses taken as part of the TESL certificate may apply toward the undergraduate major. (Students should consult with an advisor.)

Courses taken as part of the TESL certificate and also used to complete the requirements for an undergraduate degree cannot be applied at a later time toward any graduate certificate or degree.

Certificate Requirements

Certificate candidates must complete the following LING courses:

1. LING 326, 521, 522, 523, 582
2. One elective (A list of approved electives is available from the English Department.)

Undergraduates in Graduate English Courses

The English Department permits qualified undergraduates to enroll in its graduate courses numbered 500 through 599, either for undergraduate or for reserve graduate credit. See the English department for details on how to enroll.

Teacher Licensure

Students who wish to become teachers should consult the Professional Licensure section in the Graduate School of Education chapter and attend an information session during their sophomore year. Information sessions for teacher licensure are offered every month. Call (703) 993-2892/4648, e-mail gseinfo@gmu.edu, or consult the web site at gse.gmu.edu for more information.

The Writing Center

The Writing Center offers one-on-one conferencing during all stages of the writing process. Conferences are available free of charge to all George Mason students, faculty, staff, and alumni. Writing Center tutors, who are graduate teaching assistants in the English Department, have been trained in current methods of composition instruction. They can help clients overcome writing anxiety, develop organizational and revision skills, and learn useful strategies for editing their own work.

Appointments should be made by calling (703) 993-1200 or by stopping by the center at Robinson Hall, Room A116, to schedule a session.

Northern Virginia Writing Project

The Northern Virginia Writing Project (NVWP) is an in-service organization dedicated to improving the writing of Northern Virginia students, kindergarten through university level. Each summer, selected teachers attend an intensive five-week institute where they demonstrate successful teaching techniques, study research on the teaching of writing, and write. After the summer institute, these teachers return to their schools, colleges, and universities to lead workshops and in-service seminars for other teachers.

NVWP is an affiliate of the National Writing Project and one of the seven sites of the Virginia Writing Project.

GRADUATE PROGRAMS

The Department of English offers graduate programs in the study and practice of writing and literature, as well as course work in related fields such as folklore, film, and cultural studies. The M.A. in English (30 credits) provides tracks in the following areas: (1) literature (including an optional concentration in cultural studies), (2) professional writing and editing, (3) the teaching of writing and literature, and (4) linguistics. The department also offers a terminal degree, the M.F.A. in Creative Writing (48 credits), with concentrations in fiction, poetry, and nonfiction. In addition, the department offers a certificate in the teaching of English as a second language (TESL, 18 credits) and courses as part of the Ph.D. in Education.
English, M.A.

Admission Requirements
In addition to fulfilling admission requirements for graduate study, applicants must submit one copy of a 1,000-word analytical writing sample and two letters of recommendation. For those applying in literature, professional writing and editing, and the teaching of writing and literature, the writing sample should be an interpretive paper on a literary text. In addition to the writing sample requirement, applicants must submit a goals statement (no more than 750 words). Applicants for the track in professional writing and editing must also submit two copies of a 10- to 15-page portfolio of their nonfiction work (a technical or business report, an essay, a term paper, an editing project, or any other material reflecting the student’s interests and skills in nonfiction writing).

Applicants may submit scores on the GRE when they believe those scores will lead to a clearer presentation of their qualifications. Those with undergraduate majors in disciplines other than English are encouraged to apply but may be required to make up deficiencies before entering the program.

Degree Requirements
Students must successfully complete 30 credits in graduate English courses. With the approval of the department, up to 6 graduate credits in courses in related disciplines may be substituted for 6 credits in English. One of the tracks described below must be completed.

General Requirements
1. ENGL 701 (normally in the first semester of study)
2. 9 credits in literature courses. For the track in the teaching of writing and literature only, ENGL 610 may be used to fulfill 3 credits of the literature requirement.
3. Foreign language proficiency demonstrated by course work equivalent to George Mason’s foreign language 202 or 209, or by passing a translation test administered by the English Department

◆ Track in Literature
1. General requirements (above)
2. 6 credits in critical theory, including at least one of the following courses: ENGL 514, 551, 675, 676, 705 (The other 3 credits may be in any graduate course in which theoretical issues form a major strand.)
3. 6 credits in a core program organized by period, genre, theme, or some other principle approved by the student’s advisor and the director of graduate studies in English before the student commences the second course. In the second course of the core program, the candidate must write an M.A. paper—a substantial paper on a topic agreed on with the course instructor and with the advisor at the beginning of the semester. On completion of the core program, the student writes an 8- to 10-page statement with the bibliography, explicitly linking the work of the two courses and situating this work within the chosen field. The student submits this statement and the papers from both courses to the advisor and the director of graduate studies for review along with the graduation application. The M.A. papers must receive a grade of B or better, and they, along with the statement, are filed with the English Department.

4. 6 credits of electives
5. Optional: 6 credits of thesis may be substituted for the core program.

◆ Concentration in Cultural Studies
English students planning to apply to the Ph.D. in Cultural Studies program should pursue the literature track of the M.A. in English and make the following modifications to the above requirements:
1. 3 of the 6 credits in critical theory in ENGL 676
2. 9 credits in a core program designed around designated cultural studies courses (ENGL 676 also may be used as one of these courses.)
3. 3 credits in CULT 802

◆ Track in Professional Writing and Editing
1. General requirements (above)
2. 3 credits in nonfiction writing
3. 9 credits in professional courses (e.g., editing, technical writing, scientific writing, internship in writing or editing, or Northern Virginia Writing Project)
4. 3 credits of electives in writing or literature
5. 3 credits of thesis

◆ Track in the Teaching of Writing and Literature
1. General requirements (above)
2. 6 credits in writing/publishing courses
3. 3 credits in linguistics
4. 3 credits in the teaching of writing and three credits in the teaching of literature
5. 3 credits in composition theory: either ENGL 697 or an appropriate section of ENGL 611
6. 3 credits of electives from literature or writing (alternatively, a thesis may be arranged through the student’s advisor and the director of graduate studies in English)

◆ Track in Linguistics
The linguistics track of the English M.A. combines courses in linguistics with courses in some related area of language study, such as teaching English as a second language, bilingual education, or foreign language teaching. The course of study is designed to prepare students for teaching in one of these fields or for doctoral work. The certificate in teaching English as a second language can be earned concurrently. Students pursuing the linguistics track must successfully complete 30 graduate credits, distributed as follows, and demonstrate foreign language proficiency (see above).
1. 18 credits in the following core courses: LING 690, 691, 692, 785, 786, 787
2. 12 credits of graduate electives, chosen in consultation with an advisor, which reflect one or more areas of language study (The electives can be in such areas as linguistics, the teaching of reading or writing, literary criticism, bilingual education, or a foreign language, and may include 6 credits of thesis.)
Creative Writing, M.F.A.
The M.F.A. in Creative Writing has three concentrations: poetry, fiction, and nonfiction. Students should apply to only one concentration, although a student turned down by one concentration may subsequently apply to another, and a student turned down by one concentration may apply again to that same concentration in a subsequent year.

Persons interested in taking individual courses or in applying at a future date to the M.F.A. program are welcome to apply to take classes as Extended Studies. Persons interested in taking a course through Extended Studies should submit a brief letter of introduction and a writing sample to the professor at least one week before the start of classes.

Admission Requirements
In addition to fulfilling admission requirements for graduate study, applicants must submit two letters of recommendation, one copy of a 1,000-word analytical writing sample, and a portfolio of original work. The analytical writing sample may be a paper written for an undergraduate class or any other work that gives evidence of advanced writing skills. For those applying to the M.F.A. concentration in fiction, the portfolio should consist of up to 50 pages of fiction (at least two complete short stories are preferred). For those applying to the M.F.A. concentration in poetry, the portfolio should consist of up to 20 pages of poetry. For those applying to the M.F.A. concentration in nonfiction, the portfolio should consist of up to 50 pages of creative nonfiction.

Degree Requirements
Students must successfully complete 48 graduate credits, including the following:

1. 12 credits in literature
2. 12 to 18 credits of writing seminars in one genre, including Form of Poetry, Form of Fiction, or Forms of Nonfiction and at least 3 credits of Advanced Workshop (ENGL 750, 751, or 752)
3. 3 to 9 credits in other genres
4. 6 credits in thesis (Only with the permission of the thesis committee may thesis credits be taken in the summer term.)
5. Up to 9 credits of electives chosen in consultation with the writing program faculty
6. For M.F.A. students in the poetry concentration, at least one credit of ENGL 699
7. For M.F.A. students in the nonfiction concentration, 3 credits of ENGL 506 (Students should enroll in ENGL 506 the first semester it is offered after they enter the program.)

With the approval of the M.F.A. faculty and the program director, the number of credits required for an M.F.A. may be reduced by a maximum of 18 credits on the basis of graduate course work before admission.

Students in poetry must pass a written M.F.A. exam based on the authors they have chosen. The authors are selected in collaboration with the writing faculty any time after the completion of 12 credits of course work and before the completion of 32 credits. The exam must be completed at least one semester before the student registers for the final three hours of thesis.

Students in fiction and nonfiction must pass an M.F.A. exam or complete an M.F.A. project. Students who elect to take the M.F.A. exam select, after the completion of 18 credits and with the approval of their faculty advisors, a list of authors and an area of emphasis (e.g., the European novel). Students who elect to complete an M.F.A. project (e.g., edit an anthology) must carry out the project under the direction of a faculty member and may register for ENGL 798 to do this requirement. ENGL 798 may not be used to fulfill the literature requirement or as thesis preparation. The exam or project must be completed at least one semester before the student registers for the final three hours of thesis.

Students who have not completed the equivalent of George Mason's foreign language 202 or 209 must do so or demonstrate proficiency by passing a translation test administered by the English Department.

Certificate in the Teaching of English as a Second Language (TESL)
The TESL certificate prepares students to teach non-native speakers of English in the United States or abroad. Certificates fulfill, in part, the requirements for an endorsement in English as a second language to the Virginia state teaching credential. (Students who want to earn this endorsement should consult with an advisor.)

Admission Requirements
Applicants interested in the TESL certificate must be admitted to graduate study or approved for graduate course enrollment through Extended Studies. Students who initially enroll in the certificate program through Extended Studies may apply for admission to the graduate program no later than the second semester of study. At the time that formal admission to graduate study is sought, applicants must submit one copy of an analytical writing sample of approximately 1,000 words, a goals statement, and two letters of recommendation.

The certificate may be pursued concurrently with any of several degree programs offered through the Graduate School of Education, the English Department, and the Modern and Classical Languages Department, and part of the course work toward the certificate may be applied toward degrees in those departments.

Students enrolled in another graduate degree program who want to work for the certificate must apply to the English Department for admission into the certificate program.

Certificate Requirements
Certificate candidates must complete the following series of graduate English courses, earning a grade of 3.00 or better in each.

1. LING 520, 521, 522, 523, and 582 (EDCI 519 or LING 507 may be substituted for LING 521.)
2. One elective (list of approved electives is available from the English Department)

Certificate in Professional Writing and Editing
The Certificate in Professional Writing and Editing provides graduate students with course work in nonfiction writing in specific genres, in current writing practices and theories of
writing in organizational settings, in research methods in professional writing, and in nonfiction literature.

Admission Requirements
Applicants must submit an analytical writing sample of at least 1,000 words, a goals statement, two letters of recommendation, and a portfolio of their writing or editing. Applicants must be currently admitted to a graduate degree program or approved for enrollment through Extended Studies. Because only 6 credits earned as an Extended Studies student may be applied to the certificate, students who initially take courses through Extended Studies should apply for admission before the completion of 6 credits of course work. Completion of course work is not in itself a guarantee of admission to the Certificate Program.

The certificate may be pursued concurrently with any of several degree programs in English and elsewhere in the College of Arts and Sciences. Part of the course work toward the certificate may be applied to those degrees.

Certificate Requirements
Certificate candidates must complete 18 credits of English graduate courses, earning a grade of B– or better in each, distributed as follows:

1. One course in editing or publications writing: ENGL 503 or 505
2. One course in writing in organizational settings: ENGL 504 or 612
3. One course in nonfiction writing: ENGL 565, 611, 613, or 616
4. One course in nonfiction literature. Each year the English Department designates sections that fulfill this requirement from among the following courses: ENGL 513, 660, and 685.

5. One course in research: ENGL 506 or 701

Environmental Science and Policy

Core Faculty
Professors: Dicicchio, Dietz (CAS Distinguished Professor), Hazen (Robinson Professor), R. C. Jones (interim chair)
Visiting professor: Talbot
Associate professors: Jonas, Kelso
Visiting associate professor: Stewart
Assistant professors: Balint, Harlan, McBride
Visiting assistant professors: Books, Martin-Vermilyea, Verardo

Affiliated Faculty
Professors: Conlan, Cozzens, Ernst, Foster, Haack, C. Hill, Houck, Lawrey, Morowitz, Mose, Mushrush, Nadeau, Oates, Pfiffner, Skog, G. Taylor, Soyfer, Stalick, Willett, B. Wright
Research professor: R. Brown
Associate professors: Adamkewicz, Andrykovich, Beach, Birchard, Bradley, Chandhoke, A. Christensen, deMonsabert, Gifford, Guagnano, Gunn, Honeychuck, Kalof, Kozlowski, Litchfield, Mahler, Meyer, R. Paden, Palkovich, Regan, Rockwood, Royt, Schriefels, Torzilli, Wan, Wong
Assistant professors: Fryxell
Adjuncts: Rao, Reynolds

Course Work
This program offers all course work designated EVPP, EVSC, and GEOL in the Course Descriptions chapter of this catalog.

UNDERGRADUATE PROGRAMS

Geology, B.A.
In addition to the universitywide general education requirements and the requirements for a B.A. degree in the College of Arts and Sciences, candidates for a degree in geology must complete the following. (Through the course work below, geology majors satisfy the universitywide requirements in natural science and quantitative reasoning.)

1. 38 credits in geology and geography, including GEOL 101, 102, 302, 304*; 308*, 312, 317, 401, 404; GEOG 308 (Field camp is recommended and may be substituted for GEOL 308 and GEOL 404 with prior approval of the department.)
2. MATH 110, 111, or 113
3. CHEM 211, 212
4. GEOL 316 or a computer science course (may fulfill the university information technology requirement)
5. 9 credits of degree-related course work in a coherent program designed in coordination with an advisor and approved by the department chair
*Students must achieve a grade of 2.00 or better in GEOL 302 before taking GEOL 304 or 308.

Minor in Geology
To receive a minor in geology, students must successfully complete 20 credits (GEOL 101, 102, and 302) plus two of the following courses: GEOL 304*, 308*, 312, 317, or 401.
*Students must achieve a grade of 2.00 or better in GEOL 302 before taking GEOL 304 or 308.

Minor in Earth Science
To receive a minor in earth science, students must successfully complete 18 credits (GEOL 101, GEOL 309, GEOG 309) and 8 credits of geology electives.

Writing-Intensive Requirement
The university requires all students to complete at least one course designated as writing intensive in their majors at the 300 level or above. Students majoring in geology or earth systems science fulfill this requirement by successfully completing GEOL 308. Students who do not take GEOL 308 must arrange with their advisors for a suitable alternative writing-intensive course.

Teacher Licensure
Students who wish to become teachers should consult the Professional Licensure section in the Graduate School of Education chapter and attend an information session during their sophomore year. Information sessions for teacher licensure are offered every month. Call (703) 993-2892/4648, e-mail

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Certificate in Environmental Management

Environmental Science and Policy offers an undergraduate certificate in environmental management for students interested in environmental issues. The program consists of a minimum of 27 credits, most of which, with appropriate planning, may be counted toward the fulfillment of B.S. or B.A. requirements in biology, geography, earth systems science, urban systems engineering, and other natural and social sciences.

The curriculum provides a substantive appreciation of the biological, physical, and social aspects of environmental problems and methods for their analysis and resolution. The program should particularly interest students wishing to pursue graduate work or seeking employment in the environmental field. Inquiries should be made to the director of the environmental management certificate program.

Students receiving the certificate must hold a baccalaureate degree or be receiving a baccalaureate degree from the university at the time they receive the certificate. As an entry-level requirement, students must complete a two-semester laboratory science sequence in environmental science, biology, chemistry, or geology. Only courses with a grade of C or better are counted toward the certificate program.

Students select at least 27 credits of course work chosen in consultation with the certificate director. The courses are divided into five categories. Courses listed in more than one category can satisfy the requirements of only one. Any substitution in the following list requires permission from the certificate director.

1. Environmental certificate core (4 courses): EVPP/BIOL 377; GEOG 303 or 503; ECON 103; GOVT 351, or GOVT 357; a course in statistics
2. Physical perspective (1 or 2 courses*): BIOL/GEOL 309, BIOL 355, EVPP 550, EVPP/BIOL 577; GEOG 102, 309; GEOL 313, 317, 403, 405; USE 440
3. Biological perspective (1 or 2 courses*): BIOL 307, 309, 344, 345, 371, 375, 440, 446, 447, 471, 532, 535, 536, 537, 543, 547; EVPP 550, EVPP/BIOL 546, 577; HEAL 450
4. Social perspective (1 course): ANTH 305, 365, 370, 440; CONF 501; ECON 350, 360; GEOG 301, 304, 305, 306, 316, 325, 406; GOVT 318, 357, 364, 366; MGMT 312; NURS 543; PHIL 555; PRLS 300, 402, 526; PUAD 502
5. Environmental methods (1 course): DESC 301, 352; GEOG 310, 411, 412, 416, 550, 553, 579, 580, 585

*Biology majors are required to complete two courses in physical perspective; geology and geography majors are required to complete two courses in biological perspective.

Graduate Programs

Environmental Science and Policy, M.S.

The M.S. in Environmental Science and Policy is designed to meet the increasing need for trained environmental professionals who can address the problems of land and water management, land use and urbanization, wetland loss, and ecosystem preservation. These professionals will also need to contribute to the analysis and resolution of global problems such as deforestation, insufficient world food supplies, acid deposition, population growth and public health, global warming, and depletion of the ozone layer. Areas of specific departmental focus include ecosystems, conservation, and sustainability science, policy, and management.

Environmental problems are defined in the real world and do not necessarily conform to traditional academic disciplines. As such, their solutions require creative combinations of diverse interest and subjects. Effective training requires rigorous, problem-focused interdisciplinary action in a setting in which research is an essential element supporting instruction.

Two concentrations are available in the master's program: Environmental Science and Policy and Environmental Management. The Environmental Science and Policy Concentration is designed for students who wish to obtain a research-oriented master's degree. The concentration can serve as a training ground for students wishing to further their education by pursuing the Ph.D. in Environmental Science and Public Policy at George Mason or doctoral programs at other universities. The Environmental Management Concentration combines the managerial and administrative skills developed in a traditional master of public administration degree program with the scientific knowledge and understanding normally found in a master of science degree. This concentration serves as a terminal professional master's degree for individuals currently working in or aspiring to work as managers in the environmental field in both government and private industry.

Admission Requirements

Applicants must complete a standard George Mason University Graduate Application Form available from the Graduate Admissions Office or online at admissions.gmu.edu. Application deadlines for admission are March 15 for the fall semester and October 1 for the spring semester. Applicants for the M.S. in Environmental Science and Policy should hold a bachelor's degree with a GPA of 3.000 in natural or earth sciences, engineering, resource planning, or a related field from an accredited institution. Applicants should have taken at least two semesters of chemistry and three semesters of biology including a course in ecology. Applicants should submit three letters of recommendation, including at least one from a former professor (or if not available, from someone with a Ph.D.). The aptitude portion of the GRE is required, and successful applicants will normally achieve a minimum score of 1,100 for verbal and quantitative combined. Applicants must also submit a substantial statement of interest in the program, which includes the concentration to which they are applying (Environmental Science and Policy or Environmental Management), potential areas of emphasis, research skills option preferred (for Environmental Science and Policy Concentration), and an explanation of career goals. Prospective students are encouraged to contact potential faculty advisors appropriate to their interests. The availability of an advisor in the student's area of interest is one of the criteria for admission. Students will choose their research skills option at the time of application but may change this option later with their advisor's permission.

Degree Requirements

Environmental Science and Policy Concentration

This degree encourages an independent and creative approach to the development of curricula. Students are assigned an
advisor upon admission. They must form a supervisory committee and submit a program of study to the program director for approval within the first 9 credits of course work or by the end of the second semester, whichever comes first. The supervisory committee will consist of the advisor and at least two other members, conforming to university policy on master's thesis committees. Course requirements may be fulfilled by completing courses from a variety of academic units at the university. The program requires a minimum of 33 graduate credits distributed in four categories to provide the depth and the breadth in knowledge related to environmental problems. Course selection should reflect a coherent Individual Program Focus, which is stated and briefly described in the Program of Study.

Natural sciences: A minimum of 6 hours is required in biology, geology, geography, chemistry, or environmental engineering. For those students without previous course work in ecology, EVPP 607 is required in addition to the 6 hours.

Public policy: A minimum of 6 hours is required in environmental law, human ecology, environmental ethics, planning, or public affairs.

Methods and statistics: A minimum of 6 hours is required in statistics, remote sensing, information systems, instrumental analysis, or modeling. A course in statistics is highly recommended.

Seminar: A minimum of 1 hour of EVPP 692 Master's Seminar in Environmental Science and Public Policy is required.

Research: This requirement may be satisfied in one of two ways: EVPP 798 Research Project (1–3 hours) or EVPP 799 Thesis (3–6 hours).

Students may conduct a project (EVPP 798) or produce a formal thesis (EVPP 799). The depth and sophistication of the research differs between the two options. The thesis normally involves original research with independent acquisition and interpretation of data with a goal of peer-reviewed publication. Projects are generally less extensive and can include a broader range of activities.

Students fulfilling the research requirement with EVPP 798 will be required to take a comprehensive exam administered by their committee. Students choosing to do a thesis and completing EVPP 799 will present their results in a public seminar and defend their thesis before their committee. Students will be graded pass/no credit on their research skills component.

Environmental Management Concentration

Students must complete 37 credit hours for the Environmental Management Concentration. A full-time student can complete this degree in three semesters; a part-time student, six semesters. Course work must include the following.

Administration and policy: A minimum of 12 hours is required, including the following:

- EVPP 741 Advanced Topics in Environmental Law and Policy
- PUAD 502 Administration in Public and Nonprofit Organizations or PUAD 620 Organization Theory and Management Behavior
- PUAD 640 Public Policy Process (with sections tailored to environmental science and policy)

PUAD 749 Issues in Public Policy: Environmental Policy and Management

Environmental science: A minimum of 12 hours is required, including the following:

- EVPP 607 Fundamentals of Ecology (if student has not already taken a course in general ecology)
- EVPP 641 Environmental Science and Public Policy
- EVPP 677 Applied Ecology and Ecosystem Management

Methods and statistics: A minimum of 6 hours is required, including the following:

- PUAD 611 Problem Solving and Data Analysis I (research design)
- PUAD 612 Problem Solving and Data Analysis II (statistics)

Research/seminar: This requirement is fulfilled with EVPP 741 Advanced Topics in Environmental Law and Public Policy: Problems in Environmental Management (4 hours).

Electives: Students may choose 3 hours (or more to complete 37) from the following list of approved electives. Other courses may be used subject to approval of the program committee.

- EVPP 546 Estuarine and Coastal Ecology (if not already taken)
- EVPP 550 Waterscape Ecology and Management (if not already taken)
- EVPP 622 Management of Wild Living Resources
- EVPP 626 Environment and Development in South and East Asia
- EVPP 627 Environmental Policy in Latin America
- EVPP 628 Environment and Development in Africa
- EVPP 630 Methods and Logic of Social Inquiry
- EVPP 644 Wetland Ecology and Management (if not already taken)
- EVPP 650 Environmental Analysis and Modeling
- EVPP 675 Environmental Planning and Administration
- EVPP 741 Advanced Topics: Environment and Society
- EVPP 741 Advanced Topics: Ecological Economics
- EVPP 741 Advanced Topics: Development of U.S. Environmental Policies
- EVPP 741 Advanced Topics: Overview of Biodiversity Conservation
- GEOG 550 Introduction to Geographic Information Science
- PUAD 509 Justice Organizations and Processes
- PUAD 613 Administrative Law
- PUAD 622 Program Planning and Implementation
- PUAD 657 Association Management
- PUAD 729 Issues in Public Management: Lobbying and Advocacy
- PUAD 741 Policy Analysis
- PUAD 742 Program Evaluation
- MBA 623 Marketing Management
- MBA 712 Project and Cost Management
- MBA 724 Marketing Communications
- MBA 725 Leadership

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Graduate Certificate in Environmental Management

The graduate certificate allows students to expand their knowledge of the environment and environmental management beyond their undergraduate training. The certificate offers a professional credential to students who might not have the time or background to enroll in a graduate degree program requiring a thesis or dissertation. Students desiring admission to the M.S. or Ph.D. programs in Environmental Science Policy (ESP) who do not currently meet admission requirements can demonstrate their ability to do degree work through successful completion of the certificate with excellent academic achievement.

The curriculum provides a substantive appreciation of the biological, physical, and social aspects of environmental problems and methods for their analysis and resolution.

Admission

Admission requirements are identical to those for admission to the graduate programs in Environmental Science and Policy, except that the GRE and undergraduate GPA targets are more flexible. Prospective students must have the following minimum requirements:

1. An undergraduate (baccalaureate) degree, preferable in biology, chemistry, geology, geography, earth systems science, or some other environmentally related discipline
2. Two semesters of general chemistry with a laboratory
3. Two semesters of general biology with a laboratory
4. An undergraduate course in general ecology (Students who do not meet this requirement must take EVPP 607 Fundamentals of Ecology as their natural science elective.)
5. Three letters of reference and a statement of interest in the program

*Exceptions to 2 and 3 are considered on a case-by-case basis.

Requirements

The certificate is awarded after satisfactory completion of six graduate courses (a minimum of 18 semester hours) as specified below:

1. Environmental certificate core (3 courses)
   - EVPP 677 Applied Ecology and Ecosystem Management
   - GEOG 503 Conservation and Natural Resources
   - One of the following:
     - EVPP 641 Environmental Science and Public Policy
     - EVPP 675 Environmental Planning and Administration
     - SOCI 635 Environment and Society
2. Three electives (one from each of the following areas)
   A. Natural sciences
      - BIOL/EVPP 546 Estuarine and Coastal Ecology
      - BIOL/EVPP 577 Biogeochemistry: A Global Perspective
      - BIOL/EVPP 643 Microbial Ecology
      - BIOL/EVPP 745 Environmental Toxicology
      - EVPP 550 Waterscape Ecology and Management
      - EVPP 607 Fundamentals of Ecology
      - EVPP 644 Wetland Ecology and Management
      - EVPP 645 Freshwater Ecology
      - GEOG 570 Environmental Hydrology
   B. Social sciences
      - CONF 501 Introduction to Conflict Analysis and Resolution
      - EVPP 641 Environmental Science and Public Policy
      - EVPP 741 Advanced Topics: Environmental Law
      - EVPP 675 Environmental Planning and Administration
      - PHIL 555 Environmental Ethics
      - PRLS 526 Environmental Education and Resource Interpretation
      - PUAD 502 Administration in Public and Nonprofit Organizations
      - SOCI 635 Environment and Society

Environmental Science and Public Policy, Ph.D.

The Ph.D. in Environmental Science and Public Policy is an interdisciplinary program in the College of Arts and Sciences, which draws on faculty and expertise from the Environmental Science and Policy core faculty as well as from the departments of Biology, Public and International Affairs, Chemistry, Economics, Geography and Earth Science, and Sociology and Anthropology, and the schools of Computational Sciences and Public Policy.

This program provides students training to contribute to the solution of complex environmental problems, which requires students to develop knowledge and skills in the collection, analysis, and interpretation of scientific data as well as in the integration of scientific understanding into the public policy process.

Admission Requirements

Applicants should have a bachelor's degree with an overall GPA of at least 3.000. Applicants should have taken at least two semesters of chemistry and three semesters of biology, including a course in ecology. Application deadline for admission in the fall semester is February 15. Admission to spring semester is not available.

In addition to the materials required of all applicants for graduate study at George Mason, applicants should submit the following:

1. Scores on the aptitude portion of the GRE (This requirement may be waived if the applicant has a master's degree in an appropriate field.)
2. Three letters of recommendation (At least two of these should be from individuals with doctorates.)
3. A recent resume
4. A substantial statement of interest in the program, which should include a description of a potential focus—environmental science or environmental public policy—and an explanation of career and research goals
In addition, it is recommended that each applicant schedule an interview with the program director or an environmental faculty member in the chosen focus. Admission decisions are based on the student's qualifications and the availability of a faculty advisor.

Degree Requirements

The Environmental Science and Public Policy doctoral program requires a minimum of 78 graduate credits beyond the bachelor's degree. Students with a master's degree in an appropriate field may obtain a reduction of credit for appropriate course work of up to 30 graduate credits. To ensure that all students obtain the necessary skills and knowledge to function as an environmental professional, the program requires all students to fulfill the following category requirements:

Category 1. Natural sciences: A minimum of 12 credits is required in areas of natural science such as biology, chemistry, geology, geography, or environmental engineering.

Category 2. Public policy: A minimum of 12 credits is required in areas related to public policy such as public affairs, economics, sociology, and business. A course in environmental law is required as part of this category requirement.

Category 3. Methods and technology: A minimum of 6 credits is required in research skills such as statistics, remote sensing, geographic information systems, analytical chemistry, modeling, or information technology.

Category 4. Doctoral seminar: EVP 991 must be taken once, and students must present a total of 4 graduate seminar credits. Beyond these basic requirements, students focus their study on environmental science or environmental public policy. Those focusing on environmental science should take a total of 24 credits in natural science; those focusing on environmental public policy should take 24 credits of public policy course work. A specific set of recommended courses is provided for students in the environmental public policy focus. Previous thesis research courses may not be applied to this degree.

On admission to the program, each student is assigned an advisor from the environmental faculty. The advisor guides the student through course selection. An advisor may be changed by mutual consent of student and advisor or by petition to the program director and the dean of the College of Arts and Sciences. Each student is required to complete a course work proposal by the end of the second semester of courses. The proposal must be approved by the advisor and the program director. In keeping with the general philosophy inherent in a Ph.D. degree, students adopt an individual program that focuses on a specific area of research. The students' course work must provide the knowledge base from which original research projects in their specific areas of interest can be successfully completed.

By the end of the fourth semester of course work, the student should assemble a dissertation committee of at least four graduate faculty members with representation from at least two academic departments. After reviewing the student's course work proposal, progress to date, and area of research, the committee makes final recommendations concerning course work that will be codified in the program of study to be signed by all committee members and the program director.

On completion of all (or nearly all) course work, the student may request to take the qualifying or candidacy exam. The qualifying exam has both oral and written parts. The written portion consists of questions submitted by each member of the dissertation committee. Successful completion of the written exam should be followed by the oral portion within one month. The qualifying exam may be repeated once at the discretion of the student's committee. On completion of all course work, passage of the qualifying exam, and submission of the program of study, the student is recommended for advancement to candidacy by the program director. Students must advance to candidacy within six years of admission to the program.

Dissertation

Students must complete a dissertation (12 to 24 credits) by registering for credit in a combination of EVP 998 and EVP 999. No more than half the credits specified for dissertation credit on the student's program of study may be taken as EVP 998 Doctoral Dissertation Proposal. The dissertation is an original written work, demonstrating mastery of subject matter, methodologies, and conceptual foundations on a specific problem in the general field of environmental science and public policy. The dissertation will generally involve collection and analysis of original data or the substantially new analysis and reinterpretation of existing data.

Before the student may enroll in dissertation research, he or she must have advanced to candidacy and have a dissertation proposal approved by the dissertation committee, the program director, and the dean of the college. The student must present the completed dissertation in a public seminar and defend the work before the dissertation committee. Awarding of the degree is contingent on approval of the dissertation by the dissertation committee, the program director, and the dean. The dissertation and defense must be completed within five years of advancement to candidacy.

Geography

Faculty

Professors: Gortner (interim chair, Geography; Public and International Affairs), Haack, Haynes (Dean, School of Public Policy), Stough (School of Public Policy)

Associate Professors: Beach (Associate Provost), Wong

Assistant Professors: Drennon, Schintler (School of Public Policy)

Visiting Assistant Professor: Hunter

Instructors: Dillon, Neuendorf

Adjuncts: DeCola, Hirsch, Kuus, Mobley, Rennick, Ward, Wheeler, Zinn

Course Work

This department offers all course work designated GEOG in the Course Descriptions chapter of this catalog.

UNDERGRADUATE PROGRAMS

■ Geography, B.A.

In addition to the university-wide general education requirements and the requirements for a B.A. degree in the College of Arts and Sciences, candidates for a degree in geography must complete the following:

1. 28 credits in geography, including
   a. 16 credits of geography core courses: GEOG 102, 103, 300, 310, and 415 (GEOG 103 fulfills the university requirement in social science.)
## Geography, B.S.

In addition to the university general education requirements, candidates for a degree in geography must complete the following:

1. 28 credits in geography, including
   a. 16 credits of geography core courses: GEOG 102, 103, 300, 310, and 415 (GEOG 103 fulfills the university requirement in social science.)
   b. 12 credits of systematic (e.g., GEOG 301, 303, 304, or 305) and regional courses at the 300 level or above (Some of the regional courses will fulfill the college-level non-Western culture requirement.)

2. 18 or more credits consisting of an approved double major, disciplinary minor, interdisciplinary minor, or certificate, or any other coherent 18-credit (minimum) package of courses approved by the advisor and the department chair. No more than 7 credits used to meet the requirements in item 1 may be used to meet this requirement. (Some of these courses may fulfill university-wide general education or college-level requirements.)

- **Minor in Geography**

  To receive a minor in geography, students must complete 18 credits in geography, distributed as follows:

  1. 6 credits of GEOG 101 (fulfills the university requirement in global understanding), or GEOG 103 (fulfills the university requirement in social science) and GEOG 102 (non-lab natural science credit)
  2. 4 courses (12 credits) at the 300 and 400 level, including 1 systematic course (such as GEOG 301, 303, 304, 305, 306, or 309) and 1 regional course (such as GEOG 315, 316, 320, 325, 330, or 380)

- **Minor in Geographic Information Systems**

  To receive a minor in geographic information systems (GIS), students must complete 18 to 19 credits in geography beyond the prerequisite of GEOG 102 or 103:

  1. 4 required courses (12 credits): GEOG 110, 300, 311, 463
  2. 2 elective courses (6 to 7 credits) chosen from GEOG 310, 411, 412, 416

With departmental permission, one course with significant GIS content may be substituted for one of the above.

### Writing-Intensive Requirement

The university requires all students to complete at least one course designated as writing intensive in their majors at the 300 level or above. Students majoring in geography fulfill this requirement by successfully completing GEOG 415.

### Teacher Licensure

Students who wish to become teachers should consult the Professional Licensure section in the Graduate School of Education chapter and attend an information session during their sophomore year. Information sessions for teacher licensure are offered every month. Call (703) 993-2892/4648, e-mail gseinfo@gmu.edu, or consult the web site at gse.gmu.edu for more information.

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### GRADUATE PROGRAM

- **Geographic and Cartographic Sciences, M.S.**

  The M.S. in Geographic and Cartographic Sciences provides courses for students interested in the techniques of collection, analysis, and display of spatial data. Students may prepare for further study or careers in geography and cartography with federal agencies, state and local government agencies, private corporations, and educational institutions.

#### Admission Requirements

In addition to meeting all admission requirements for graduate study at George Mason, applications to the M.S. in Geographic and Cartographic Sciences should have a bachelor's degree in geography, cartography, or equivalent. An applicant without an undergraduate degree in geography may be required to take one course in each of the following: physical geography, human geography, and regional geography. All applicants must have a course in statistics. The program also requires GRE aptitude scores, three letters of recommendation, transcripts of all college course work, and a statement of interest in geography.

#### Degree Requirements

Students must complete 30 graduate credits to include 3 to 6 credits of thesis or 36 graduate credits without a thesis. If the non-thesis option is selected, students are required to pass a comprehensive examination.

1. 4 required courses (12 credits)
   - GEOG 550 Introduction to Geographic Information Science
   - GEOG 579 Remote Sensing
   - GEOG 585 Quantitative Methods
   - GEOG 680 Seminar in Thought and Methodology
2. 12–15 credits (thesis option) or 24 credits (non-thesis option) of elective courses in geography
3. 3 to 6 credits of thesis (thesis option)
4. comprehensive exam (non-thesis option)

Electives should be selected in consultation with an advisor. With departmental approval, up to 9 credits from closely related disciplines may be applied to the degree.
History and Art History

History Faculty
Professors: Bakhash (Robinson Professor), J.R. Censer (chair), Holt, L. Levine, Petrik, Rosenzweig (CAS Distinguished Scholar), Wade, Wilkins (Robinson Professor), Zagarri
Assistant professors: Bristol, Carton, Chang, Cheng, Cohen, Hamdani, Hawkes, Karush, Kelley, Miller, Platt, Smith
Visiting assistant professors: Cohen, Schrum, Sparrow

This department offers all course work designated HIST and ARTH in the Course Descriptions chapter of this catalog.

UNDERGRADUATE PROGRAMS

History, B.A.

In addition to satisfying the university general education requirements and the requirements for the B.A. degree in the College of Arts and Sciences, candidates for a degree in history must complete 36 credits of history, with at least 18 credits at the 300 and 400 levels. Additional credits of history in excess of 36 may be presented as elective credits to be counted toward graduation. No more than 6 credits with a grade of D may be used for the major. The 36 credits are distributed as follows:

1. 6 credits of U.S. history (3 credits fulfilled by the university-wide requirement HIST 120)
2. 6 credits of European history (3 credits fulfilled by the university-wide requirement HIST 100)
3. 6 credits of global, Latin American, African, Asian, or Middle Eastern history (6 credits will be met if approved history courses are used to fulfill the university general education requirement in global understanding and the college-level requirement in non-Western culture)
4. 3 credits of HIST 300 Introduction to Historical Method, with a minimum grade of C or better
5. 3 credits of HIST 499 Senior Seminar in History
6. 12 credits of history electives (at the 300 and/or 400 levels if necessary to complete the 21-credit, upper-division history requirement)

HIST 300 and 499 may not be used to satisfy requirements 1–3. See an advisor before registering to help plan your history program to meet university general education and college-level requirements. This step will allow you to take more electives or choose a minor.

Writing-Intensive Requirement

The university requires all students to complete at least one course designated as writing intensive in their majors at the 300 level or above. Students majoring in history may fulfill this requirement by successfully completing HIST 300 and 499.

Honors Program in History

History majors who have completed 75 credits (a minimum of 15 in history, 6 of which must have been taken at George Mason) with a 3.500 overall GPA and a 3.500 GPA in history are eligible to apply to the history honors program. Candidates must have completed or be enrolled in HIST 300 at the time of application. The statement of application should include two George Mason history faculty members as references. If a major part of the student’s work includes transfer credit, transcripts may be required. Not all applicants who meet the minimum requirements may be accepted into the program.

To graduate with honors in history, students must complete HIST 490 and 491, which are linked, individualized courses normally given by the same instructor. Students must have completed at least one course in the field (or with the professor) chosen for these honors courses. HIST 490 should be taken before 491, although they may be taken concurrently. Either course may be taken concurrently with HIST 499 Senior Seminar in History. These 6 credits must be passed with a minimum 3.500 GPA, and the overall history GPA presented for graduation must be a minimum of 3.500. These 6 credits may be counted toward the 36-credit major requirement in history, but they do not replace HIST 499.

Minor in History

To receive a minor in history, students must complete 18 credits in history, including 12 credits at the 300 and 400 levels and 6 credits concentrated in a region or topic related, if possible, to the student’s major. The program must be approved by the undergraduate coordinator before graduation. A GPA in history courses of at least 2.000 is required.

Interdisciplinary Minor

The department coordinates the interdisciplinary minor in African American studies. See the Interdisciplinary Minors section of this chapter for a description.

Advising

The undergraduate coordinator advises majors and minors. History majors are urged to discuss their programs periodically with the coordinator.

Teacher Licensure

Students who wish to become teachers should consult the Professional Licensure section in the Graduate School of Education chapter and attend an information session during their sophomore year. Information sessions for teacher licensure are offered every month. Call (703) 993-2892/4648, e-mail gseinfo@gmu.edu, or consult the web site at gse.gmu.edu for more information.

GRADUATE PROGRAM

History, M.A.

The Department of History and Art History provides graduate training in historical methods and analysis for students with widely varying goals. The four M.A. concentrations that follow are designed to meet those goals.

Admission Requirements

Applicants to the M.A. in History program must fulfill the admission requirements for graduate study and for the Department of History and Art History. These include satisfactory scores on the GRE and two letters of recommendation from professors of history with whom the applicant has studied or from others directly familiar with the applicant’s professional competence and interests.

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The GRE requirement is waived for students who received their undergraduate degrees 10 or more years ago or who hold another graduate degree.

Degree Requirements
Within the first three concentrations listed below, students must specialize in American history, modern European history, or comparative world history.

Requirements for all concentrations include the following:

1. a minimum of 30 credits (36 credits in the teaching concentration) with a GPA of at least 3.000
2. 3 credits of HIST 610 The Study and Writing of History, taken within the first 9 credits
3. except in the teaching concentration, a comprehensive readings course (HIST 790, 791, or 792) designed individually by the student and a professor taken during the last semester of course work (The course is used to round out the student's general historical knowledge and prepare him or her for the comprehensive exam.)
4. a written comprehensive exam (Students who do not pass the exam are given the option of a second written exam following the original procedures. The second exam must be taken within a calendar year.)

To remedy deficiencies in their undergraduate preparation in history, students may be required to take up to 21 additional credits of foundation courses, which cover broad thematic areas (HIST 601, 602 Themes in U.S. History I, II and 605, 606 Themes in European History I, II). If required as foundational, these credits cannot be applied toward the 30 credits required for the degree (36 credits in the concentration in teaching).

If foundation courses are not required at admission, students in the concentrations in enrichment (Track III) and in teaching (Track IV) may apply one of the themes courses toward their degrees. Students in the other concentrations may not apply these courses toward their degrees.

◆ Concentration in Predoctoral History, or Predoctoral History with a Cultural History Emphasis
This concentration is for students planning to continue into doctoral studies. In addition to HIST 610, it requires the following:

1. 15 credits in the area of specialization (American history, modern European history, or comparative world history), including a research seminar and the comprehensive readings course (The comprehensive readings course for students in this concentration generally requires reading beyond what is required in the other concentrations.)
2. 6 credits outside the area of specialization, including applied history courses (HIST 690, 691, 692, 693)
3. 6 credits in HIST 799 Thesis or 3 credits in HIST 798 Directed Research and Writing in History (HIST 798 requires the completion of a major paper that is a substantial and original contribution to historical knowledge on the model of an article in a scholarly journal. If the major paper option is chosen, students must complete an additional 3 credits in the major field.)
4. reading proficiency in a modern foreign language, as demonstrated by course work or an examination

◆ Cultural History Emphasis
This emphasis is for students with a particular interest in cultural history as well as for students considering future work in the cultural studies doctoral program. Completion of this emphasis does not guarantee admission into the doctoral program; those interested in enrolling in that program should contact the Cultural Studies program directly. In addition to HIST 610, the cultural history emphasis requires the following:

1. 15 credits in the area of specialization (American history, modern European history, or comparative world history), including a research seminar (The comprehensive readings course for students in the cultural history emphasis generally requires additional reading similar to that in the predoctoral concentration.)
2. CULT 802 Histories of Cultural Studies
3. an approaches to cultural history course
4. 3 credits in HIST 798 Directed Research and Writing in History on a topic in cultural history
5. 1 additional course from outside the area of specialization, containing a significant cultural history component as defined by the instructor
6. reading proficiency in a modern foreign language, as demonstrated by course work or examination

◆ Concentration in Applied History
This concentration is for students seeking expertise in such applied history fields as archival management, museum studies, historic preservation, and historical editing. It is also suitable for professionally employed historians who desire to further their careers. In addition to HIST 610, this concentration requires the following:

1. 15 credits in the area of specialization (American history, modern European history, or comparative world history), including a research seminar and the comprehensive readings course
2. 6 credits of applied history courses (historic preservation, museum studies, archives, historical editing, or new media and information technology)
3. 3 or 6 credits of internship (If the 3-credit internship is selected, then the other 3 credits are taken in applied history course work.)
4. proficiency in a relevant research tool (computers, statistics, or a modern foreign language), as demonstrated by course work or an examination

◆ Concentration in Applied History with a New Media and Information Technology Emphasis
In addition to HIST 610, this concentration requires the following:

1. 15 credits in the area of specialization (American history, modern European history, or comparative world history), including a research seminar and the comprehensive readings course
2. 6 credits in new media and information technology course work
3. 3 or 6 credits of internship in information technology (If a 3-credit internship is selected, the other 3 credits are taken in applied history course work.)
4. proficiency in a relevant research tool (computer science, statistics, information technology, or a modern foreign language, as demonstrated by course work or an examination)

**Concentration in Enrichment**

This concentration is for students who want to study history for intellectual self-fulfillment or for vocational reasons. It allows more flexibility in the selection of courses and does not require a foreign language. In addition to HIST 610, this concentration requires the following:

1. 15 credits in an area of specialization (American history, modern European history, or comparative world history), including a research seminar and the comprehensive readings course
2. 12 credits of electives

Six credits of thesis work are optional. If a thesis is elected, 3 credits in the major and 3 credits in electives are assigned to it.

**Concentration in Teaching**

This concentration is intended for students already licensed for teaching or seeking licensure. Unlike the other three concentrations, it requires a minimum of 36 credits and does not include the comprehensive readings course. Although it includes course work in history and education, completion of this concentration alone is not sufficient to qualify for licensure. That program is offered by the Graduate School of Education and admission is limited. Students are advised to consult with the Graduate School of Education for specific requirements regarding licensure. In addition to the general M.A. in History requirements, this concentration requires the following:

1. 24 credits in history, including 3 credits in HIST 610 The Study and Writing of History, at least 3 credits each from U.S., European, and non-Western history course offerings; and one research seminar
2. 12 credits in graduate education courses, including EDCI 567

**History, Ph.D.**

The Ph.D. in History prepares students for careers in college teaching, digital media, publishing, educational administration, public history, and historical research. Students gain expertise in both conventional historical methods and web-based technologies. Major fields include U.S. history, European history, and comparative world history; minor fields include public history, constitutional studies, and new media and information technology. Depending on career goals and interests, students can also focus their degrees in one of four areas:

- **College/university teaching:** This concentration is for students who are seeking a career in teaching or research at the community college, college, or university level.
- **New media and information technology:** Although all students in the program take some courses in new media, students in this concentration seek careers specifically in new media (e.g., publishing, education, or a college or university history department where they would serve as the department's lead person in new media and information technology). This emphasis requires more advanced work in new media than any other.
- **Public and applied history:** This emphasis prepares students for work in applied areas of history, such as museums, archives, federal government work, preservation, and editing, or helps students already working in those areas to advance. In some cases, students will do advanced course work in their field of work; in other cases, they will acquire knowledge or skills that will foster their professional work (e.g., in nonprofit management).
- **Professional development:** This emphasis responds to the needs of students who are already launched on a career and want a doctoral degree because it will further their career goals or because it fulfills personal intellectual goals. Candidates who need flexible scheduling will be advised on a case-by-case basis.

**Admission Requirements**

In addition to meeting all admission requirements for graduate study at George Mason, applicants to the Ph.D. in History should submit the following:

1. Three letters of recommendation from professional colleagues or academic mentors
2. GRE score
3. A goals statement that explains the applicant's academic credentials, professional background, intellectual interest in George Mason's doctoral program in history, and ultimate career goals
4. A writing sample consisting of a history essay, research paper, or professional paper

Admission decisions are ordinarily sent in early March.

**Financial Assistance**

The department offers several research and teaching assistantships to highly qualified applicants. Other aid is available in the form of work study and federal student loans.

**Reduction of Credit**

For students entering the doctoral program with a master's degree, the number of required credits may be reduced by a maximum of 30 credits, subject to the approval of the program faculty. Requests for reduction of credit are reviewed only after acceptance to the doctoral program.

**Degree Requirements**

Candidates for the Ph.D. in History must complete a minimum of 72 graduate credits. In addition to core courses, students must complete course work in a major field of study and two minor fields; pass a comprehensive exam; and complete a dissertation. The dissertation demonstrates mastery of the subject matter, methodologies, and conceptual foundations in the chosen fields of study. This requirement is generally achieved through consideration of a problem on the boundaries of knowledge in the discipline.

1. Core courses: 21 credits distributed as follows:
   a. HIST 610 The Study and Writing of History (3 credits)
   b. HIST 696 Clio Wired: An Introduction to History and New Media (3 credits)
   c. HIST 697 Creating History in New Media (3 credits)
   d. HIST 711/731/751 Research Seminar in U.S. History / European History / Comparative World History (3 credits)
   e. HIST 810 History Doctoral Colloquium (1 credit a semester for 6 credits)
   f. HIST 811 Doctoral Research Seminar (3 credits)
2. Major field: 15 credits chosen from U.S. history, European history, comparative world history

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3. Minor fields: 18 credits in two minor fields (9 credits each)

4. Doctoral research skills: All doctoral students in history must demonstrate basic competency in computers. Students whose research requires a knowledge of a foreign language must also demonstrate a reading knowledge of one foreign language. The department sets specific research skills requirements for students, which depend on their field of study.

5. Comprehensive exam: Students need to pass a comprehensive exam that consists of a written field statement for each minor field and an oral examination for the major field.

6. Dissertation: HIST 998 (3 credits minimum; 6 credits maximum) and HIST 999 (15 credits)

Art History Faculty
Professors: folliott, Mattusch (Mathy Professor of the History of Art)
Associate professors: Butler (coordinator), Todd
Assistant professor: DeCaroli
Adjuncts: Bauman, Guignon, Lipinski, Mason, Poole, Reason

UNDERGRADUATE PROGRAMS

Art History, B.A.

As a liberal arts discipline, art history emphasizes the analysis of visual data in a historical context. The major program prepares students for graduate study in art history as well as for professional work.

In addition to satisfying the university-wide general education requirements and the requirements for a B.A. degree in the College of Arts and Sciences, candidates for a degree in art history must complete 33 to 34 credits. These include 30 credits of ARTH, including 3 to 6 credits at the 100 to 200 level, 18 to 21 credits at the 300 level, and 6 at the 400+ level, plus 3 to 4 credits of studio art (AVT). Specific requirements are as follows:

6. 3 to 6 credits in ARTH at the 100 or 200 level, including 3 credits from ARTH 200, 201, or 203

7. ARTH 394 or 594

8. 18 to 21 credits of ARTH at the 300 level (may include ARTH 394)

9. 6 credits of ARTH at the 400 level or above, including 3 credits from ARTH 400, 420, 430, 440, 471, or 482

10. 3 to 4 credits in the Department of Art and Visual Technology in the College of Visual and Performing Arts: AVT 103, 104, 392, or others with permission of that department

All art history majors are encouraged to pursue internships in art history (ARTH 393 or with permission ARTH 593) in their junior year or senior year. Up to 6 credits in art history internships may be applied toward ARTH requirements for the major with permission of the art history undergraduate coordinator.

Students are strongly recommended to participate in a study abroad program. Students contemplating graduate study in art history should acquire a reading knowledge of French and/or German.

Students contemplating museum or arts administration careers should consider taking electives from the following: ACCT 201, COMM 330, ENGL 410, ENGL 503, and PUAD 505.

Writing-Intensive Requirement

The university requires all students to complete at least one course designated as writing intensive in their majors at the 300 level or above. Students majoring in art history fulfill the university's writing-intensive requirement by successfully completing any 400-level ARTH course.

Honors Program in Art History

Art history majors who have completed 75 credits (a minimum of 15 credits in art history, with 6 credits taken at George Mason) with a 3.500 overall GPA and a 3.500 GPA in art history are eligible to apply to the art history honors program. Eligible students should apply to the undergraduate coordinator by November 15 or April 15 with a statement of application, which includes the names of two George Mason art history faculty members to serve as references; transfer students may also submit transcripts. Not all applicants who meet the minimum requirements may be accepted into the program. Selection is made by the Art History Committee.

To graduate with honors in art history, students must complete ARTH 492 and 493, which are linked, individualized courses that culminate in a research paper. Students must have completed at least one course in the field (or with the professor) chosen for these honors courses. ARTH 492 should be taken before 493, but they may be taken concurrently. These 6 credits must be passed with a minimum 3.500 GPA, and the overall art history GPA presented for graduation must be a minimum of 3.500. These 6 credits may be counted toward the 39- to 40-credit major requirement in art history, but they do not replace the 6 required credits in ARTH 400, 420, 430, 440, or 471.

• Minor in Art History

The minor in art history requires 18 credits and covers a broad spectrum of periods, cultures, and themes, with an emphasis on historical context. Requirements for the minor are as follows:

1. 3 to 6 credits of 100- or 200-level art history courses
2. 12 to 15 credits of 300- or 400-level art history courses

ARTH 393 is not required for the minor but is strongly encouraged.

• Interdisciplinary Minor

The art history program coordinates the interdisciplinary minor in ancient Mediterranean art and archaeology. See the Interdisciplinary Minors section of this chapter for a description of the minor.

Courses in Support of Graduate Programs

Although a graduate degree program in art history is not available, these courses are offered in support of other graduate programs: ARTH 593, 594, 596, 599, and 699. See the Course Descriptions chapter of this catalog.

Honors Program in General Education

Faculty

Albanese, Alligood, Bakhash, Bergoffen, Boettke, Burr, L. Butler, J.T. Censer, Cheng, Cartlon, R. Clark, R. Davis, Deshmukh, DiCaroli, Diecchio, R. Dudley, Ehrlich,

Course Work
The Honors Program in General Education offers all course work designated HNRS in the Course Descriptions chapter of this catalog.

Honors Program
The Honors Program in General Education provides highly qualified students with an integrated foundation for their future studies. The program consists of a challenging interdisciplinary curriculum that satisfies university-wide general education requirements for graduation and prepares students for their majors. Administered by the College of Arts and Sciences, the program is intended for students who are willing to cross traditional disciplinary boundaries and make connections that transcend the limits of conventional subjects. Through intensive discussion in small classes led by outstanding faculty members, students learn to probe the foundations of knowledge, develop new skills in addressing complex issues, and think independently, imaginatively, and ethically. The program offers students special access to the technical, intellectual, and artistic resources of the university and the national capital region and seeks to develop among its students a sense of intellectual community with the faculty and a commitment to lifelong learning.

Admission
Admission to the Honors Program in General Education is limited and competitive. Applicants are evaluated on the strength of their entire academic record, including the rigor of their high school curricula, GPA, standardized test scores, and leadership qualities as identified through their application portfolios. Admission is by invitation only.

Requirements
Not a major in itself, the Honors Program fulfills a core of general education requirements for every major. Requirements of the individual departments in regard to their majors are updated annually and are available in the offices of the Honors Program and the departments. Students in the program must earn a minimum GPA of 3.00 in all courses designated HNRS to successfully complete the program. Students whose cumulative GPA falls below this level may complete the program but will not receive honors recognition on their transcripts.

Continuation in Honors
Students in the program who are placed on academic warning because their GPA falls below 2.000 (1.800 in the first or second semester) may be transferred out of the program. Students who, for any reason, leave the Honors Program before completion must meet the general education requirements of their particular degree programs. On leaving the Honors Program and before registering for general education courses, students should be advised on equivalencies between the honors courses they have completed and their general education requirements.

Transfers
Within George Mason: Because of the sequential and integrative nature of the program, honors courses do not correspond exactly to other courses used to fulfill general education requirements. A list of equivalencies is available in the Honors Program office.

Outside George Mason: The Honors Program may meet the general education requirements of other universities. As in all transfer situations, however, the general education requirements of one institution may not precisely match those of another.

Interdisciplinary Minors

African American Studies

Faculty and Staff
Carton, Clark, Dennis, Fuchs, Horton, Levine, McFerson, Miller, Mobley McKenzie, Paden, Richards Jordan, Slade Martin, Smith, Smith-Bermiss, Stewart (director), Trafton, Travis, Warner, Wilkins, Williams

Course Work
The African American Studies program offers all course work designated AFAM in the Course Descriptions chapter of this catalog.

Requirements
African American studies is an interdisciplinary field of study that examines the cultural, historical, economic, and political dimensions and experiences of people of African descent in America, the Caribbean, Africa, and around the world. It introduces students to methodologies for examining the complex dynamics of race, class, gender, and ethnicity in America, and enables them to develop critical and analytical approaches to address contemporary issues in African American life and culture.

The interdisciplinary minor in African American studies requires a minimum of 21 credits of related course work, which includes 12 required credits and 9 elective credits from various disciplines in the College of Arts and Sciences.

Required Courses
AFAM 200 Introduction to African American Studies
AFAM 499 Independent Study
ENGL 368 Beginnings of African American Literature through 1865, ENGL 370 African American Literature: Reconstruction to 1903, ENGL 371 African American Literature through 1946, or ENGL 372 Contemporary African American Literature
HIST 335 The African American Experience in the United States: African Background to 1885 or HIST 336 The African American Experience in the United States: Reconstruction to the Present

Elective Courses
AFAM 490 Internship
DANC 118 World Dance
ENGL 414 The Harlem Renaissance
FREN 451 Sub-Saharan African Literature

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FREN 454 Caribbean Literature in French
GEOG 325 Geography of North Africa and the Middle East
HIST 130 History of the Modern Global System
HIST 261 Survey of African Civilization to the 1800s
HIST 262 Africa Since 1800: Legacies of Colonialism and Liberation
HIST 340 History of American Racial Thought
HIST 418 Ethnic Groups in America
HIST 466 Origins of Conflict in Southern Africa
SOCI 308 Sociology of Race Relations and Minorities
SOCI 413 Seminar in Social Issues
SOCI 523 Racial and Ethnic Relations: American and Selected Global Perspectives
UNIV 190 Echoes of Slavery
UNIV 290 The Quest for Racial Justice
Other courses as approved by the coordinator of the interdisciplinary minor in African American studies.

♦ Ancient Mediterranean Art and Archaeology

Faculty
Butler (coordinator), Cherubin, Lyton, Mattusch, Winkler

Course Work
The interdisciplinary minor in ancient Mediterranean art and archaeology is designed for students with diverse interests in the material culture of the ancient world. Course work combines the study of archaeology, literature, art, history, philosophy, myth, and religion. The minor's scope is not limited to Greece and Rome but touches on all the ancient civilizations of the Mediterranean, as well as the heirs of late antiquity such as Byzantium and early Islam.

The program represents foundation work crucial to graduate study in traditional departments of classical, Near Eastern, or Mediterranean art and archaeology. Through this minor, students are given credit for acquiring practical linguistic skills and archaeological field experience as well as scholarly background. Students should consult with the coordinator in designing a program.

Requirements
Students in this minor complete 18 credits distributed as follows:
1. Preparatory work: At least 3 credits of Greek, Latin, or a modern research language in addition to the basic George Mason University two-year introductory language sequence or
3 credits of course work in ancient literature chosen from ARTH 102, CLAS 250, 260, RELI 251, 252
2. 6 to 9 credits of electives from ANTH 320, 322, 325, 375, 420, 430; ARTH 319, 321, 322, 324, 333, 399 (with approval); CLAS 340, 350, 360, 370, 380, 390; HIST 301, 302, 480; PHIL 301; RELI 352; other courses pertaining to the region and period, with approval of the coordinator. At least 9 credits must be taken outside ARTH with at least 3 credits in ARTH.
3. 3 credits of seminar: ARTH 420 or ARTH 430 (if topic is appropriate)
4. 3 to 6 credits of practicum: a museum course (e.g., ARTH 394/594) and/or archaeological field work done for credit

♦ Asia-Pacific Studies

Faculty
Butler, Chang, Cheng, Cuong, DeCaroli, H. Nguyen (coordinator), Lin, Liu, Paden, Platt, Ro, Wan, Zhang

The interdisciplinary minor in Asia-Pacific Studies is designed for students whose interests focus on the humanities and social sciences and Asia's role in global systems and the cultural mosaic of human experience. In particular, a new type of transregionalism is explored (i.e., the links between Asia and North America).

Requirements
To receive the minor in Asia-Pacific Studies students must complete a minimum of 21 credits distributed as follows.
1. 3 required courses (9 credits)
   GOVT 333 Government and Politics of Asia
   HIST 251 & 252 Survey of East Asian History
2. 4 electives (12 credits) chosen from
   ANTH 306 Peoples and Cultures of Island Asia
   ANTH 311 Peoples and Cultures of Mainland Southeast Asia
   ARTH 320 Art of the Islamic World
   ARTH 382 Arts of India
   ARTH 383 Arts of Southeast Asia
   ARTH 384 Arts of China
   ARTH 385 Arts of Japan
   GOVT 433 Political Economy of East Asia
   GOVT 444 Issues in International Studies (if topic is on Asia)
   GOVT 490 Seminar (if topic is on Asia)
   HIST 353 History of Traditional China
   HIST 354 Modern China
   HIST 356 Modern Japan
   RELI 314 Chinese Philosophies and Religious Traditions
   RELI 315 The Buddhist Tradition
   RELI 337 Mysticism: East and West
   RELI 376 Special Topics in Religious Thought (if topic is on Asia)

Approved study abroad and/or internships or other courses as approved by the coordinator of the interdisciplinary minor in Asia-Pacific Studies.

Language courses in Chinese or Japanese are strongly recommended.

♦ Film and Media Studies

Faculty
Brunette (coordinator), Burton, Christensen, Fuchs, Gibson, Lont, Ricouart, Roan, P. Smith, Winkler

We are inundated on a daily basis with mass culture, especially as it is purveyed through the mass media. The effects are enormous and often unconscious. The film and media studies (FAMS) interdisciplinary minor aims to develop in students a more informed awareness of the nature of this culture, its ideological tendencies, and its effects on daily life in our society. The program offers diverse perspectives on mass media in the belief that such juxtapositions are more productive than any single approach. Committed to interdisciplinary studies, the program addresses the increasing complexity and multiplicity of visual cultures.

The program's basic components are offered through the departments of Communication, English, and Music, with
other courses available through the Department of Modern and Classical Languages. This 18-credit interdisciplinary minor is designed to introduce and explore mass culture in its visual manifestations. The program offers students the tools with which to read a variety of texts, including film, television, video, news media, and architecture.

**Requirements**

Students in this minor complete 18 credits distributed as follows.

1. Two required courses (6 credits) provide an introduction to the languages of film and popular media and to modes of analysis appropriate to each. These courses are prerequisites for all advanced work in the minor.
   - ENGL 332 Introduction to Film (offered every semester)
   - COMM 380 Media Criticism (offered every fall and spring semester; occasionally in summer)

2. After completing the two required courses, students select four additional courses (12 credits) from those listed below. These courses are designed to introduce students to a more specialized level of study. Students may decide to focus on film or emphasize the study of mass culture, or they may choose some mixture of courses that suits their own interests.

Communication majors must choose at least 6 credits outside of Communication for their FAMS elective courses.

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
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<tbody>
<tr>
<td>COMM 302</td>
<td>Foundations of Mass Communication</td>
</tr>
<tr>
<td>COMM 350</td>
<td>Mass Communication and Public Policy</td>
</tr>
<tr>
<td>COMM 355</td>
<td>Video I: Principles and Practices</td>
</tr>
<tr>
<td>COMM 358</td>
<td>Video II: Producing and Directing (prerequisite: COMM 355)</td>
</tr>
<tr>
<td>COMM 360</td>
<td>Video II: Video Editing (prerequisite: COMM 355)</td>
</tr>
<tr>
<td>COMM 365</td>
<td>Women and Media</td>
</tr>
<tr>
<td>COMM 452</td>
<td>Media Production Practicum (prerequisite: COMM 355)</td>
</tr>
<tr>
<td>COMM 456</td>
<td>Comparative Mass Media</td>
</tr>
<tr>
<td>COMM 602</td>
<td>Theories and Research of Mass Communication</td>
</tr>
<tr>
<td>COMM 655</td>
<td>Theories of Visual Communication in Telecommunications</td>
</tr>
<tr>
<td>ENGL 327</td>
<td>Introduction to Cultural Studies (may only be taken with approval of the coordinator, who will review the course to determine relevance to FAMS)</td>
</tr>
<tr>
<td>ENGL 334</td>
<td>Literary Approaches to Popular Culture (may only be taken with approval of the coordinator, who will review the course to determine relevance to FAMS)</td>
</tr>
<tr>
<td>ENGL 338</td>
<td>Cultural Constructions of Sexuality (may only be taken with approval of the coordinator, who will review the course to determine relevance to FAMS)</td>
</tr>
<tr>
<td>ENGL 421</td>
<td>Topics in Film History (may be repeated if the topic is different). Sample topics include Italian film, films of the 50s, and French film.</td>
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<tr>
<td>ENGL 422</td>
<td>Topics in Film Theory (may be repeated if the topic is different). Sample topics include reading television and Hitchcock and film theory.</td>
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<tr>
<td>ENGL 490</td>
<td>Special Topics in Film (may be repeated if the topic is different). Sample topics include the horror film, queer film and theory, and African American film.</td>
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<tr>
<td>ENGL 493</td>
<td>Special Topics in Popular Literature (requires approval of FAMS coordinator)</td>
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<tr>
<td>ENGL 498</td>
<td>Internship: Special Topics (requires approval of FAMS coordinator)</td>
</tr>
<tr>
<td>ENGL 499</td>
<td>Independent Study (requires approval of FAMS coordinator)</td>
</tr>
<tr>
<td>FREN 470</td>
<td>Topics in French Cinema (permission of instructor and approval of coordinator)</td>
</tr>
<tr>
<td>MUSI 301</td>
<td>Music in the Motion Pictures</td>
</tr>
<tr>
<td>RUSS 470</td>
<td>Topics in (Post) Soviet Film</td>
</tr>
</tbody>
</table>

For further information, contact Peter Brunette, Department of English, Robinson Hall, Room A465, (703) 993-1190.

**Folklore and Mythology**

**Faculty**

Burns, floilliott, Fuchs, Johnsen-Neshati, Kendall, Mattusch (co-coordinator), Owens, Rutledge, Shiner, Todd, Winkler, Yocom (co-coordinator)

Stories told in both sacred and secular contexts, along with festivals, foods, music, material objects, and other traditional art forms, continue to influence our lives. This interdisciplinary minor offers students the tools with which to explore the compelling meanings within these seemingly simple, everyday cultural texts and become more aware of the ways these texts are used by individuals and institutions for various goals. Committed to interdisciplinary study, this program asks students to study folklore and mythology by juxtaposing the multiple viewpoints available from anthropology, art history, classical studies, literary studies, and religious studies.

**Requirements**

A minimum of 18 credits of related course work is required, taken from three groupings of courses. If any of these courses is taken for credit toward the B.A. literature requirement, it may not be taken for credit in the minor.

**Group 1 (3 credits)**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
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<tbody>
<tr>
<td>ARTH 102</td>
<td>Symbols and Stories in Art</td>
</tr>
<tr>
<td>CLAS 250</td>
<td>Classical Mythology</td>
</tr>
<tr>
<td>RELI 100</td>
<td>The Human Religious Experience</td>
</tr>
<tr>
<td>RELI 211</td>
<td>Religions of the Near (Middle) East</td>
</tr>
<tr>
<td>RELI 212</td>
<td>Religions of the Orient</td>
</tr>
</tbody>
</table>

Students may take only one Group 1 course from a department for credit toward the minor.

**Group 2 (12–15 credits)**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>ANTH 450</td>
<td>Qualitative Methods in Sociocultural Research (note ANTH prerequisites)</td>
</tr>
<tr>
<td>ARTH 319</td>
<td>Art and Archaeology of the Ancient Near East</td>
</tr>
<tr>
<td>ARTH 321</td>
<td>Greek Art and Archaeology</td>
</tr>
<tr>
<td>ARTH 322</td>
<td>Roman Art and Archaeology</td>
</tr>
<tr>
<td>ARTH 382</td>
<td>Arts of India</td>
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<tr>
<td>ARTH 383</td>
<td>Arts of Southeast Asia</td>
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<tr>
<td>ARTH 384</td>
<td>Arts of China</td>
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<tr>
<td>ARTH 385</td>
<td>Arts of Japan</td>
</tr>
<tr>
<td>CLAS 340</td>
<td>Greek and Roman Epic</td>
</tr>
<tr>
<td>CLAS 350</td>
<td>Greek and Roman Tragedy</td>
</tr>
<tr>
<td>ENGL 311</td>
<td>Writing Ethnography</td>
</tr>
<tr>
<td>ENGL 333</td>
<td>Folklore of the Americas</td>
</tr>
<tr>
<td>ENGL 337</td>
<td>Special Topics in Myth and Literature</td>
</tr>
<tr>
<td>ENGL 491</td>
<td>Special Topics in Folklore</td>
</tr>
<tr>
<td>ENGL 498</td>
<td>Internship: Special Topics (requires approval of FAMS coordinator)</td>
</tr>
<tr>
<td>ENGL 591</td>
<td>Special Topics in Folklore</td>
</tr>
<tr>
<td>RELI 351</td>
<td>Religions of the Ancient Near East</td>
</tr>
</tbody>
</table>

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Global Systems

Faculty
Clark (coordinator)

Requirements
The interdisciplinary minor in global systems consists of 18 credits of non region-specific courses that deal with global connections or transactions. The minor is ideal for majors in business disciplines, economics, languages, geography, government and international politics, history, and other disciplines that take a global view. At least 9 credits must be at the 300 level or above.

1. 1 required course (3 credits): GOVT 149 Global Awareness
2. 5 elective courses (15 credits) chosen from at least two of the following fields:

Field A: Government, geography, and administration of justice
- ADJ 405 Law and Justice around the World
- GEOG 101 Major World Regions
- GEOG 301 Political Geography
- GEOG 303 Conservation of Resources and Environment
- GEOG 304 Geography of Population
- GEOG 305 Economic Geography
- GOVT 132 Introduction to International Politics
- GOVT 348 Competencies for the Global Arena
- GOVT 349 Issues in the Analysis of Global Systems
- GOVT 444 Issues in International Studies

Field B: Economics, anthropology, marketing, history, and sociology
- ANTH 300 Civilizations
- ANTH 312 Comparative Political Systems
- ANTH 331 Refugees
- ANTH 333 Humanitarian Action
- ANTH 375 Anthropological Perspectives on History
- ECON 360 Economics of Developing Areas
- ECON 361 Economic Development of Latin America
- ECON 380 Economies in Transition
- ECON 390 International Economics
- HIST 125 Introduction to World History
- HIST 130 History of the Modern Global System
- HIST 387 Topics in Global History
- MKTG 407 International Business
- SOCI 332 Sociology of Urban Communities

Field C: Environmental science, nursing, systems engineering, urban and suburban studies, civil and infrastructure engineering
- BIOL 307 Ecology
- BIOL 377 Applied Ecology
- CEIE 100 Environmental Engineering around the World
- CEIE 450 Environmental Engineering Systems
- CEIE 455 Introduction to Environmental Engineering
- CEIE 456 Environmental Law
- EVSC 206 Environmental Science II
- NURS/HSCI 543 Global Health: Trends and Policy
- SYST 201 Discrete Dynamic Systems Modeling
- USST 301 Urban Growth in a Shrinking World

Field D: Modes of communication
- COMM 305 Foundations of Intercultural Communication
- COMM 456 Comparative Mass Media
- COMM 656 Global Communication
- DANC 118 World Dance
- MUSI 103 Musics of the World
- MUSI 431 Music History in Society
- THR 359 World Stages

Other courses such as UNIV or special topics courses may also fulfill the requirements of this program; the written permission of the coordinator is required prior to registration.

For more information, contact the coordinator in the Department of Public and International Affairs, Robinson Hall, Room A201, (703) 993-1400.

Linguistics

Faculty
Chamberlain, Collier, Goldin, Golomb, Hamburger, Holisky, Jones, Levine, Rothbard, Sanford, Weinberger (coordinator)

Linguistics is the scientific study of language. Language is studied in a variety of ways—descriptively, theoretically, computationally, and psychologically—and as a social phenomenon. The field of linguistics thus informs and is informed by many other areas of study including philosophy, psychology, sociology, computer science, the study of individual languages and literatures, literary studies, and education.

The interdisciplinary minor in linguistics may be combined with a major in one of the areas listed above or in any other field. This minor introduces the student through the required courses to the fundamental concepts of modern linguistic theory and allows the student to explore in the electives how these concepts relate to various other disciplines.

Requirements
Students must complete 15 credits distributed as follows:
1. 3 credits in general linguistics
2. 3 credits from syntactic theory, phonological theory, or linguistic semantics
3. 9 credits of electives, chosen in consultation with the linguistics coordinator (A list of approved electives is available from the coordinator).

Multimedia

Faculty
Chung, Forche, Higgins, Lont, Martin, Montecino, Smith, Weinberger, White

In the multimedia minor, students learn how to create original work and communicate with others through the fusion
of images, text, sound, and video. Students analyze and incorporate into their productions contemporary design principles and current software applications. As part of this process, students are encouraged to focus on how multimedia technologies, which offer new tools for investigating and disseminating ideas, can enhance undergraduate research and writing. These skills, now important in most academic disciplines, are also increasingly valuable not only in the specialized information technology industries, but also in business, education, and politics.

This minor is not available to students majoring in AVT with a concentration in digital arts.

Requirements
Students in this minor complete 18 to 20 credits distributed as follows:

1. 9–10 credits of core courses
   - AVT 104 Studio Fundamentals I (4 credits)
   - COMM 157 Video Workshop or ENGL 209 Enhanced Digital Text (1 credit)
   - And one of the following
   - AVT 180 or CAS 101 Computers in the Creative Arts (3 credits)
   - NCLC 249 Internet Literacy (4 credits)

2. 8–9 credits of electives with no more than 6 elective credits in any one college or department
   - AVT 280 Digital Arts I (4 credits)
   - AVT 381 Digital Arts II (4 credits)
   - COMM 355 Video I: Principles and Practices (3 credits)
   - NCLC 345 Introduction to Multimedia (5 credits)
   - NCLC 445 Multimedia Design (5 credits)
   - ENGL 497 Special Topics in Creative Writing: Hyper-text Poetry and Web Publishing (3 credits)

Contemporary Europe

Coordinator: Desmond Dinan, School of Public Policy

Students receiving the university-wide minor in the New Europe complete a minimum of 18 credits: a 3-credit required course and 15 credits of electives (at least 3 credits from each field). Special topics courses, seminars, independent study, internships, and study abroad, where relevant to the minor, may also be taken for elective credits, with approval of the coordinator.

1. 1 required course (3 credits)
   - GOVT 334 Government and Politics of Europe, or
   - GOVT 444 Issues in International Studies (with approval of the coordinator)

2. 5 electives (15 credits) (at least one chosen from each field below)

Field A: History, geography, and politics
   - GEOG 320 Geography of Europe
   - GOVT 334 Government and Politics of Europe (if not taken as the required course)
   - GOVT 337 Ethnic Politics in Western Europe and North America
   - GOVT 338 Government and Politics of Russia and Central Eurasia
   - HIST 314 History of Germany
   - HIST 322 Modern Britain
   - HIST 329 Modern Russia and the Soviet Union
   - RUSS 354 Contemporary Post-Soviet Life

Field B: Language, literature, and the arts
   - ARTH 362 Twentieth-Century European Art
   - FREN 441 Twentieth-Century Prose Fiction
   - FREN 442 Twentieth-Century Drama and Poetry
   - FREN 470 Topics in French Cinema
   - FREN 580 Contemporary French Society and Culture
   - GERM 451 Modern Literature: 1925 to the Present
   - GERM 580 Contemporary Germany
   - PHIL 336 Contemporary Continental Thought: Existentialism
   - SPAN 484 Literature of Spain II
   - SPAN 580 Contemporary Hispanic Institutions

Study of the Americas

Faculty

Course Work
   - The Study of the Americas program offers all course work designated STAM in the Course Descriptions chapter of this catalog.

Requirements for the Minor in Latin American Studies
   - Students must complete a minimum of 18 credits distributed as follows.
     1. 1 required course (3 credits) chosen from
        - GOVT 331 Government and Politics of Latin America
        - HIST 271 or 272 Survey of Latin-American History
     2. 3 elective courses (9 credits) from three different disciplines to be chosen from anthropology, dance, economics, folklore, Francophone Caribbean literature (in French or English), geography, government, history, Latin American literature and culture (in Spanish or English)
     3. 6 elective credits to be chosen in consultation with the coordinator

Requirements for the Minor in North American Studies
   - Students receiving a minor in Latin American studies must also demonstrate reading, speaking, or writing knowledge of Spanish, Portuguese, or French by examination or by achieving a minimum grade of 2.00 in a 300-level course in the language selected. Those students taking an upper-level Francophone Caribbean or Latin American literature or culture course in the target language that is relevant to Latin American studies may use it to fulfill 3 credits of the requirements for the minor.

Requirements for the Minor in North American Studies
   - 1. 1 required course (3 credits):
      - STAM 410 Senior Seminar in the Study of the Americas
   - 2. 5 elective courses (15 credits) in the region of emphasis chosen in consultation with the program coordinator

http://catalog.gmu.edu
An emphasis on French-speaking Canada requires proficiency in French as demonstrated through either a proficiency exam or the successful completion of a 300-level language course (which may count toward the fulfillment of the 18-credit minimum for the minor).

Internships
Internships are possible with the U.S. Congress and with local governments, community organizations, environmental organizations, foundations, nongovernmental agencies, human rights organizations, international business organizations, labor unions, legal organizations, libraries, media organizations, museums, political parties, public interest organizations, publications, and religious organizations.

Study Abroad
Students are encouraged to spend a semester abroad, especially if the region of emphasis is French Canada or Latin America. The Center for Global Education provides opportunities for study abroad in a wide range of countries. These affordable programs sharpen language skills and give students a first-hand experience with a different culture.

◆ Urban and Suburban Studies

Faculty
Clapsaddle, Clark, Dumont, Endo, Gifford, Hart-Nibbrig, K. Haynes, Horton, Hysom, Mattusch, Rosenzweig, Schintler, Sockett, Stough, Todd, Travis (coordinator), Verheyen, Wong

Course Work
The Urban and Suburban Studies program offers all course work designated USST in the Course Descriptions chapter of this catalog.

Requirements
The interdisciplinary minor in urban and suburban studies requires a minimum of 18 credits of course work:
1. 3 core courses
2. 3 electives chosen from a list of approved electives, which must be selected from more than one of the following categories:
   - Environment and culture
   - Government and policy
   - Economy

Consult the coordinator for a list of approved courses in each category.

Interdisciplinary Studies

Executive Committee
Radner (chair), Beale, Button, Jacobs, Lont, Mahler, Ro, Sorrell

Course Work
This program offers courses designated MAIS in the Course Descriptions chapter of this catalog. In addition, students in the MAIS program do most of their work in courses listed under the disciplines that they integrate through this graduate program.

GRADUATE PROGRAM

◆ Interdisciplinary Studies, M.A.I.S.
The Master of Arts in Interdisciplinary Studies is for students who seek master's degrees that integrate knowledge from several disciplines. With the help of faculty advisors, students design individualized programs of study that include courses from several academic departments. The program is divided into two tracks: liberal studies and individualized studies. For more information, contact the MAIS office at (703) 993-8762 or mais@gmu.edu.

◆ Track in Liberal Studies
The liberal studies track is administered through the Department of Philosophy and Religious Studies. Please consult that section of this chapter for further information.

◆ Track in Individualized Studies
The individualized studies track differs from traditional graduate programs in that it emphasizes the integration of knowledge from various disciplines. The program is intended to promote advanced scholarship that transcends traditional disciplinary boundaries.

Within the program, several faculty-sponsored concentrations provide structured, yet flexible, options for prospective students. Concentrations are available in political science, video-based production, and recreation resources management.

In addition to faculty-sponsored concentrations, students may, with the help of faculty advisors, design individualized programs of study that include courses from several academic departments. Individualized programs must involve a course of study that is not already offered within any of the other graduate programs at George Mason University and should consist of a coherent package of interrelated courses.

Students in this track must complete a project or thesis that represents the culmination of their program of study. Work on the project or thesis is done under the direction of a faculty committee headed by a faculty advisor. Project or thesis proposals must be approved by the committee and the MAIS Executive Committee before students can register for project or thesis credits (MAIS 798, 799). All university policies governing theses, including the requirement for continuous registration, also apply to the project.

Admission Requirements
Students admitted to the MAIS program must show a capacity for original thought in cross-disciplinary research. Students will only be admitted if the program can assign a faculty advisor appropriate for the intended course of study. In addition to fulfilling George Mason admission requirements for graduate study, applicants must submit the following:
1. Three letters of reference
2. Scores from the GRE or the MAT (Students may substitute the GMAT or LSAT if taken within the past five years.)

Students admitted provisionally must achieve a 3.250 GPA in the first 12 credits of graduate course work. If they fail to do so, they will be terminated from the program.

Degree Requirements
Candidates for the degree must successfully complete 36 credits of graduate course work, including the following:

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1. 12 to 24 credits in a single discipline
2. At least 3 credits of research methodology (approved by the student’s faculty advisor)
3. 3 to 6 credits of MAIS 798 (project) or 6 credits of MAIS 799 (thesis)

Additional requirements for faculty-sponsored concentrations are listed below. Students must submit a curriculum contract that has been approved by their faculty advisor to the MAIS program by the time they have completed 12 credits of graduate work. Credits that apply to the MAIS degree are subject to the following restrictions:

- A maximum of 6 credits earned through independent study or directed readings and research courses
- A maximum of 6 credits taken through the Consortium of Universities of the Washington Metropolitan Area (These credits are counted as resident and not transfer credit.)
- A maximum of 15 transfer credits*
- Of the 15 possible transfer credits, a maximum of 6 may be from other accredited institutions (12 for students in the concentration in recreation resources management).
- All transfer credits require the approval of the faculty advisor, the director of the MAIS program, and the dean. Transfer credits are any credits taken before first enrolling as an admitted degree-seeking student, whether taken at another institution, taken in another George Mason University graduate program, or completed through George Mason University’s Extended Studies Program.

### Concentration in Political Science

The concentration in political science is concerned with the institutions and processes of politics and government in America, in the international arena, and other nations and regions of the world. The concentration is designed to prepare students for advanced work in political science, for teaching and research about government, for careers in government and politics, and for work in domestic and international nongovernmental organizations. Courses in comparative politics, international studies, American government, and political theory are offered within the concentration. The interdisciplinary opportunities of the M.A.I.S. degree allow students to work with the many other centers of excellence in the university in history, philosophy, economics, sociology, psychology, and public policy.

**Degree Requirements**

Students complete 36 credits of core courses and specialized courses distributed as follows:

1. 12 credits of core courses: GOVT 500, 510, 520, 540
2. 9 to 15 credits chosen to reflect a specialization in American government or in international politics and comparative government:
   - American government: 6 credits of GOVT 605, 606 and 3 to 9 credits of electives chosen from GOVT 703, 715, 725 or PUAD 615, 640, 651, 661, 781
   - International politics and comparative government: 6 credits of GOVT 631, 641 and 3 to 9 credits of electives chosen from GOVT 725, 731, 741, 743, or 745
3. 6 to 12 credits from other departments selected to complement the specialization and reflect the ideas, institutions, or processes of contemporary governance. Courses should be approved in an education plan designed by the student and advisor. Courses that complement an American specialization include HIST 628, ECON 828, PHIL 611, or SOCI 614. Courses that complement an international and comparative specialization include GEOG 581, PUBP 550, or SOCI 523.

4. 3 to 6 credits of research project, MAIS 798, or 6 credits of thesis research, MAIS 799. Three credits of the research project may be linked to an advanced specialty course to produce a research project. Arrangements for any of these options should be made with the advisor. If thesis option is chosen, the director and a committee of two additional faculty read and approve the thesis.

### Concentration in Video-Based Production

The concentration in video-based production emphasizes video production that encompasses various components, such as teleconferencing, interactive video, and digital editing. As low-end, high-quality video equipment becomes more affordable, more organizations (for profit and nonprofit) are investing in in-house production studios and staff. Their video needs include traditional videography, teleconferencing, interactive video techniques, digital video editing, and multimedia, to name a few.

Four units offer relevant courses for the concentration in video-based production. The Communication Department offers courses in the theory and practice of video production. The Graduate School of Education courses in interactive and distance learning provide a background for pedagogy and a wide spectrum of interactive skills. The English Department offers a course in film theory, and the Art and Visual Technologies Division focuses on computer-mediated visual applications, including the study of multimedia tools and design, digital and electronic art, animation, and virtual reality.

Students entering the program must have a basic knowledge of video production. Students with little or no video experience must take COMM 590 Seminar in Video Production within the first 9 credits of the program. Students with video experience who wish to waive this requirement must provide a videotape of their past work.

**Degree Requirements**

1. 8 required core courses: COMM 590 (Video Production); COMM 655 or ENGL 670; COMM 590 (Script Writing) or EDIT 704; COMM 697; EDIT 611 or EDIT 750; COMM 694; MAIS 798
2. 9 to 12 credits of electives chosen from COMM 554, 590, 602, 636, 656, or 696; EDIT 571, 572, 575, 771, 772; AVT 676

### Concentration in Recreation Resources Management

The concentration in recreation resources management is designed to prepare students and professionals in the fields of recreation and natural resources to pursue advanced academic training, seek career advancement, and serve their communities more adequately. Upon completion of the MAIS, students will possess a working knowledge of research and theory and an enhanced ability to think analytically. The program focuses on problems and challenges affecting the quality and quantity of outdoor recreation experiences and on the conservation and preservation of the nation’s public land resources.
The core courses are available in distance-learning formats. Access to the Internet is required. Enrollment is continuous. Students have six months to complete each course. Students should consult with their faculty advisors to design a program of study beyond the core requirements. Students are required to present an oral defense of the thesis or project on the George Mason campus.

Degree Requirements
A contract with a clearly identified cognate must be approved by a faculty academic advisor at or before the time that a student completes 9 to 12 credits. The contract must include a 3-credit course in research/methodology.

1. 5 required core courses (15 credits): PRLS 531, 533, 535, 560, LRNG 572
2. 3 to 4 cognate courses (9 to 12 credits) (Cognate courses form a coherent focus.)
3. 1 to 3 elective courses (3 to 6 credits)
4. Project or thesis: MAIS 798 (3 to 6 credits) or MAIS 799 (6 credits)

Mathematical Sciences

Faculty
Professors: Alligood, Fischer, Kulesza, B. Lawrence, J. Lawrence, Levy, Polyak, Sachs (chair), Saperstone, Sauer (CAS Distinguished Scholar), Shapiro, Struppa
Associate professors: Colonna, Gabel, Kiley, Lin, Lin, Morris, Singman, Walnut, Zoltek
Assistant professors: Anderson, Goldin, Lamba, Sander, Soltan
Adjuncts: Ailes, Goellner, Keller, Lieberman, Lighthorne, Orlova, Perencevich, Pilley, Senus, Soltan, Wallace, Wheatley, Zampedro
Visiting instructors: O’Beirne, O’Brien, Orlova-Shokry
Affiliates: Loustaunau, Peterson

The degree programs in mathematics serve the needs of students with various interests and career goals from business, industry, and research to graduate and professional school. Students may pursue the standard program or a program focused on either actuarial mathematics or applied mathematics. Students may complement other interests by taking a double major in mathematics and a related field, such as finance, economics, physics, computer science, or engineering.

Graduating seniors are required to have an exit interview and take an assessment exam.

Course Work
The Mathematical Sciences Department offers all course work designated MATH in the Course Descriptions chapter of this catalog.

UNDERGRADUATE PROGRAMS
Mathematics, B.A.
In addition to satisfying the university-wide general education requirements and the requirements for the B.A. degree in the College of Arts and Sciences, candidates for the degree in mathematics must present the following. (Through the course work below, math majors satisfy the university-wide requirement in quantitative reasoning.)

1. 26 credits of required MATH courses: MATH 113, 114, 125, 203, 213 or 215, 216, 290, and 322
2. 12 credits of electives in MATH numbered above 300. CS 112 is recommended and may substitute for 3 credits of MATH.

Mathematics, B.S.
In addition to satisfying the university-wide general education requirements for the B.S. degree, students majoring in mathematics must present the following. (Through the course work below, math majors satisfy the university-wide requirement in quantitative reasoning and natural sciences.)

Students may pursue a traditional mathematics program or a concentration in actuarial mathematics or applied mathematics.

1. Mathematics core requirements: 23 credits of required MATH courses from MATH 113, 114, 203, 213 or 215, 216, 290, and 322
2. Science, accounting, and economics requirements:
   a. For all students, 8 credits of a laboratory science sequence selected from one of the following: BIOL 213 and 303 or 304
   b. For students in the traditional mathematics program and the applied mathematics concentration, a second year of science selected from one of the following three options:
      - A second course sequence from the list above (credits from more advanced courses in biology, chemistry, geology, and physics (but only courses acceptable for credit toward a natural science major)
   c. For students in the concentration in actuarial mathematics, 3 credits of ACCT 202 (special arrangements may be made to waive the prerequisite of ACCT 201) and 6 credits of economics, including ECON 103 (three credits) and either ECON 306, 310, or FNAN 321. (The Economics Department has agreed to waive ECON 104 as a prerequisite for ECON 306 for mathematics majors.)
3. Computational requirement:
   a. For all students, four credits of CS 112
   b. For students in the actuarial concentration, 3 credits of STAT 362
4. Program and concentration-specific requirements:
   a. For students in traditional mathematics, 24 credits of MATH (MATH 125, 315, 316, either 321 or 431) and 12 credits of course work above MATH 300
   b. For students in the actuarial mathematics concentration, 24 credits of MATH (MATH 351, 352, 551, 554, 555, 556) and 6 credits from MATH 441, 442, or 446
   c. For students in the applied mathematics concentration, 24 credits of MATH 125, 315, 351, 413, 414, 446, and 6 credits of course work above MATH 300

The department recommends that a two-year proficiency in French, German, or Russian be demonstrated.
For math majors:
1. MATH 105, 106, 108, 110, 111, 271, and 272 do not satisfy the requirements for a major in mathematics.
2. MATH 214 is not recommended for mathematics majors. In special circumstances, a student may substitute MATH 214 for MATH 216.

For non-math majors:
1. MATH 108, 110, and 111 are designed for students in the social and behavioral sciences.
2. Liberal arts majors are advised to take MATH 106, MATH 110, or MATH 111.
3. Students in the natural sciences who plan to do graduate work are advised to add to their basic calculus sequence courses from MATH 313, 314, 351, 352, 382, 441, 442, 446, and 447.

For majors and non-math majors:
1. The following math courses have as a prerequisite a specified score on the Math Placement Test: MATH 105, 106, 108, 110, 111, and 113. The Math Placement Test is given frequently. Visit cas.gmu.edu/math_placement online for the schedule.
2. Students who do not achieve the necessary test score to take the math course they need may go to the Math Literacy Center (see below) or may study and retake the test on their own. If they do not complete the relevant program in the center or do not achieve the necessary score after re-taking the test, they will be dropped from the course. Depending on their test scores, students who do not place into MATH 113 will be advised to take MATH 105 or go to the Math Literacy Center to prepare for MATH 105.
3. MATH 105 does not fulfill the university quantitative reasoning requirement.
4. Students may not receive credit for both MATH 214 and 216; both MATH 213 and 215; both MATH 351 and STAT 344; and both MATH 352 and STAT 354.
5. After receiving a grade of C or better in one of the courses listed below on the left, students may not receive credit for the corresponding course on the right:
   - MATH 113, MATH 105 or 108
   - MATH 351 or STAT 344, MATH 110
   - MATH 441, MATH 111

Writing-Intensive Requirement
The university requires all students to complete at least one course designated as writing intensive in their majors at the 300 level or above. Students majoring in mathematics fulfill this requirement by successfully completing MATH 290.

Minor in Mathematics
To receive a minor in mathematics, students must complete 21 credits distributed as follows:
1. 5 required courses (15 credits): MATH 125, 203, 213 or 215, 214 or 216, and 290
2. 3 credits from any math course that requires MATH 290 as a prerequisite, and
3. 1 elective course in math at the 300 or 400 level, or STAT 344

Students must earn a 2.000 or better in MATH 290 and the courses chosen to fulfill requirement 2.

Minor in Mathematics for Undergraduates in the School of Management
To receive this minor, students must complete 20 credits, including MATH 113, 114, 203, 213, and 351 and one course chosen from MATH 352, 441, and 554.

The Math Tutoring Center
The department manages the Math Tutoring Center, which offers free tutoring for first- and second-year math courses. The tutoring is given by faculty and mathematics majors and is available on a drop-in basis with daytime and evening hours throughout the term.

The Math Learning Center
For a small fee, the Math Learning Center offers self-paced and classroom noncredit tutorial programs for students who do not place into the math course they need. Special tutors and tutorial software are available to those enrolled in the program. Successful completion of the relevant program will enable a student to enroll in MATH 105, 106, 108, 110, or 111.

Teacher Licensure
Students who wish to become teachers should consult the Professional Licensure section in the Graduate School of Education chapter and attend an information session during their sophomore year. Information sessions for teacher licensure are offered every month. Call (703) 993-2892/4648, e-mail gseinfo@gmu.edu, or consult the web site at gse.gmu.edu for more information.

GRADUATE PROGRAM

Mathematics, M.S.
The Department of Mathematical Sciences offers courses in pure and applied mathematics leading to the M.S. in Mathematics. The program offers a standard mathematics program and an emphasis in computational and applied mathematics.

Assistantships
The Department of Mathematical Sciences offers a limited number of merit-based teaching assistantships to students taking at least 6 graduate credits each semester. Other sources of support, such as research assistantships, are available as funding permits. Graduate students also have the opportunity to work in the Math Tutoring Center and the Math Learning Center.

Admission Requirements
In addition to fulfilling the admission requirements for graduate study, applicants must submit three letters of recommendation. GRE scores are recommended but are not required. Students intending to pursue a certificate in the actuarial sciences must have three semesters of calculus, a course in linear algebra (equivalent to MATH 322), a calculus-based course in probability (equivalent to MATH 351), and statistics (equivalent to MATH 352). Completion of the Society of Actuaries Course I is also sufficient preparation for the certificate program.

All other students must have a course in linear algebra (equivalent to MATH 322) and a course in advanced calculus (equivalent to MATH 315). Students intending to go into the computational and applied mathematics emphasis must have some computer knowledge.
Degree Requirements

Standard Program
In addition to fulfilling the degree requirements for graduate study, the candidate must complete 30 credits distributed as follows.
1. 6 credits of MATH 621 and 675
2. 6 approved graduate courses (18 credits), at least 4 of which are MATH (All six courses must be approved by the student’s advisor. Courses not listed as MATH courses must be approved by the Graduate Committee.)
3. The research/creative component (see below)

Emphasis in Computational and Applied Mathematics
The emphasis in computational and applied mathematics provides students with the analytical skills and background in computational techniques most relevant to the needs of business, industry, and government. The large number of high-tech firms, telecommunications firms, and government laboratories in the Washington, D.C., metropolitan area gives students an opportunity to gain practical experience and secure employment after graduation. The emphasis in computational and applied mathematics also provides the background necessary for advanced graduate work, in particular for the Ph.D. in Computational Sciences and Informatics.

In addition to fulfilling the degree requirements for graduate study, the candidate must complete 30 credits distributed as follows.
1. 12 credits of MATH 621; 675; 677 or 678; and MATH 685/CSI 717
2. 4 approved graduate courses (12 credits), at least 2 of which are MATH courses (All four courses must be approved by the student’s advisor. Courses not listed as MATH courses must be approved by the Graduate Committee.)
3. The research/creative component (see below)

Research/Creative Component
Students receiving the master’s degree in mathematics are required to write a thesis or present a paper. In preparation for either option, they form a committee comprising a chair and two other faculty members. The chair and at least one other member must be from the department; one member may be from a related field.

Students choosing the thesis option complete a thesis under the direction of the committee chair. The thesis work is typically completed while students are registered for 6 credits of MATH 799. A thesis proposal and thesis are submitted in accordance with university rules, and students must give an oral thesis defense.

Students choosing the paper presentation option, give an oral presentation of a paper (or series of papers or book chapter) agreed to in advance by the committee. The chosen material must be distinct from work done in fulfillment of course requirements. Students choosing this option take 6 additional credits of electives.

In the thesis defense or paper presentation, the student gives an oral defense/presentation of the thesis or paper to the committee and the George Mason community at large. Students are expected to respond to questions on the thesis or paper and related material. The committee determines whether the defense/presentation is satisfactory.

Certificate in the Actuarial Sciences
The certificate in the actuarial sciences is designed to serve students and professionals in the Washington, D.C., area who are interested in pursuing careers as actuaries. The course content provides students specific training related to the first four courses offered by the Society of Actuaries.

Requirements
Students must complete 6 courses (18 credits): MATH 551, 554, 555, 556, and two courses chosen from MATH 653, 654, or 655.

MATH 655 is recommended only for students who wish to pursue a career as a pension actuary. Substitutions for the elective courses may be made with the approval of the student’s advisor.

Modern and Classical Languages

Faculty
Professors: Aguera, Aksyonov (Robinson Professor), Elston, Francescato, Gilbert, Hecht, Wagner, Warner, Winkler
Associate professors: Berroa, Chamberlain (chair), Christensen (associate provost), Goldin (associate chair), LePage, Levine, Rabin, Ricouart
Assistant professors: Leeman, Roman-Mendoza, Wekerle
Visiting assistant professors: Kurlat-Ares, Zhang
Visiting instructors: Beaulieu, Bucelli, Mellander, Mircean-Pines

Course Work
This department offers all course work designated ARAB, CLIN, CHIN, FREN, FRLN, GER, ITAL, JAPA, LATN, RUSS, and SPAN in the Course Descriptions chapter of this catalog.

The following courses are offered in English. Knowledge of a foreign language is not required:
FREN 325, 329; GER 301, 325; RUSS 300, 326, 327, 353, 354; SPAN 321, 322, 325, 329; and all courses designated CLAS and FRLN. Courses numbered 325 may be repeated once for credit if the authors studied are different.

Courses that Fulfill General Education Requirements
1. Language courses through the intermediate level (through the 200 level) can be used to fulfill the college-level requirement in foreign languages for the B.A. degree.
2. Approved literature courses offered by the Department of Modern and Classical Languages can be used to fulfill the university general education and college-level requirements in literature.
3. FREN 451, RUSS 353, and RUSS 354 fulfill the college-level requirement in non-Western culture.
4. RUSS 353, RUSS 354, and SPAN 322 fulfill the university global understanding requirement.

UNDERGRADUATE PROGRAMS

Foreign Languages, B.A.
This program, which offers concentrations in French and Spanish, prepares students for teaching careers at the secondary school level, graduate study in languages, and re-
search and professional work in government and private enterprise. Language majors are encouraged to complete a minor or, if possible, a second major in another field. Students who want a double major in a language and another subject should plan a program of study in consultation with advisors from both disciplines.

**Writing-Intensive Requirement**
The university requires all students to complete at least one course designated writing intensive in their majors at the 300 level or above. Students in language concentrations may fulfill this requirement by successfully completing FREN 352 or SPAN 452.

**Concentration in French**
In addition to satisfying the university-wide general education requirements and the requirements for a B.A. degree in the College of Arts and Sciences, candidates must complete a minimum of 30 credits in French courses at the 300 level and above. Students are expected to complete a balanced program that includes courses in language, culture and civilization, and literature. The 30 credits required in the concentration must include the following:

1. 6 credits in advanced language courses (3 credits): FREN 350, 351, 352, 357, 460, 461, or 462
2. 1 course in French civilization (3 credits): FREN 375 or 376
3. 1 survey course in French literature (3 credits): FREN 377 or 378
4. 4 courses (12 credits) at the 400 level or above
5. 3 electives in French at the 300 level or above (9 credits)

No more than one course (3 credits) conducted in English may be taken for credit for the concentration in French.

Students are encouraged to take courses in other languages and literatures and in related disciplines such as music, art, history, and philosophy.

**Concentration in Spanish**
In addition to satisfying the university-wide general education requirements and the requirements for a B.A. degree in the College of Arts and Sciences, candidates must complete a minimum of 33 credits in Spanish at the 300 level or above. Students are expected to complete a balanced program that includes courses in language, culture and civilization, and literature. The 33 credits must include the following:

1. 36 credits in language skill courses (12 credits): SPAN 301, 302, 452
2. 1 course in Hispanic civilization (3 credits): SPAN 461 or 466
3. 4 literature courses (12 credits): SPAN 390, 483, 484, 488
4. 2 or more electives at the 300 level or above (6 credits)

SPAN 321, 322, 325, and 329 may not be applied to the concentration in Spanish.

**Comparative Literature Emphasis**
The Department of Modern and Classical Languages and the Department of English offer a concentration in comparative literature. This program permits the student to combine the study of a language with cross-cultural literary study. The program requires 10 courses above the 200 level, distributed as follows:

1. 2 courses in a foreign literature with selected readings in the original language
2. 2 courses in English and/or American literature
3. 3 courses designated as comparative or world literature by the Comparative Literature Committee. These courses include CLAS 390, ENGL 431, 436, 437; and appropriate special topics courses designated CLAS, FREN, GERM, RUSS, and SPAN.
4. CL 300 Introduction to Comparative Literature
5. 1 course in literary criticism: ENGL 494, ENGL 551, FREN 381, or SPAN 390, as appropriate for the student's focus
6. CL 514 Theories of Comparative Literature

Students should consult with their advisors to design a program of study focusing on a specific genre, period, issue, or other cross-cultural topic.

For more information, contact the Department of Modern and Classical Languages or the Department of English.

**Teacher Licensure**
Students who wish to become teachers should consult the Professional Licensure section in the Graduate School of Education chapter and attend an information session during their sophomore year. Information sessions for teacher licensure are offered every month. Call (703) 993-2892/4648, e-mail gseinfo@gmu.edu, or consult the web site at gse.gmu.edu for more information.

**Minor in French, German, Latin, Russian, or Spanish**
Prerequisite: Completion of an intermediate (202 or 209) course in French, German, Russian, Spanish, or Latin, or equivalent placement test score.

A minor in any of these languages consists of 18 credits above the intermediate level in a single language. Except for the minor in Latin, no more than one course taught in English may be applied to the minor.

**Requirements for the Minor in French**
Three of the following (9 credits):
- FREN 350 French Conversation
- FREN 351 Advanced French Grammar
- FREN 352 French Composition
- FREN 355 Phonetics and Oral Expression
- FREN 357 Introduction to Translation
- FREN 391 French for the Business World I

Two of the following (6 credits):
- FREN 375 French Civilization: From Ancient Gaul to the French Revolution
- FREN 376 French Civilization: From the Revolution to Contemporary France
- FREN 377 Survey of French Literature: Middle Ages to 1800
- FREN 378 Survey of French Literature: 1800 to Present

One French elective at the 300 level or above (3 credits)

**Requirements for the Minor in German**
Three of the following (9 credits):
- GERM 310 Conversation and Composition
- GERM 316 German for the Business World
- GERM 318 Translation of Texts
- GERM 415 Advanced Grammar and Style
- GERM 418 Advanced Composition
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One of the following (3 credits):
- Genre courses at the 300 level
- Period courses at the 400 level

One of the following (3 credits):
- GERM 301 Culture and Civilization
- GERM 340 Survey of German Literature

One German elective at the 300 level or above (3 credits)

Requirements for the Minor in Latin
Eighteen credits from the following:
- LATN 351 Roman Prose Literature
- LATN 352 Roman Poetry
- LATN 451, 452 Studies in Roman Literature

Courses vary in content and may be repeated for credit.

Requirements for the Minor in Russian
Three of the following (9 credits):
- RUSS 302 Russian Conversation and Composition
- RUSS 380 Advanced Russian I
- RUSS 381 Advanced Russian II

One of the following (3 credits):
- RUSS 310 Readings in Russian Literature
- RUSS 311 Contemporary Russian Short Fiction

One of the following (3 credits):
- RUSS 353 Russian Civilization
- RUSS 354 Contemporary Post-Soviet Life

One Russian elective at the 300 level or above (3 credits)
(This course must be conducted in Russian.)

Requirements for the Minor in Spanish
Two required courses (9 credits):
- SPAN 301 Grammar and Syntax
- SPAN 302 Reading and Writing Skills Development

Two elective courses (6 credits):
- SPAN 390 Introduction to Hispanic Literary Analysis
- SPAN 452 Advanced Written Spanish
- SPAN 461 Spanish Civilization and Culture
- SPAN 466 Latin American Civilization and Culture
- SPAN 483, 484 The Literature of Spain I, II
- SPAN 488 The Literature of Spanish America

One Spanish elective at the 300 level or above (3 credits)

Minor in Classical Studies

The minor is intended for students who wish to become familiar with the classical cultures and broaden their knowledge of the foundations of Western civilization, and for students who are studying other areas of the humanities, especially English, languages, comparative literature, history, art history, philosophy, or religion. The minor provides enough flexibility for students to choose relevant courses according to their primary interests.

The minor in classical studies consists of the following 18 credits:
1. 6 credits in classics, including CLAS 250
2. 3 credits in classical history (HIST 301, 302, 304, 388 [with approval], 480)
3. 3 credits in classical art history or classical philosophy, and religious studies
4. 6 credits of approved electives from classical art history, classics, classical history, classical philosophy, and religious studies

GRADUATE PROGRAMS

Foreign Languages, M.A.
The Master of Arts in Foreign Languages is designed to meet the needs and interests of prospective and practicing teachers and other professionals, and to prepare students for doctoral study at other institutions. The program offers three concentrations: French or Spanish, French and Spanish, and Spanish/bilingual-multicultural education.

Admission Requirements
In addition to satisfying the general admission requirements for graduate study, applicants seeking degree status must hold a baccalaureate degree in French or Spanish, have at least a 3.000 GPA (on a 4.000 scale) in the field, and submit two letters of recommendation from persons familiar with their academic qualifications.

Applicants whose baccalaureate degrees were earned in other fields or who otherwise do not meet the above requirements but who provide evidence of a capacity to pursue graduate study are encouraged to apply and may be admitted to the program with provisional status. Applicants in this category may be asked to appear for a personal interview and take the appropriate part(s) of the GRE. They may also have undergraduate deficiencies to make up before being advanced to degree status.

Degree Requirements
Candidates who elect a concentration in one language must complete a program of 30 credits. Those who concentrate in two languages must complete a program of 42 credits. The concentration in Spanish/bilingual-multicultural education requires 36 credits. In all three concentrations, 6 of the total credits may be earned with a thesis. Regardless of the concentration selected, all students must meet the core and distribution requirements given below and pass an oral comprehensive examination.

Concentration in French
The concentration requires 30 credits, of which at least 18 must be earned in courses listed under the designator FREN and distributed accordingly: at least 6 credits in literature courses covering two different periods, at least 6 credits in language/linguistics courses, and at least 6 credits of French electives (in either literature or language). The remaining 12 credits are electives, of which up to 6 may be used for directed reading and research (798) and thesis (799).

Concentration in Spanish
The concentration requires 30 credits, of which at least 18 must be earned in courses listed under the designator SPAN and distributed accordingly: at least 6 credits in Spanish American literature courses, at least 6 credits in Peninsular Spanish literature courses, and at least 6 credits in language/linguistics courses. The remaining 12 credits are electives, of which up to 6 may be used for directed reading and research (798) and thesis (799).
Concentration in French and Spanish
The concentration requires 42 credits, including 18 credits in French distributed according to the requirements for the concentration in French and 18 credits in Spanish distributed according to the requirements for the concentration in Spanish. The remaining 6 credits are electives, which may be used for directed reading and research (798) and thesis (799).

Concentration in Spanish/Bilingual-Multicultural Education
The concentration requires 36 credits, including at least 18 credits in SPAN distributed according to the requirements for the concentration in Spanish and 6 credits of bilingual education seminars selected from EDCI 517, 518, and 519. The remaining 12 credits are electives, of which up to 6 may be used for directed reading and research (SPAN 798) and thesis (SPAN 799).

Philosophy and Religious Studies

Faculty
Professor: Bergoffen
Associate professors: Burns, De Nys, Fletcher, Froman, Holman, Kaufmann (chair), Nguyen, Paden, Ro, Rothbart, S.M. Skousgaard
Assistant professors: Cherubin, Dakake, Kinnaman, Shiner
Adjuncts: Catlett, Caudill, Glazer, Giuliani, D. Gregory, M. Gregory, Hebar, Mairena, Oberoi, Romanovskaya, S.A. Skousgaard, Sojka

Course Work
This department offers all course work designated PHIL, LS, and RELI in the Course Descriptions chapter of this catalog.

UNDERGRADUATE PROGRAMS

Philosophy, B.A.
The degree program in philosophy covers the major issues and areas in philosophy and serves the needs of students with various interests and career goals. Major emphases are available for students who wish to pursue graduate studies in philosophy or to emphasize philosophy while acquiring a broad liberal arts education. Students can use this major as preparation for professions such as law or government service or complement other interests by taking a double major in philosophy and a related field of study.

In addition to the university-wide general education requirements and the requirements for a B.A. degree in the College of Arts and Sciences, philosophy majors must complete at least 33 credits in philosophy earning a 2.000 or better in each. At least 21 credits must be at the 300 level or above including at least 6 credits at the 400 level or above. No course may be used to fulfill more than one requirement. The credits must be distributed as follows:

1. Logic (at least 3 credits): PHIL 273 or PHIL 376
2. History of philosophy (at least 12 credits)
   Required: PHIL 301, 303, and 332
   Either PHIL 336 or 337
3. Theories of value (at least 3 credits):
   PHIL 311 Philosophy of Law
   PHIL 323 Classical Western Political Theory
   PHIL 324 Modern Western Political Theory
   PHIL 325 Karl Marx’s Social and Political Thought
   PHIL 326 Liberty, Equality, and Community
   PHIL 327 Contemporary Western Political Theory
   PHIL 338 Woman: The Philosophical Questions
   PHIL 355 Contemporary Ethical Theory
   PHIL 356 Philosophy of Art
   PHIL 470 Seminar: Philosophical Examination of Social Issues and the Law
   When the subject matter is appropriate, and at the discretion of the professor, PHIL 391, 392, 421, 425, or 426 may be used to fulfill the theories of value requirement.
4. Reality, knowledge, and science (at least 3 credits)
   PHIL 312 Philosophy of Technology
   PHIL 337 Twentieth-Century Continental Thought: Phenomenology
   PHIL 340 Hermeneutic Philosophy
   PHIL 357 Philosophy of the Social Sciences
   PHIL 371 Philosophy of Natural Sciences
   PHIL 373 Theory of Knowledge
   PHIL 374 Philosophy of Mind
   PHIL 375 Metaphysics
   PHIL 531 Freud and Philosophy
   When the subject matter is appropriate, and at the discretion of the professor, PHIL 391, 392, 421, 425, or 426 may be used to fulfill the reality, knowledge, and science requirement.
5. Philosophy electives

Writing-Intensive Requirement
The university requires all students to complete at least one course designated “writing intensive” in their majors at the 300 level or above. Philosophy majors should consult the undergraduate coordinator for the courses that can be taken to fulfill this requirement.

Minor in Philosophy
The minor in philosophy is organized according to specific emphases, each one stressing a different aspect of philosophy. The emphasis in the history of philosophy is particularly useful to students in the humanities, especially those who wish to pursue graduate study. Students majoring in the human and natural sciences would benefit from the emphasis in reality, knowledge, and science, while those who hope to pursue a career in law or politics would be well advised to complete the emphasis in social and political philosophy.

Students must complete 18 credits in philosophy and achieve a grade of 2.000 or better in each course. No course may be used to fulfill more than one requirement. The credits must be distributed as follows:

1. Logic: 3 credits chosen from PHIL 173, 273, or 376
2. History of philosophy: 6 credits: PHIL 301 and 303
3. Electives in philosophy: 9 credits at the 300 level or above, including at least 3 credits at the 400 level. Electives may be chosen to complete one of the emphases below.

Emphasis in the history of philosophy
This emphasis requires at least 3 additional credits in the history of philosophy plus 6 credits of electives (see list of courses under the major).
Emphasis in reality, knowledge, and science
This emphasis requires at least 6 credits from courses in reality, knowledge, and science plus 3 credits of electives (see list of courses under the major).

Emphasis in social and political philosophy
This emphasis requires at least 9 credits chosen from PHIL 311, 312, 323, 324, 325, 326, 327, 338, or 470.

Religious Studies, B.A.
The major in religious studies is intended to bring the student to an understanding of the major traditions of world religions. Areas of study include Asian religious traditions, biblical studies, Near Eastern religious traditions including Judaism, Islam, and Christianity. Students develop skills in reading and interpreting sacred texts. They explore the cultural and social dimensions of religion, along with a consideration of religious values and ethics, from comparative and cross-cultural perspectives with relation to global issues.

The courses are writing intensive and allow the student to study and analyze religious ideas and symbols, and encourage students to present well-argued papers.

In addition to the university-wide general education requirements and the requirements for a B.A. degree in the College of Arts and Sciences, religious studies majors must complete at least 39 credits in religious studies distributed as follows:

1. 6 credits of introduction to the main world religions
   RELI 211 Religions of the Near (Middle) East
   RELI 212 Religions of the Orient

2. 9 credits in methodological and comparative aspects of the discipline, including a writing-intensive seminar
   RELI 300 Approaches to the Study of Religion
   RELI 420, 421, 422, 423 Seminar
   RELI 425, 426 Independent Study
   RELI 490 Comparative Study of Religions
   RELI 591 Current Issues in Religious Studies

3. A minimum of 12 credits from the following (which may be selected to emphasize Eastern or Western religious traditions or biblical studies)
   ANTH 313 Anthropological Perspectives on Religion
   PHIL 313 Philosophy of Religion
   RELI 314 Hindu Religion and Philosophy
   RELI 315 Chinese Philosophies and Religious Traditions
   RELI 315 The Buddhist Tradition
   RELI 337 Mysticism: East and West
   RELI 341 Global Perspectives on Spirituality and Healing
   RELI 351 Religions of the Ancient Near East
   RELI 352 Judaism between the Old and New Testaments
   RELI 353 From Creation to Covenant
   RELI 354 The Prophets of Israel
   RELI 355 The Wisdom of Israel
   RELI 356 Jesus and the Gospels
   RELI 370 Judaism: Life and Thought
   RELI 374 Islamic Thought
   RELI 375 Qur’an and Hadith
   RELI 376, 377 Special Topics in Religious Thought
   SOCI 385 Sociology of Religion

4. 6 elective credits in religious studies, philosophy, or related disciplines (including anthropology and art history) to be chosen in consultation with the student’s advisor

Writing-Intensive Requirement
The university requires all students to complete at least one course designated “writing intensive” in their majors at the 300 level or above. Religious studies majors may fulfill this requirement by successfully completing one of the courses under requirement 2 above.

Minor in Religious Studies
The minor in religious studies introduces students to the world’s religious traditions. Within the minor, students may pursue biblical studies or Western or Eastern religious traditions. The minor consists of 18 credits, at least 9 of which must be in 300- and 400-level courses. Three credits must be taken from RELI 100 The Human Religious Experience, RELI 211 Religions of the Near (Middle) East, or RELI 212 Religions of the Orient.

Graduate Program

Track in Liberal Studies, M.A.S.
The Philosophy and Religious Studies Department is the academic and administrative home of the liberal studies track of the Master of Arts in Interdisciplinary Studies. The liberal studies track is designed for students interested in a multidisciplinary and multicultural approach to human ideas and values. The track provides an opportunity for students to broaden their liberal arts backgrounds. The program is for students interested in pursuing graduate degrees in the humanities (e.g., cultural studies, philosophy, religious studies, women’s studies) and those who wish to explore social and political questions within their cultural contexts. It is recommended for teachers and business and professional people who understand that the study of the humanities provides valuable insights into the problems posed by contemporary society.

Admission Requirements
Students must show a capacity for original thought and sustained work in the humanities and liberal arts. Transcripts of all colleges attended, with a minimum undergraduate GPA of 3.000, three letters of reference, and an essay detailing interest in the liberal studies track are required. One of the standardized examinations (GRE, LSAT, or MAT) is strongly recommended.

Prospective students are encouraged to call the coordinator of liberal studies at (703) 993-1292.

Degree Requirements
Students must complete 30 credits of graduate course work and take a comprehensive essay exam. According to university policy, 18 credits must be taken at George Mason University after having been admitted to the degree program. A maximum of 12 credits may be transferred into the program from George Mason’s Extended Studies program, another George Mason graduate degree program, or other accredited institutions. Credits are distributed as follows:
1. 4 required courses (12 credits) chosen from
   LS 500 Religious Worlds in Transition
   LS 502 Religions in Conflict and Dialogue
   LS 511 Contemporary Values
   LS 513 Existence, Faith, and Doubt
   LS 515 Time and the Human Condition
   LS 520 Science, Reason, and Reality
2. 2 elective courses (6 credits) chosen from
   PHIL 510 Seminar in Ethics of Health Care
   PHIL 512 Issues in Philosophy and Literature
   PHIL 531 Freud and Philosophy
   PHIL 555 Environmental Ethics
   PHIL 573 Current Issues in Theory of Knowledge
   PHIL 574 Philosophical Issues in Cognitive Science
   PHIL 591 Special Topics in Philosophy
   PHIL 611 Philosophy of Law
   PHIL 615 Postmodernist Thought
   PHIL 656 Happiness and the Quality of Life
   PHIL 658 Feminist Theory
   PHIL 681 Philosophical Figures
   RELI 591 Current Issues in Religious Studies
   RELI 641 Drama in the World's Religions
   RELI 657 “Scripture” in Religious Traditions
3. 12 credits in a liberal studies emphasis of the student’s choice. Possible emphases include
   • Ethics, politics, and public policy
   • Ethnicity, culture, and class
   • Global religious traditions
   • Philosophy, interpretation, and culture
   • The arts in a cultural context
   • Women’s studies

Physics and Astronomy

Faculty
Professors: Blaisten-Barojas, Dworzecka (chair), Ehrlich, Ellsworth, Kafatos, Lankford, Lieb, Satija, Trefil (Robinson Professor)
Associate professors: Becker, Ceperley, Evans, Wallin, Summers
Assistant professors: Barreto, Gluckman, So, Sambruna, Satyapal
Visiting assistant professors: Oeterer Wyczalkowski
Visiting instructor: Ewell, Geller, Jazaeri

Course Work
The Physics and Astronomy Department offers all course work designated ASTR and PHYS in the “Course Descriptions” chapter of this catalog.

UNDERGRADUATE PROGRAMS

Astronomy, B.S.*
The B.S. in astronomy prepares students for graduate school and careers in research or teaching positions, or employment in industry, business, or science education fields where analytical skills and scientific background are advantageous. Students who are considering a double major in the fields of mathematics, science, computer science, and engineering should talk to an undergraduate coordinator. Some course substitutions are allowed for such majors but must be approved in writing in advance.

*pending approval by SCHEV

In addition to satisfying the university-wide general education requirements for the B.S. degree, candidates must complete a total of 39 credits in physics and astronomy and 17 credits in mathematics, as follows. (Through the coursework below, astronomy majors satisfy the university-wide requirements in natural science and quantitative reasoning.)

1. Seven required core astronomy courses (21 credits): ASTR 103 or 113, 201, 403, 328, 404, 428, 490.
3. Five required math courses (17 credits): 113, 114, 213, 214, and 313 or 314.
4. Nine credits from the following (at least 6 credits must be in upper level courses): ASTR 228, 401, 408, 409, 530, 535, CS 112, MATH 203, 446, 447, PHYS 121, 122, 123, 124, 251, 303, 307, 510, and 575, or any pre-approved PHYS, CHEM, BIOL, or MATH courses.

In meeting requirement number 4, students may choose an area of emphasis. Students who wish to complete an emphasis should plan a program of study in consultation with their advisors. Some areas require more than 9 credits as listed below.

Emphasis in Graduate School Preparation
Prepares students for graduate study in observational or theoretical astronomy. Student must take two courses from: ASTR 530, 535, or MATH 446. They must complete a senior project (ASTR 408) or internship (ASTR 409) in the specialty that they intend to pursue in graduate school.

Emphasis in Computational Astronomy
Prepares students planning for computation/information related jobs in industry and government labs. Student must take nine credits of the following: ASTR 401, PHYS 251 or 510, MATH 446 or 447. In addition, they should complete a senior project (ASTR 408) or internship (ASTR 409).

Emphasis in Astrobiology
Prepares students for careers in research, teaching, or science journalism. Students must take: BIOL 213, 305, 506 (The Origin of Life) and complete a senior project (ASTR 408) or internship (ASTR 409).

Writing-Intensive Requirement
The university requires all students to complete at least one course designated “writing intensive” in their majors at the 300 level or above. Students majoring in astronomy may fulfill this requirement by successfully completing ASTR 490.

Astronomy, B.A.*
The B.A. in astronomy prepares students for a career in industry, business, science education and science writing where analytical skills and scientific background are necessary. Students in the fields of mathematics, science, computer science, and engineering who are considering a double major should discuss it with the undergraduate coordinator. Some course substitutions are allowed for such majors but they must be approved in writing in advance.

In addition to satisfying the university-wide general education requirements for the B.A. degree, candidates must complete a total of 30 credits in physics and astronomy and 11 credits in mathematics, as follows. (Through the coursework...

http://catalog.gmu.edu
below, astronomy majors satisfy the university-wide requirements in natural science and quantitative reasoning.)

1. Six required core astronomy courses (18 credits): ASTR 103 or ASTR 113, 201, 228, 328, 403 or 404, and 490.
2. Five required physics courses (12 credits): 160, 260, 261, 262, and 263.
3. Three required math courses (11 credits): 113, 114, and 213.
4. Nine credits from the following (at least 6 credits must be in upper level courses): ASTR 401, 403, 404, 408, 409, 428, 530, 535; CS 112; PHYS 121, 122, 123, 124, 251, 303, 305, 307, 308, 510, and 575, or any pre-approved PHYS, CHEM, BIOL, or MATH course.

Writing-Intensive Requirement
The university requires all students to complete at least one course designated "writing intensive" in their majors at the 300 level or above. Students majoring in astronomy may fulfill this requirement by successfully completing ASTR 490.

Emphasis in Computational Physics
This emphasis is for students who wish to pursue a career that applies computers to the solution of physical problems and data analysis. To complete this emphasis, students should take at least 9 credits from the following courses: PHYS 510, ECE 442, MATH 446 and 447. In addition, they complete a senior project (PHYS 408) or honors thesis (PHYS 405 and 406) on a problem that involves the use of the computer for the solution of a physical problem.

Emphasis in Astrophysics
This emphasis is for students who are planning to attend graduate school in astrophysics or pursue a career in industry. To complete this emphasis, students should select four courses from the following: PHYS 428, ASTR 328, 530, 532, 535, and MATH 446. In addition, students should complete a senior project (PHYS 408) or honors thesis (PHYS 405 and 406) on an astrophysics problem.

Emphasis in Electronics
This emphasis is for students who wish to pursue a career in industry applying a strong background in electronics to physical problems. To complete this emphasis, students should take at least 9 credits from the following courses: ECE 301, 333, 430, 431, and 433. In addition, they should complete a senior project (PHYS 408) or honors thesis (PHYS 405 and 406) on an electronics problem.

Emphasis in Applied Solid State Physics
This emphasis is for students who wish to pursue a career in the semiconductor industry. To complete this emphasis, students should take the following courses: PHYS 512, ECE 430, and ECE 431. In addition, the student should complete a senior project (PHYS 408 or 409) or honors thesis (PHYS 405 and 406) in applied solid state physics.

Writing-Intensive Requirement
The university requires all students to complete at least one course designated "writing intensive" in their majors at the 300 level or above. Students majoring in physics may fulfill this requirement by successfully completing PHYS 416.

Honors Program in Physics
Physics majors who have completed the prerequisites for PHYS 405 and 406 Honors Thesis in Physics and who have maintained an overall GPA of at least 3.5 in physics courses and a GPA of 3.5 in all courses taken at George Mason may apply to the departmental honors program. To graduate with honors in physics, a student is required to maintain a minimum GPA of 3.5 in physics courses and to successfully complete PHYS 405 and 406 with a GPA of at least 3.5 and a grade of at least A- in PHYS 406.

Minor in Physics
A minor in physics requires 18 credits, including PHYS 160, 260, 261, 262, and 263, and any two courses from PHYS 303, 306, 307, 308, 402, 428, and 305 or 513.

Minor in Astronomy
A minor in astronomy requires the completion of a physics prerequisite and 15 credits in astronomy. The prerequisite consists of one of the two sequences: PHYS 243, 244, 245, 246; or PHYS 160, 260, 261, 262, 263. Following the introductory physics sequence, students are required to take ASTR
Physics for Majors

Students who intend to major in physics should take the physics introductory sequence (PHYS 160, 260, 261 or 265, 262, 263). Students who decide to major in physics after completing PHYS 243 and 245 may do so but only with written permission of the Physics and Astronomy Department. Those students are required to take at least 4 additional credits in approved physics courses.

Physics for Nonmajors

PHYS 243, 244, 245, and 246 are recommended for biology, chemistry, geology, and premedical students and for mathematics students who seek a bachelor of arts degree. PHYS 101, 102, 103, and 104 are intended for nonscience majors. PHYS 160, 260, 261 or 265, 262, 263 constitute a calculus-based sequence in general physics to be taken by physics and engineering majors and chemistry, computer science, and mathematics students who are pursuing a bachelor of science degree. Students may receive credit for only one of the following three sequences: PHYS 243, 244, 245, 246; or PHYS 103, 104; or PHYS 160, 260, 261, 262, 263.

Premedical, Predental, and Preveterinary Students

Students planning to enter medical, dental, or veterinary schools may meet the requirements of these professional schools by majoring in physics. Those students should consult with the premedical advisor for physics.

Teacher Licensure

Students who wish to become teachers should consult the section, "Professional Licensure" in the Graduate School of Education chapter and attend an information session during their sophomore year. Information sessions for teacher licensure are offered every month. Call (703) 354-2892 / 4448, e-mail gseinfo@gmu.edu, or consult the web site at gse.gmu.edu for more information.

GRADUATE PROGRAMS

Applied and Engineering Physics, M.S.
The M.S. in Applied and Engineering Physics contains both elements of traditional physics programs and the application of physics to a diversity of critical societal problems. The program is divided into two emphases. The applied physics emphasis is intended for those who wish to apply the techniques and subject areas of physics to multifaceted problems encountered in the workplace, particularly in physics, engineering, computational science, and other related areas. The engineering physics emphasis, jointly administered with the Department of Electrical and Computer Engineering, allows students to select a larger number of courses from electrical engineering.

All courses are offered during late afternoon or evening hours to allow students with full-time employment to attend easily. Persons employed at area high-technology organizations may take up to 6 credits (out of 30) for work done on the job under the guidance of a faculty member. This employment-related research may be conducted either under an optional 3-credit research project or an optional 6-credit master's thesis. Master's students who are not employed full time may apply for financial aid or for a limited number of research assistantships.

Admission Requirements

Those holding a baccalaureate degree in physics or a related field from an accredited institution and who earned a GPA of 2.750 (out of 4.000) in their last 60 credits are invited to apply for admission. If the baccalaureate degree is in a field other than physics, the applicant should have taken several courses beyond the introductory physics courses, such as junior-level classical mechanics, electricity and magnetism, or electronics. An applicant may be required to make up one or two deficiencies, based on a graduate physics advisor's assessment, and still be permitted to enroll in the program. Two letters of recommendation must be submitted, preferably from former professors. The general Graduate Record Examination (GRE) and the GRE subject test in physics are recommended for applicants who received their baccalaureate degrees within the last five years. A less recent bachelor's degree recipient may present a statement of his/her work experience in lieu of the GRE.

Degree Requirements

Candidates for the degree must successfully complete 30 credits as follows:

1. 9 credits of required core courses: PHYS 510, 513, and 732 or 736.

2. 9 credits in an emphasis
   a. For the applied physics emphasis, any three of the following courses: PHYS 512, 533, 540, 575, 612, 613, 620, 676, 701, 705, 711, 722, 728, 732, and 736; ASTR 530, 761, 764, 765, and 766
   b. For the engineering physics emphasis, PHYS 533 and any 6 credits in electrical engineering (ECE)

3. 12 credits of electives chosen from courses in physics, chemistry, mathematics, engineering, information technology, and computational sciences and informatics. No more than 6 credits may be chosen from areas outside PHYS, ASTR, CSI, and ECE. Elective credits can include a project (PHYS 798) or thesis (PHYS 799)

4. Students may choose to do either ECE/PHYS 798 Research Project (3 credits) or ECE/PHYS 799 Master's Thesis (6 credits), but not both. The research project may be conducted at a student's place of employment with the concurrence of a faculty advisor. The thesis is a more substantial piece of work performed under the supervision of a major professor and requires the student to make an oral defense. ECE/PHYS 798 may be taken only once. No more than 6 credits of PHYS 799 may be applied to the degree.

In addition to the requirements stated above, a student may also select an emphasis in astrophysics, atmospheric physics, biological applications of physics, computational physics, condensed matter, instrumentation (engineering physics), or nonlinear dynamics. An emphasis requires that a student complete 15 credits of approved courses. The students in the master's degree program can earn a graduate certificate in Computational Techniques and Applications from the School of Computational Sciences by choosing an approved sequence of courses.
Physics, Bachelor's/Accelerated Master's Program

The five-year Bachelor's/Accelerated Master's Degree program allows academically strong undergraduates with a commitment to research to obtain a B.S. and a M.S. degree within five academic years (plus summers their last two years). The program leads to a research-based M.S. degree following satisfactory completion of 144 credits. Upon completion of this program, a student will be exceptionally well prepared for entry into either a professional school or a Ph.D. program in physics or a related discipline. Qualified students can enter this program after completion of 90 credits and can enroll in graduate courses when they have successfully completed the prerequisites. Offering this flexibility makes it possible for students to complete some of their graduate classes during their junior and senior years. Consult the department for details on the program.

Computational Sciences and Informatics, Ph.D.

The doctoral program in computational sciences and informatics includes concentrations in computational physics and in space sciences and computational astrophysics. See the "School of Computational Sciences" chapter for degree and admission requirements.

Psychology

Faculty

Professors: Barocas, Boehm-Davis, Denham, Klimoski (director, Applied Experimental Program and the Center for Behavioral and Cognitive Studies), Lehman (director, Developmental/Biopsychology/School Programs), Maddux (associate chair for graduate studies), Mandes, Naglieri (director, Center for Cognitive Development), Pasnak, Riskind, Schiff, R. Smith (chair), Tangney, Wahl (director, Clinical Training)

Visiting professor: Fedio

Research professors: Butler, Olds

Associate professors: Allen, Bitter, Blaha, Buffardi, Cortina, Erdwinski, Flinn, Gerton, Gessner, Gray, Holt, Merydith (director, School Psychology Program), Rugel, Sanford (associate chair for undergraduate studies), Short, Winsler, Zaccaro

Research associate professors: Mahach

Assistant professors: Ascoli, McFarland, Schunn

Visiting associate professors: Chroniak, Wanschura

Research assistant professor: Chong, Wochinger


More information about the department, its faculty, and its programs can be found at its web site through the university's main page at www.gmu.edu.

Course Work

The Psychology Department offers all course work designated PSYC in the "Course Descriptions" chapter of this catalog.

UNDERGRADUATE PROGRAMS

Psychology, B.A.

In addition to the university-wide general education requirements and the requirements for the B.A. degree in the College of Arts and Sciences, psychology majors must complete the following:

1. 36 credits of psychology (24 of which must be at the 300 and 400 levels) including PSYC 100 (fulfills the university social science requirement), 211, 231, 300, 301, 317, 325, 372, and 465; and one of the following: PSYC 304, 309, 320, 323, or 373

2. It is strongly recommended that students fulfill the natural science requirement by completing BIOL 103 and 104 (These courses are prerequisites to PSYC 372.) Students who receive transfer credit for a research methods course must take PSYC 304, 309, or 323 unless the transfer course has been approved as writing intensive.

Some of these courses may simultaneously fulfill university or college general education requirements, and students should consult with an advisor in planning their programs.

Psychology, B.S.

In addition to satisfying the university-wide general education requirements for a B.S. degree, candidates must complete the following:

1. 38 credits of psychology (24 of which must be at the 300 and 400 levels) including PSYC 100 (fulfills the university social science requirement), PSYC 211, 231, 300, 301, 317, 325, 372, and 465; and one of the following: PSYC 304, 309, 320, 323, or 373

2. 14 credits of natural science; this must include BIOL 103 and 104 (fulfills the university natural science requirement), plus six credits from ASTR, BIOL, CHEM, GEOL, PHYS, GEOG 102 and 309, and UNIV 301

3. 6 credits of mathematics, selected from MATH 108, 110, 111, 113, and 114 (fulfills university quantitative reasoning requirement)

4. 3 credits of IT 103 (fulfills the university IT proficiency requirement)

5. 12 credits of social/behavioral science (not in psychology or GEOG 102 or GEOG 309) and fine arts/religious studies/philosophy (other than PHIL 173 and 376). Courses must include a minimum of six credits in social/behavioral science and three in fine arts/religious studies/philosophy. (These may fulfill the university social sciences and fine arts requirements)

6. 3 credits of English or a third laboratory course in psychology selected from PSYC 304, 309, and 323.

7. 6 credits of literature (ENGL 201; any other course in English literature at the 200 level, for which ENGL 201 is a prerequisite; and/or any literature course in foreign languages at the 300 level or above) (3 credits fulfill the university-wide literature requirement.)

Information for All Majors in Psychology

A grade of D in any of the 9 (10 for B.S. students) required psychology courses may not be used toward graduation.

All psychology courses may be used to satisfy either the 36-credit psychology requirement for the B.A. degree or the 38-credit psychology requirement for the B.S. degree with the following restrictions:
College of Arts and Sciences

1. A maximum of 6 credits may be counted from PSYC 327, 328, 421, 422, 548, and 549.
2. A maximum of 6 credits may be counted from PSYC 260, 350, and 460.
3. No more than 9 credits can be taken from 1. and 2. above without written permission of the department chair.
4. PSYC 330 may not be taken for credit by psychology majors.

In addition to course work, undergraduate research experience and letters of recommendation are major factors for admission to graduate study. Therefore, students interested in graduate study should distribute courses across a number of areas in psychology and work closely with one or more professors on an individual project during the junior and senior years.

Writing-Intensive Requirement

The university requires all students to complete at least one course designated “writing intensive” in their majors at the 300 level or above. Students majoring in psychology may fulfill this requirement by successfully completing PSYC 301, 304, 309, or 323.

Honors Program in Psychology

Students majoring in psychology may apply to the Honors Program in Psychology. The Honors Program consists of a sequence taken over three consecutive semesters, PSYC 490, 491, and 492 (see “Course Descriptions” chapter of this catalog), to be taken during the spring semester of the student’s junior year and fall and spring semesters of the senior year. For more information, please contact the Undergraduate Psychology Office or the director of the Honors Program in Psychology.

To be eligible for admission, psychology majors must have completed at least 50 credits, have a minimum cumulative GPA of 3.25, and a minimum GPA of 3.40 in psychology courses. To graduate with honors in psychology, a student is required to maintain a minimum GPA of 3.25 and a minimum GPA of 3.40 in psychology courses. Students must earn at least 3.50 in their three honors courses culminating in the successful completion and presentation of an independent honors thesis.

Minor in Psychology

The Psychology Department offers a minor to students who major in any other discipline at the university. Students in the minor complete 18 credits of course work in psychology distributed as follows.

1. 3 credits of PSYC 100 Basic Concepts in Psychology
2. One course from three of the following five areas (9 credits). At least one course must be PSYC 317 or 372.
   - Developmental: PSYC 211 or 313
   - Social/Personality: PSYC 231 or PSYC 324
   - Cognition: PSYC 317
   - Abnormal: PSYC 325
   - Physiological: PSYC 372
3. 6 additional credits of psychology courses. No more than 3 credits may be taken from PSYC 260, 350, and 460.

Related coursework in psychology can enhance many different majors. Please contact the Undergraduate Psychology Office or the Psychology Department web site for a list of suggested courses for students who are majoring in specific disciplines or areas of study that interact well with psychology.

Teacher Licensure

Students who wish to become teachers should consult the section, “Professional Licensure” in the Graduate School of Education chapter and attend an information session during their sophomore year. Information sessions for teacher licensure are offered every month. Call (703) 993-2892/4648, email gseinfo@gmu.edu, or consult the web site at gse.gmu.edu for more information.

GRADUATE PROGRAMS

Psychology, M.A.

The Department of Psychology offers an M.A. in Psychology with concentrations in industrial/organizational psychology, human factors/applied cognition, school psychology, applied developmental psychology, and experimental neuropsychology. The department does not offer an M.A. in clinical or counseling psychology, but an M.A. concentration in clinical psychology is available for students who have been admitted to the Ph.D. program.

The industrial/organizational concentration trains students in the conduct and application of psychological research in work settings. Expertise can be developed in a variety of areas including personnel selection, training, leadership, motivation, and human performance assessment.

The human factors/applied cognition concentration trains students in the application of cognitive science to real-world problems. Students gain expertise in such areas as human-computer interaction, cognitive system engineering, cognitive ergonomics, and documentation. Faculty members help place students who do not have real-world experience in a part- or full-time practicum before completing the degree.

The school psychology concentration prepares students for endorsement as fully certified school psychologists in Virginia and in most other states. It is approved by the Virginia Department of Education and meets the standards of the National Association of School Psychologists.

The applied developmental psychology concentration focuses on child development. It provides basic knowledge about normal development, skills for assessing developmental level, and techniques for planning and evaluating programs that foster optimal development.

The biopsychology concentration emphasizes training in the neurobiological bases of behavior. Students are prepared for doctoral work or employment in government or industry research laboratories.

The clinical psychology concentration seeks to develop clinical psychologists with a strong capacity to create and integrate new knowledge and procedures into practice.

Admission Requirements

In addition to fulfilling admission requirements for graduate study, applicants must have 15 credits in psychology, including a course in statistics and a laboratory course in psychology. In addition, school psychology requires courses in personality or abnormal psychology, developmental psychology, and tests and measurements. All applicants are required to submit the results of the Graduate Record Examination (GRE) taken within the last five years (applicants should...
plan to take the GRE at least two months before the deadline; three letters of reference from professors or supervisors; and a departmental application. In addition, applicants are asked to submit a biographical statement outlining their background and experience and describing their future goals in psychology. An overall GPA of 3.0 for the last 60 undergraduate credits is required and, generally, a minimum of 3.250 in undergraduate psychology courses, and combined GRE scores of 1,000 or above are also required. Work experience, publications, or special recommendations may compensate for deficiencies in other qualifications. The deadline for receipt of all application materials is January 1 for the clinical psychology concentration; February 1 for the school psychology, applied developmental and biopsychology concentrations; and April 15 for the industrial/organizational and human factors/applied cognition concentrations. Because the number of students admitted to each program is limited, meeting these minimum requirements does not guarantee admission.

Financial Assistance
Financial assistance is available through graduate assistantships and various forms of grants, loans, and employment.

Concentration in Industrial/Organizational Psychology
Students must complete 32 graduate credits including the following:
- 3 credits of core: PSYC 701, 703, or 667
- 8 credits of quantitative and research methods: PSYC 611, 612
- 12 credits of specialized content: PSYC 636 and 639; three credits from PSYC 557, 592, 631, 638, 640, 733, and 736; and select three credits from PSYC 592, 635, 735, 739, and 741
- Practicum (optional: 6 credits of practicum; requires permission of advisor)
- Thesis (optional: 6 credits of thesis; requires permission of chair)
- Electives: No more than 6 credits of advisor-approved electives from outside the department

Concentration in Human Factors/Applied Cognition
Students must complete 32 graduate credits including the following:
- 3 credits of core: PSYC 701, 766, or 768.
- 8 credits of quantitative and research methods: PSYC 611, 612
- 6 credits of specialized content: PSYC 530, 645
- 6 credits of PSYC 734, 766, 768, or 737 (these may be repeated)
- Practicum 792 (optional: 6 credits of practicum requires permission of advisor)
- Thesis 798, 799 (optional: 6 credits of thesis requires permission of chair)
- Other courses within or outside the department may be taken with advisor's approval

Concentration in School Psychology: Masters Degree and Certificate of Advanced Graduate Studies
The master's degree concentration and the Certificate of Advanced Graduate Studies in School Psychology make up a two-level degree program to prepare graduates for professional certification in school psychology. The program is designed to meet the approval for School Psychology Training Programs by the National Association of School Psychologists (NASP); students completing the program will be eligible for licensure to work in Virginia public schools as a school psychologist. (Students seeking licensure for independent practice as a school psychologist must meet the educational, residency, and examination requirements of the Commonwealth of Virginia Board of Psychology.) Students who have not already earned a master's degree in a related field must apply for admission to both the master's program and the Certificate of Advanced Graduate Studies. All students entering the master's program are expected to complete the certificate.

Students who wish to apply directly to the certificate program must have earned a master's degree in an allied field such as counseling, clinical psychology, developmental psychology, or special education, in which at least 15 graduate credits correspond to required courses in the master's curriculum below. They must complete all the requirements of the master's in school psychology that they have not previously taken.

Students must receive a B or better in the course work below. Coursework must be completed before the internship. School psychology students are required to enroll full time.

To receive the master's degree with a concentration in school psychology, students must complete 47 credits:
- PSYC 709, 710, 750, 671, 678, 673, 704, 617, 701
- PSYC 506 or 669
- PSYC 611 and 612
- EDUC 529
- EDLE 621 or 612
- EDSE 655

To receive the Certificate of Advanced Graduate Studies, students must complete 25 credits: PSYC 712, 722, 684, 792, 750, 790

Previously earned credit
With the approval of the school psychology faculty, the graduate coordinator, and the dean, the number of credits required for the concentration in school psychology may be reduced by a maximum of 18 credits on the basis of graduate course work before admission.

With the approval of the graduate coordinator and the dean, students admitted directly to the certificate program may transfer up to 3 graduate credits from another institution.

A special policy applies to students admitted directly to the certificate program who received a master's degree in psychology with a concentration in school psychology, or special education, in which at least 15 graduate credits from another institution. Such students should consult with an advisor.
At the conclusion of course work, students may choose to complete a thesis or practical research project concurrent with the internship. All students must complete a full year of internship. An unsatisfactory evaluation at any time by the School Psychology Committee may result in separation from the school psychology program.

♦ Concentration in Applied Developmental Psychology
Students must complete 32 graduate credits including the following:
• 6 credits of core: from cognitive (PSYC 701, 766, 768), biological (PSYC 702, 558, 559), or social (PSYC 703, 667 or 668)
• 8 credits of quantitative methods: PSYC 611, 612
• 9 credits of specialized content: from PSYC 592, 666, 669, 704, or 780
• 9 credits of electives
• 6 credits of practicum or thesis optional (practica contingent on availability; thesis only with permission of chair)

♦ Concentration in Biopsychology
Students must complete 32 graduate credits including the following:
• 8 credits of quantitative methods: PSYC 611, 612
• 9 credits of specialized content: PSYC 531, 558, 559
• 3 credits of methods or statistics: PSYC 646, 652, 693, 754, 755, or 756
• 6 credits of electives to be selected from relevant courses including the following:
  PSYC 561 Behavioral Biology of Substance Abuse
  BIOL 583 General Biochemistry
  PSYC 646 Issues and Methods in Developmental Psychology
  BIOL 693 Directed Studies, Bioinstrumentation
  PSYC 702 Biological Bases of Behavior
  PSYC 704 Life-Span Development
• 6 credits of thesis: PSYC 798, 799. Six credits of practicum (PSYC 792) may serve as a substitute if approved by the advisor and program coordinator.

George Mason undergraduate students may be eligible to admission to an accelerated M.A. in Psychology with a concentration in biopsychology. This program makes it possible for students to complete some graduate classes during their last 30 credits of their undergraduate degrees. Interested undergraduates should contact the department.

♦ Concentration in Clinical Psychology
Students who have been admitted to the doctoral program with a concentration in clinical psychology are awarded an M.A. in psychology upon completion of the following:

1. PSYC 611/612 Advanced Statistics I and II (8)
2. Three of the following courses:
   - PSYC 701 Cognitive and Affective Bases of Behavior (3)
   - PSYC 702 Biological Bases of Behavior (3)
   - PSYC 703 Social Bases of Behavior (3)
   - PSYC 704 Life-Span Development (3)
   - PSYC 705 Historical and Philosophical Issues in Psychology (3)
3. PSYC 880 Clinical Foundations (3)
4. PSYC 830 Theories of Psychotherapy (3)
5. A total of 30 graduate credits in psychology
6. Good standing in the clinical program (as determined by the director of clinical training)

The M.A. concentration in clinical psychology is not a terminal degree to which individuals can apply independent of the Ph.D. It is awarded only to clinical Ph.D. students who have met the above requirements.

Nondegree Status
Applicants who qualify for degree status but who are not applicants for a degree at the university may be admitted to nondegree status. Nondegree status is not intended as a qualifying program for degree status. While consideration may later be given to the application of credits earned toward a degree program while in nondegree status, applicants are not assured that such requests will be granted. If granted, however, no more than 12 credits earned in nondegree status may be applied to a degree program. All students seeking to pursue this option should make their interests known to the appropriate program coordinator.

Provisional Admission
Students admitted provisionally must take 12 credits in psychology and earn a minimum GPA of 3.250 in those courses to qualify for removal of provisional qualifier. Programs may add other conditions to provisional admission. Individualized study work does not count toward the 12 credits.

Psychology, Ph.D.
The goal of the doctoral program is to train students in the principles and applications of psychology. To accomplish this, the program provides students with both knowledge of the basic content areas in psychology and practical experience in applying this knowledge to solving human problems in life, work, and school. The program offers the following concentrations: industrial/organizational psychology, human factors/applied cognition, clinical psychology, applied developmental psychology, and biopsychology.

The concentrations in industrial/organizational psychology and human factors/applied cognition, grouped under the applied experimental program, are focused on educating psychologists in the use of psychological knowledge and methods employed in settings such as industry, government, consulting organizations, and research and development organizations. Students develop skills in such areas as human-computer interaction design, cognitive ergonomics, training, personnel selection, and organizational psychology.

The clinical psychology concentration focuses on educating clinical psychologists to deal with the unique demands of mental health systems and private practice.

The applied developmental concentration has two goals:
(1) to train students to teach and do research on basic and applied issues in child development for employment in such settings as universities, research institutes, and organizations, and (2) to train students to do applied work in developmental psychology (consultation, program evaluation, assessment and evaluation, developmental interventions, parent training) in such settings as schools, hospitals, courts, child
care facilities, and other organizations. Applied development-
tal psychology doctoral students have the option of also com-
pleting course requirements for the M.A. concentration in
school psychology. The program emphasis is on child de-
velopment (infancy, early childhood, middle childhood, and
adolescence), and students may focus their studies on the
cognitive, social, emotional, language, personality and/or
physiological aspects of development.

The biopsychology concentration offers a broad program
with faculty expertise in comparative neuroanatomy, cogni-
tion, substance abuse, and learning and memory. The de-
partment has facilities for animal research, access to the
Shared Research Instrumentation Facility (SRIF), and links
to the Krasnow Institute for Cognitive Study. The program
prepares students for careers in a university, college, or re-
search setting.

Admission
Entering students are accepted only for fall semesters. The
deadline for receipt of all application materials is January 1.
The department does not normally consider applications that
fail to meet the minimum criteria of 3.0 undergraduate GPA,
3.250 in psychology course work, and combined GRE scores
of 1100. Applicants who meet this minimum receive contin-
guidance of the final candidate pool on the basis
of experience, letters of recommendation, objective test
scores, and (in some programs) an interview. No specific
set of qualifications guarantees admission.

Documents
Each applicant must provide the following materials by Janu-
ary 1 to be considered for admission:
1. Completed graduate admission application, with fee.
2. Completed Virginia Domicile Classification form.
3. Completed Department of Psychology application form.
4. All undergraduate and graduate transcripts.
5. Three letters of recommendation (forms are enclosed with
   general graduate application) from individuals who have
   firsthand knowledge of the applicant’s academic capa-
   bilities and/or work experience.
6. A two- to three-page typewritten personal statement de-
   scribing professional goals, training history, and reasons
   for seeking the Ph.D.
7. Graduate Record Examination (GRE) taken within the
   last five years and before the January 1 deadline (appli-
   cants should take the GRE by October because applica-
tions cannot be processed until these scores are received).
   Scores must be sent directly from Educational Testing
   Service, P.O. Box 955, Princeton, NJ 08541. Only the
   aptitude scores are required, but scores for the Advanced
   Test in Psychology may also be submitted.
8. A writing sample selected from academic papers, pub-
    lications, or professional reports.
9. Applicants in the final candidate pool may be required to
   participate in an interview.

All materials should be sent directly to the Graduate Admis-
sions Processing Center, College of Arts and Sciences,
George Mason University, MS 2D2, Fairfax, VA 22030-4444.
Applicants are responsible for ensuring that all materials
arrive before the January 1 deadline.

Requirements
In addition to fulfilling the admission requirements, appli-
cants in the program are expected to have the following:

For the Ph.D. with a concentration in industrial/organiza-
tional psychology or in human factors/applied cognition, at
least 15 credits in psychology, including a statistics course
and a laboratory course in psychology, are required. A tests
and measurements course is recommended.

For the Ph.D. with a concentration in clinical psychology, at
least 15 credits in psychology, including a statistics course,
a laboratory science course, and abnormal psychology, are
required. Courses in developmental psychology, personality,
physiological psychology, and tests and measurements are
desirable.

For the Ph.D. with a concentration in applied development-
tal psychology, at least 15 credits in psychology, including
statistics and a laboratory course in experimental psychol-
ogy, are required. Courses in personality, abnormal psychol-
gy, developmental psychology, and tests and measurements
are also required for applicants to the school psychology
concentration within the M.A. program.

For the Ph.D. with a concentration in biopsychology, at least
15 hours of psychology, including physiological psychol-
ogy, statistics, and a lab course in experimental psychology.

Financial Assistance
Financial assistance is available through graduate assistant-
ships, doctoral fellowships, and various forms of grants,
loans, or employment.

Reduction of Credits
For students entering the doctoral program with a master’s
degree, the number of credits required may be reduced by a
maximum of 30 credits subject to the approval of the pro-
gram faculty and the dean. Requests for reduction of credit
are reviewed by a committee only after acceptance to the
Ph.D. program.

Degree Requirements
The Ph.D. program has four educational components: core
courses, upper-level specialty courses, supervised practica,
and dissertation.

Core Courses
Core course requirements cover the basic subject matter iden-
tified by the profession as essential to doctoral training:
biological bases of behavior, social bases of behavior, cog-
nitive bases of behavior, individual behavior, and history of
psychology.

Specialty Courses
The 700-, 800-, and 900-level courses provide doctoral can-
didates with greater depth of study in specific content areas.

Practica
The purpose of the practica is to provide a broad range of
experiences in settings related to the students' concentrations.

Dissertation
The dissertation requirement is designed to demonstrate the
student’s ability to apply psychological principles to research
problems. Students must take at least 3 credits of proposal
Students are to take credits in PSYC 897 Directed Reading and Research each semester.

Students are strongly encouraged to develop competence in programming and computer science by course work or independent study.

Students are encouraged to identify and take relevant courses within or outside the department (with advisor's approval).

**Concentration in Clinical Psychology**

The clinical psychology program at George Mason University is guided by the scientist-practitioner model. The necessary preparatory training requires the following:

- A primary commitment by both faculty and students to research and clinical work.
- The ability to conduct, evaluate, and apply research. Clinical psychologists must be able to create new knowledge and apply new discoveries to clinical problems. They must be capable of, and committed to, evaluating the services provided to consumers.
- A broad knowledge of psychological science. Clinical psychologists must possess a fundamental knowledge of their field.
- Exposure to a variety of approaches in clinical psychology. Clinical psychologists must be aware of a range of perspectives on psychopathology, assessment, and intervention to ensure flexible and creative approaches to problems they encounter.
- Acquisition of skill and experience in the major techniques of assessment and intervention. Clinical psychologists should acquire skills and substantial experience in human service settings.
- A recognition of the need for skills for provision of service to special populations and opportunities for working with such groups.

The clinical faculty are strongly committed to the support of cultural diversity within its programs. This includes both admission and training of students from diverse ethnic and racial backgrounds and exposure of all students to issues of cultural diversity and to work with diverse populations.

Students must complete 88 graduate credits (36 in general core courses, 25 in required clinical core courses, 12–14 credits of advanced clinical courses, and 15 credits of electives organized around a theme).

- 36 credits of required general core courses
  - PSYC 701 Cognitive and Affective Base of Behavior
  - PSYC 702 Biological Bases of Behavior
  - PSYC 703 Social Bases of Behavior
  - PSYC 704 Life-span Development
  - PSYC 705 History and Philosophical Issues
  - PSYC 611, 612 Quantitative Methods I, II
  - PSYC 998 Doctoral Dissertation Proposal
  - PSYC 999 Doctoral Dissertation Seminar in professional psychology (1)

- 25 credits of required clinical core courses
  - PSYC 822 Psychopathology I
  - PSYC 810 Intellectual Assessment
  - PSYC 880 Clinical Foundations
  - PSYC 830 Theories of Psychotherapy
  - PSYC 840 Community Psychology Theory
  - PSYC 881 Assessment and Psychotherapy Supervision
  - PSYC 885 Internship

(998) and 3 of research (999) and must have at least 12 credits of 998 and 999 combined. (No more than 12 credits of 998 and 999 may be applied toward the degree.)

**Student Evaluation**

A student in the doctoral program is evaluated on the basis of grades, comprehensive examinations, research, and communication skills. In doctoral courses, A and B are the only acceptable grades. Students in the doctoral program must successfully complete comprehensive examinations administered each year in August. A student who successfully completes the comprehensive examinations is admitted to doctoral degree candidacy.

**Concentration in Industrial/Organizational Psychology**

Students must complete 88 graduate credits taken from the following:

- 9 credits from cognitive (PSYC 701, 766, or 768), social (PSYC 703, 667, or 668), and historical (PSYC 705) core (one from each cluster)
- 8 credits of quantitative and research methods: PSYC 611 and 612
- 9 credits of advanced quantitative and research methods: PSYC 557, 754 and 756
- 18 credits of specialized content: PSYC 636, 639; six credits from PSYC 631, 638, 733, 736, 592/892; and 6 credits from PSYC 735, 739, 741, 592/892
- 3 credits of special topics in professional issues: PSYC 890
- 9 credits of electives (can be outside the department with advisor approval)
- 20 credits of practicum (PSYC 790) or directed readings (PSYC 897) (at least 1 credit per semester)
- 12 credits of dissertation: PSYC 998 and 999

**Concentration in Human Factors/Applied Cognition**

Students must complete 88 graduate credits to include the following requirements:

- 3 credits of cognitive core: PSYC 701, 766, or 768.
- 6 credits of core from biological (PSYC 702, 558, or 559), social (PSYC 703, 667, or 668), developmental (PSYC 704, 666, or 669), or historical (PSYC 705).
- 8 credits of quantitative and research methods: PSYC 611 and 612.
- 9 credits of advanced statistics or qualitative methods.
- 6 credits of specialized content: PSYC 530 and 645.
- 9 credits of additional specialized content to include PSYC 734, 737, 766, or 768.
- 3 credits of Special Topics in Professional Issues: PSYC 890.
- Options: To reach the 88 credits required for the Ph.D., students may repeat 734, 737, 766, and/or 768.
- 6 credits of practicum (PSYC 730) with permission of advisor. (Students who do not have work experience in applied cognition or human factors are encouraged to take up to six credits of practicum.)
- 12 credits of dissertation: PSYC 998 and 999.
Emphasis in Clinical Neuropsychology

Students may elect to pursue an emphasis in clinical neuropsychology within the clinical program. This course of study trains students in both clinical and research methods that focus on altered brain-behavior relations in individuals with neurological or neuropsychiatric disorders. Students complete the core courses within clinical psychology, including intellectual and personality assessment. Students also select courses dedicated to advancing their knowledge and skills in neuropsychological theory and assessment, and cognitive neurosciences.

Clinical training is provided through placements in local hospitals and clinical/research programs serving adults and children with neurological disorders. Research training employs various clinical and experimental methodologies to study the neural basis of behavior and the effects of brain injury on cognition and emotion.

Public and International Affairs

Faculty
Robinson Professors: Heclo, Paden
Professors: R. Clark, Conlan, Gortner, Katz, Keeter, Mastrofski, Sockett
Associate professors: Brindle, Brown, Conant, Dudley, Friedlander, Harbour, Hart Nibbrig, Lukacs, Mahler, McFerson, Hung Nguyen, Regan, Sacco, Travis, Walters, Wan
Assistant professors: Balint, Burt, Gallagher, Gould, Hackler, Maguire, Mandaville, McDonald, Miller, Rivera, Shogan, Snyder, Toepeler, Wilson
Visiting assistant professors: Burroughs, Bushee, Casamayou, J. Clark
Visiting instructor: Lay
Nonprofit Professional in Residence: Lewis
Research professor: Turner
Affiliate faculty: Brandwine, Butler, Czarda, Fuller, Garreau, Gifford, Haines, Haynes, Hennessey, Kash, Lipset, Pfiffner, Rossell, Slaght, Stevenson, Stough, Tolchin

Course Work

The Public and International Affairs Department offers all course work designated ADJ, GOVT, and PUAD in the "Course Descriptions" chapter of this catalog.

UNDERGRADUATE PROGRAMS

Government and International Politics, B.A.

In addition to satisfying the university-wide general education requirements and the requirements for the B.A. degree in the College of Arts and Sciences, students majoring in government and international politics must complete the following. With careful planning, some courses required for the major may also fulfill college requirements and/or uni-
University general education requirements. See an advisor before registering.

1. 15 credits in core requirements: GOVT 101, 103, 132, 133, 300 (fulfills the university social science requirement)

2. 24 credits in advanced government courses. At least 3 credits must be taken from each of the fields listed below:
   - American politics: GOVT 301-319, 400-419
   - Political theory and law: GOVT 320-329, 420-429
   - International and comparative politics: GOVT 330-349, 430-449

   Public administration and policy: GOVT 350-369, 450-469

With permission of an advisor, a total of 9 credits of GOVT 480, GOVT 490, GOVT 491, and GOVT 496 may be substituted for upper-division GOVT field courses. Only 3 credits of 6-credit GOVT 480 and 6 credits of GOVT 496 may be substituted for major requirements.

3. 3 credits of analytic or language competency skills from the following: GOVT 359, 400, 459; ECON 103, 104; SOCI 313, 405; any CS, MIS, INFS, IT, or STAT course; or an upper-level foreign language course taught in the language.

4. Students may choose to concentrate in one of the four fields listed above by completing 5 courses (15 credits) in one field. Students must still complete 3 credits in each of the other 3 fields.

A total of 120 credits are required for the B.A., 45 of which must have been at the 300 and 400 levels. Only GOVT courses passed with a grade of C or better may be used to fulfill major requirements.

### Public Administration, B.S.

In addition to satisfying the university-wide general education requirements for the B.S., students majoring in public administration must complete the following. With careful planning, some courses required for the major may also fulfill university or college general education requirements. See an advisor before registering.

1. 18 credits of core requirements: GOVT 101; 103; 132 or 133 or 149; 204; 300; 351 (fulfills the university social science requirement)

2. 21 credits of advanced GOVT courses including GOVT 355, 356, and 3 credits from GOVT 357, 358, 452, 490, NCLC 331; 3 credits from GOVT 320’s or 420’s; 3 credits from GOVT 360’s or 460’s; 6 credits of upper level GOVT taken outside of GOVT 350’s and 450’s (may include GOVT 480, 490, or 496). Only 3 credits of GOVT 480 may be substituted for a major requirement. The same GOVT 490 may not be substituted for more than one major requirement.

3. 6 credits in analytical skills from the following: DESC 210, 301; STAT 250, 350; SOCI 313; MATH 106, 108, 110 or 111

4. 9 credits from ECON 103, 104, and any upper-level course in ECON or FNAN or GOVT 343.

5. 3 credits in ACCT or GOVT 358. (GOVT 358 may only apply to one major requirement.)

6. 12 credits in either Option A or B below.

### Option A

**Information and reasoning:** GOVT 359, 400, 459; GOVT 490 on information management; any CS, MIS, INFS, or IT course; STAT 362; SOCI 405; ACCT 202, 310; PHIL 105, 173, 371, 372, 373, or 376 (Only 6 credits from ACCT and PHIL may count toward this option.)

### Option B

**Foreign language:** One modern foreign language through the intermediate level

A total of 120 credits are required for the degree, 45 of which must have been at the 300 and 400 levels. Only GOVT courses passed with a grade of C or better may be used to fulfill major requirements.

### Writing-Intensive Requirement

The university requires all students to complete at least one course designated "writing intensive" in their majors at the 300 level or above. Students majoring in government and international politics and public administration may fulfill this requirement by successfully completing the 300-level GOVT courses in their major programs.

### Honors Program

Qualified students majoring in government and international politics, in public administration, and in administration of justice may pursue advanced work leading to graduation with honors from the Department of Public and International Affairs. Those highly qualified students selected for the honors program participate in a two-course sequence, GOVT 491 and 496. To graduate with honors in government and international politics or public administration, students must complete these courses with a GPA of at least 3.00.

### Teacher Licensure

Students who wish to become teachers should consult the section, "Professional Licensure" in the Graduate School of Education chapter and attend an information session during their sophomore year. Information sessions for teacher licensure are offered every month. Call (703) 993-2892/4648, e-mail gseinfo@gmu.edu, or consult the web site at gse.gmu.edu for more information.

### Administration of Justice, B.S.

The B.S. in Administration of Justice provides a sound foundation in the liberal arts and a focused study of the justice system and the social, human, and moral problems raised in the administration of justice. The course of study prepares students for careers in law enforcement, corrections, the courts, investigations, juvenile justice, private security, and a wide range of social and human services. The program also provides a strong background needed for law school and graduate study in administration of justice or public administration.

Students may satisfy all degree requirements at George Mason. Students may also use up to 18 credits of approved ADJ courses taken at Northern Virginia Community College (NVCC) or other Virginia community college to fulfill requirements in categories 1–4 below. (No more than 9 credits may be used in category 1; no more than 6 credits in categories 2–4.) Once a student enrolls at George Mason, no additional courses may be taken at another institution without prior written
approval from the program and the college. Students transferring from the administration of justice program at Northern Virginia Community College are subject to special transfer policies and should consult with an advisor.

In addition to the university-wide general education requirements, candidates for the B.S. in administration of justice must complete the following. Only ADJ courses passed with a grade of C or better may be used to fulfill major requirements.

1. 21 credits in justice system and the legal process: ADJ 100 and 18 credits chosen from: ADJ 301, 302, 401, 402, 404, 405, 406, 407, 408, 460; GOVT 452; soci 475/575

2. 12 credits in social and human problems chosen from: ADJ 471, 475; soci 101, 301, 308, 309, 310, 315, 332, 352, 373, 401, 441; GOVT 103, 414; PSYC 100, 211, 231, 313, 314, 322, 325, 326, 327, 328, 362, 372, 561; SOCI 410, 423, 435

3. 12 credits in legal, philosophical, and ethical standards chosen from: ADJ 306, 423, 424; GOVT 101, 320, 420, 421, 424; PHIL 100, 311, 326; SOCI 400

4. 22 credits in skills for the justice professional distributed as follows:
   a. 4 credits in research methods: ADJ 300/GOVT 300
   b. 3 credits of ADJ 303
   c. 15 credits from a skill area chosen from one of the following:
      research and policy analysis: STAT 362, 455, 463, 474; PSYC 260; GOVT 364, 366, 400; SOCI 405, 410
      management and planning: ADJ 425; GOVT 305, 309, 351, 355, 356, 357, 376, 416, 459, 464
      computers and information management: GOVT 359, 459; GEOG 311; any CS course; any course that satisfies the requirements for the IT minor.
      social work: SOCW 300, 301, 323, 324, 351, 352, 425
   d. foreign language: 15 credits in a single foreign language, including only courses that develop or require foreign language skills and are taught in the language
   e. field experience in justice administration: 3 credits of ADJ 479, 9 credits of ADJ 480, and one upper level 3-credit class taken from courses listed under items 1-4 above. This course must be relevant to the student's internship experience and requires the advisor's approval. The course may not simultaneously fulfill another ADJ requirement.

Credits earned in ADJ 490 and ADJ 499 may be applied to requirements 1-4 above with approval of an advisor.

Writing-Intensive Requirement

The university requires all students to complete at least one course designated "writing intensive" in their majors at the 300 level or above. Students majoring in administration of justice fulfill this requirement by successfully completing any of the following courses: ADJ 303, 401, 404, 407, 408, 423, 424, 479, 480. Students should complete ENGL 302 before taking the writing intensive course in the major or take the two courses simultaneously.

Honors Program

Qualified students may pursue advanced work leading to graduation with honors with a degree in Administration of Justice. Those highly qualified students selected for the honors program participate in a two-course sequence, ADJ 491 and 492. To graduate with honors in ADJ, students must complete these courses with a minimum GPA of 3.5.

Minors

• Interdisciplinary Minors

The department coordinates the interdisciplinary minors in Asia-Pacific Studies, Global Systems, and Urban and Suburban Studies. See the Interdisciplinary Minors section in this chapter for descriptions.

• Minor in Administration of Justice

This minor develops knowledge of the principles, institutions, and practices for systems for administering justice. It provides a solid foundation for students seeking to supplement their major area of study; develop knowledge and skills needed for justice-related occupations, or lay the foundation for possible graduate study in the justice field. Students first obtain an overview of the justice system, learn legal or ethical standards by which to judge the behavior of justice practitioners, and then develop advanced knowledge of selected features of the justice system.

The minor requires 18 credits of course work in administration of justice distributed as follows:

1. ADJ 100 (3 credits)
2. One of the following (3 credits): ADJ 424 or 306
3. 12 credits of upper-level ADJ courses (excluding ADJ 479 and ADJ 480)

Students should plan their course of study with an administration of justice faculty advisor who will be assigned by the program. The minor must be approved by the administration of justice program before graduation. At least 9 credits must be completed at George Mason. A minimum grade of C must be achieved in all courses used to complete the minor.

• Minor in American Government

This minor develops knowledge of the principles, institutions, and behaviors of the American political system. It is not available to students majoring in government and international politics. A minor in American government requires 18 credits of government courses, including GOVT 103 Introduction to American Government and five additional courses from the following:

• Any GOVT 301–309 political institutions
• Any GOVT 310–319 political behavior
• GOVT 344 American Foreign Policy
• GOVT 409 Virginia Government and Politics
• GOVT 420 American Political Thought
• Relevant GOVT 480 or 490

• Minor in Public Policy and Management

This minor introduces students to the theory and process of policy formulation and implementation in the political/governmental arena. It is not available to students majoring in public administration. A minor in public policy and management requires 18 credits of government courses, including GOVT 103 Introduction to American Government, GOVT 351 Introduction to Public Administration and four additional courses from the following:

• GOVT 350–359 public administration
• Any GOVT 360–369 public policy
• Any GOVT 450–459 public administration

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Minor in International/Comparative Studies

This minor increases students' awareness of the regions and current issues of the world on theoretical and practical levels. It is not available to students majoring in government and international politics. A minor in international/comparative studies requires 18 credits of government courses, including GOVT 132 or 133 Introduction to International/Comparative Politics and five additional courses chosen from the following:

- GOVT 103 Introduction to American Government
- Any GOVT 330–339 comparative politics
- Any GOVT 340–349 international studies
- Any GOVT 430–439 international studies
- Any GOVT 440–449 international studies
- Relevant GOVT 480 or 490

Minor in Legal Studies

This minor focuses on the constitutional foundations, interpretation, processes, and functions of domestic and international law. A minor in legal studies requires 18 credits of government courses, including GOVT 103 Introduction to American Government and GOVT 301 Public Law and Judicial Process and four additional courses from the following:

- GOVT 307 Legislative Behavior
- GOVT 320 Political Values
- GOVT 420 American Political Thought
- GOVT 422 Constitutional Interpretation
- GOVT 423 Civil Rights and Liberties
- GOVT 424 Constitutional Law and Procedural Rights
- GOVT 446 International Law
- GOVT 452 Administrative Law and Procedures
- Relevant GOVT 480 or 490

GRADUATE PROGRAMS

Public Administration, M.P.A.

The 36-credit Master of Public Administration program is designed to build the knowledge base and skills of people who are playing, or who intend to play, a leadership role in organizations that develop or implement public policy. The curriculum consists of eight required courses and four electives. In the required courses, emphasis is placed on the development of knowledge about public policy and management, as well as analytical problem solving and communication skills. Elective courses can be used by students to focus their knowledge and skill development within one of the following eleven concentrations: public management, policy studies, public and nonprofit finance, nonprofit management, international management, state and local government, environmental science and public policy, human resources management, health policy and administration, administration of justice, and information policy and administration. Alternatively, the electives can be used to extend the breadth of a student's study, with courses drawn from a variety of concentrations or even from other departments and schools within the university.

M.P.A. students at George Mason have the research and cultural resources of the Washington, D.C. area at their disposal. Government agencies representing all levels of government in the U.S. federal system are located close to the campus, as are the National Archives, Library of Congress, and Smithsonian Institution. Another benefit of George Mason's location for M.P.A. students is the wide range of internship opportunities available in governmental and nonprofit organizations. The M.P.A. program regularly has internship invitations from national, state, and local government organizations, as well as from nonprofit organizations whose principal work is at the local, state, national, or international levels. Many of these internships are paid positions.

M.P.A. courses are delivered at both the Fairfax and Arlington Campuses during the week at 1:30, 4:30, and 7:20 p.m. Classes are also offered during the weekend in an accelerated format, meeting from 6 to 9 p.m. on Fridays and 9 a.m. to 5 p.m. on Saturdays every other weekend for eight weeks. The Arlington Campus is located near a Metro stop, which makes it easily accessible for those who work in Washington, D.C. The Fairfax Campus can be reached by taking a bus from the Metro. Parking is available at both the Fairfax and Arlington Campuses.

Completion of the M.P.A. can lead to a variety of postgraduate opportunities, including the Presidential Management Internship. With more than 750 alumni, the M.P.A. program can also serve as a valuable source for networking and job placement. Additionally, the M.P.A. can serve as a key credential in the pursuit of a Ph.D. in Public Policy, offered by the School of Public Policy at George Mason University.

Application and Admission

Students may start the M.P.A. program in the fall, spring, or summer semesters. The Admissions Committee considers an application as soon as the file is complete. Late applications are considered on a space-available basis. A complete application file consists of the following:

1. The graduate application form
2. Two copies of official transcripts from each college and graduate institution attended
3. A resume listing work experience and volunteer activity
4. Three letters of recommendation
5. A statement of professional goals
6. Test scores from the GRE, Miller Analogies Test, GMAT, or LSAT

If the applicant's undergraduate GPA is 3.300 or higher, the applicant may petition the Admissions Committee for a waiver of the examination. However, to be considered for financial aid, all applicants must submit a GRE score. Applicants who already have a graduate degree in another field may also petition the Admissions Committee for a waiver of the examination requirement.

An individual with an outstanding academic record and clear interest in public policy research may apply for joint admission to the M.P.A. program and the Ph.D. in Public Policy program. For more information, contact the M.P.A. coordinator at (703) 993-1411.

Transfer of Credits

Students may request transfer credit for graduate courses taken at other accredited universities or colleges, for courses recommended for graduate credit by A.C.E. or for courses taken through Extended Studies at George Mason. Transfer credit is subject to university policies, and must be approved by the M.P.A. program and the dean. Petitions for more than 6 credits taken while enrolled through Extended Studies are

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strongly discouraged. Students who enroll initially through Extended Studies are advised to submit their application to the M.P.A. program in their first semester of study.

Program Requirements
All students are required to take eight M.P.A. core courses. These courses give students the opportunity to develop a shared knowledge base and a shared set of skills. The courses are focused on the knowledge and skills that are needed by people who want to play a leadership role in organizations that develop and implement public policy.

PUAD 502 Administration in Public and Nonprofit Organizations
PUAD 611 Problem Solving and Data Analysis I
PUAD 612 Problem Solving and Data Analysis II
PUAD 620 Organization Theory and Management Behavior
PUAD 640 Public Policy Process
PUAD 660 Public and Nonprofit Accounting and Finance
PUAD 680 Managing Information Resources
PUAD 700 Ethics and Public Administration

Students may take their elective courses within one of the concentrations listed below. Alternatively, with the approval of their advisor, students may create their own concentration, or they may select their elective courses from several concentrations or fields. Students may receive only one concentration.

Concentration in Public Management
PUAD 615 Administrative Law
PUAD 622 Program Planning and Implementation
PUAD 661 Public Budgeting Systems
PUAD 670 Human Resources Management in the Public Sector
PUAD 720 Performance Measurement
PUAD 729 Issues in Public Management
PUAD 730 Professional Development Workshop
PUAD 742 Program Evaluation
PUAD 750 Federalism and Changing Patterns of Governance
PUAD 794 Internship

Concentration in Policy Studies
PUAD 622 Program Planning and Implementation
PUAD 661 Public Budgeting Systems
PUAD 727 Seminar in Risk Assessment and Decision Making
PUAD 741 Policy Analysis
PUAD 742 Program Evaluation
PUAD 749 Issues in Public Policy
PUAD 794 Internship
PUBP 701 Analysis for Public Decision Making
PUBP 705 Rational Choice and Uncertainty: Modeling Judgment

Concentration in International Management
PUAD 504 Managing in the International Arena
PUAD 634 Management of International Security
PUAD 636 The NGO: Managing the International Nonprofit Organization
PUAD 732 Managing Technology Transfer
PUAD 738 Issues in International Security
PUAD 739 Issues in International Management

Concentration in Nonprofit Management
PUAD 505 Introduction to Management of Nonprofits
PUAD 636 The NGO: Managing the International Nonprofit Organization
PUAD 654 The Community, Marketing, and Public Relations
PUAD 655 Philanthropy and Fundraising
PUAD 657 Association Management
PUAD 659 Nonprofit Law, Governance, and Ethics
PUAD 664 Advanced Topics in Nonprofit and Public Financial Management
PUAD 720 Performance Evaluation for Managers
PUAD 730 Professional Development Workshop
PUAD 794 Internship

Concentration in Public and Nonprofit Finance
PUAD 661 Public Budgeting Systems
PUAD 664 Advanced Topics in Nonprofit and Public Financial Management
PUAD 729 Issues in Public Management
PUAD 769 Issues in Public Financial Management
PUAD 794 Internship

Concentration in State and Local Government
PUAD 615 Administrative Law
PUAD 651 Virginia Politics, Policy, and Administration
PUAD 654 The Community, Marketing, and Public Relations
PUAD 661 Public Budgeting Systems
PUAD 729 Issues in Public Management
PUAD 730 Professional Development Workshop
PUAD 750 Federalism and Changing Patterns of Governance
PUAD 759 Issues in Local Government Administration
PUAD 794 Internship

Concentration in Human Resources Management
PUAD 670 Human Resources Management in the Public Sector
PUAD 671 Public Employee Labor Relations
LRNG 602 Group Dynamics and Team Learning
PSYC 635 Topics in Organizational Psychology
PSYC 638 Training: Psychological Contributions to Theory, Design, and Evaluation
PSYC 639 Survey of Organizational Processes
PSYC 640 Techniques in Industrial/Organizational Psychology
PSYC 667 Behavior in Small Groups and Teams

Concentration in Information Policy and Administration
PUAD 732 Managing Technology Transfer
PUAD 781 Information Management: Technology and Policy
INFS 515 Computer Organization
INFS 590 Program Design and Data Structures
CULT 816 Culture and Information Technology
HSCI 709 Health/Medical Informatics for Health System Managers
TCOM 500 Modern Telecommunications

Students may take INFS and TCOM courses, which are offered by the School of Information Technology and Engineering, if they have met the prerequisites for these courses.

◆ Concentration in Environmental Science and Public Policy

Previous science major
PUAD 741 Policy Analysis
PUAD 749 Issues in Public Policy (Public Policy and the Environment)
BIOL 607 Fundamentals of Ecology
BIOL 641 Environmental Science and Public Policy
EVPP 675 Environmental Planning and Administration

If the student would like more science (in place of INFS courses), which are offered by the School of Information Technology and Engineering, if they have met the prerequisites for these courses.

Students with little or no science background
PUAD 741 Policy Analysis
PUAD 749 Issues in Public Policy (Public Policy and the Environment)
BIOL 607 Fundamentals of Ecology
BIOL 670 Environmental Law for Biologists or PRLS 501 Introduction to Natural Resources Law (taken after BIOL 607)
BIOL 546 Estuarine and Coastal Ecology (saltwater and estuarine emphasis)
BIOL 547 Terrestrial Plant Ecology
BIOL 550 Waterscape Ecology and Management (freshwater emphasis)

It is recommended that students with little or no science background take an introductory biology sequence: BIOL 102, 103 or 211, 212.

◆ Concentration in Health Policy and Administration

PUAD 741 Policy Analysis
HSCI 542 Health Policy
HSCI 678 Introduction to the U.S. Health System
HSCI 704 Contemporary Issues in Health Systems Leadership and Management
HSCI 710 Health Management Practicum and Capstone Seminar
PUAD 794 Internship

◆ Concentration in Administration of Justice

PUAD 509 Justice Organizations and Processes
PUAD 510 Policing in a Democratic Society
PUAD 691 Justice Program Planning and Implementation
PUAD 781 Information Management: Technology and Policy
PUAD 791 Justice Program Evaluation
PUAD 799 Issues in Justice Administration
SOCI 607 Criminology
SOCI 608 Juvenile Delinquency

SOCI 609 Sociology of Punishment and Corrections
CONF 501 Introduction to Conflict Analysis and Resolution

Certificate Programs
The MPA program offers four certificates: Administration of Justice, Association Management, Information Policy and Administration, and Nonprofit Management. Applications for admission to a certificate program are made through the Office of Graduate Admissions of the College of Arts and Sciences. Students may enter a program at the beginning of any semester. Students may use up to 12 credits earned in a certificate program toward the M.P.A. degree pending admission to the M.P.A. program and subject to university policies.

Admission Requirements
Admission requirements for the certificate programs are the same as they are for the M.P.A. degree program.

Certificate Requirements
The certificate is awarded after satisfactory completion of five graduate courses as specified below.

◆ Certificate in Administration of Justice

PUAD 502 Administration in Public and Nonprofit Organizations
PUAD 509 Justice Organizations and Processes
PUAD 691 Justice Program Planning and Implementation
Two electives

◆ Certificate in Association Management

PUAD 659 Nonprofit Law, Governance, and Ethics
PUAD 660 Public and Nonprofit Accounting and Finance
PUAD 657 Association Management
Two electives, chosen from the following:
PUAD 620 Organization Theory and Management Behavior
PUAD 640 Public Policy Process
PUAD 654 Nonprofit Marketing and Media Relations
PUAD 655 Fund Raising and Resource Development
PUAD 664 Advanced Topics in Nonprofit and Public Financial Management
PUAD 720 Performance Measurement
PUAD 794 Internship

◆ Certificate in Information Policy and Administration

PUAD 620 Organization Theory and Management Behavior
PUAD 680 Managing Information Resources
PUAD 781 Information Management: Technology and Policy
Two electives

◆ Certificate in Nonprofit Management

This certificate may be obtained through standard three-credit courses or through online courses.

PUAD 505 Introduction to Management of Nonprofits
PUAD 660 Public and Nonprofit Accounting and Finance
PUAD 659 Nonprofit Law, Governance, and Ethics
Two electives

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Russian Studies

Faculty
Aksyonov (Robinson Professor, Modern and Classical Languages; English), Boettke (Economics), Christensen (Modern and Classical Languages), Drennon (Geography and Earth Science), Hecht (Modern and Classical Languages), Jensen (History and Art History), Johnsen-Neshati (Theater), Katz (Public and International Affairs), Levine (Modern and Classical Languages, director), Wade (History and Art History)

UNDERGRADUATE PROGRAM

Russian Studies, B.A.

Two principal directions are possible within this degree program: Russian Studies as one element of a double major or Russian Studies as a single degree program. In the first option, students must fulfill all requirements of the Russian Studies program as noted below. Students must also fulfill requirements of the second major. Obvious combinations with Russian Studies include geography, history, government and international politics, and economics. This program may be accomplished within a four-year period and is recommended for students who intend to seek employment in government, industry, or journalism.

The second option is recommended for students who intend to study Russian language and literature in graduate school, who are interested in careers as translators, or who are studying for self-enrichment.

In addition to satisfying the university-wide general education requirements and the requirements for a B.A. degree in the College of Arts and Sciences, students majoring in Russian Studies must complete the following:

1. Russian language through the intermediate level through course work or testing
2. Six credits of RUSS 380 and 381
3. Three credits of RUSS 480 or 481 (preferably both)
4. Six credits of Russian literature (may simultaneously satisfy the university and college literature requirement for the B.A.)
5. Three credits of additional upper-level courses bearing the RUSS course code, two of which must be selected from the following: 302, 303, 310, 311, 401, 410, and 480 or 481 (whichever is not taken to fulfill the third requirement above)
6. Three credits of RUSS 353 or HIST 328 (may simultaneously satisfy the non-Western culture requirement for CAS)
7. Three credits of RUSS 354 or HIST 329 (may simultaneously satisfy the university-wide global understanding requirement)
8. Three credits of GEOG 330 or GOVT 338 (may simultaneously satisfy a CAS social science requirement)

Qualified students are strongly encouraged to participate in study-abroad programs in Russia. Through a cooperative agreement with the American Council of Teachers of Russian, students may apply to summer or semester Russian language programs at one of several leading universities in Moscow and St. Petersburg. Interested students should consult with their major advisor.

Approved Courses

Department of Modern and Classical Languages: RUSS 101, 102, 109, 201, 202, 209 (subject to language proficiency examination), 302, 303, 310, 311, 325, 326, 327, 353, 354, 380, 381, 401, 407, 410, 470, 480, 481, 490, 491

Department of Geography and Earth Science: GEOG 330

Department of History and Art History: HIST 328, 329, 426

Department of Public and International Affairs: GOVT 338, 447

Cognate courses: ANTH 114; ARTH 360, 362; ECON 380; GEOG 103; GOVT 132; THR 351, 352

Writing-Intensive Requirement

The university requires all students to complete at least one course designated "writing intensive" in their majors at the 300 level or above. Students majoring in Russian studies may fulfill this requirement by successfully completing RUSS 302, 325, or 407.

Social Work

Faculty
Professors: Raskin, Ritchie
Associate professors: Davis, Rome (chair), Slaght

This department offers all course work designated SOCW in the "Course Descriptions" chapter of this catalog.

UNDERGRADUATE PROGRAMS

Social Work, B.S.

The B.S. in Social Work prepares students for beginning generalist professional practice in social work at the baccalaureate level and has been granted full accreditation by the Council on Social Work Education. Students are expected to abide by the Code of Ethics of the National Association of Social Workers.

No academic credit toward field experience or course work is given based on life or previous work experience(s).

The social work program does not offer all required courses during evening hours. Students should meet with an advisor to develop a plan in order to complete course work for the degree.

Degree Requirements

To receive a B.S. in Social Work, the student must successfully complete requirements for the bachelor of science degree, including the following:

1. First year general education requirements. An entering freshman should register for the New Century College Integrative Studies first-year sequence (NCLC 110 Community of Learners, NCLC 120 The Natural World, NCLC 130 The Socially Constructed World, and NCLC 140 Self as Citizen) for a total of 32 credits. A transfer student fulfills these requirements by presenting the following courses or their equivalents: 3 credits fine arts, IT 103, ENGL 101, SOC 101, and ENGL 201; 3 credits in western civilization and 3 credits in global understanding; MATH 106 or above, 3 credits in philosophy or religious studies, COMM 100, and BIOL 104.

2. BIOL 103, ECON 100, GOVT 103, PSYC 100, PSYC 300 or SOC 313, and 3 credits in American history.
3. 44 credits in social work, including SOCW 300, 301, 323, 324, 351, 352, 357, 358, 359, 452, 453, 454, 456, 471, and two 400- or 500-level social work electives. A grade of C or better must be obtained in all these courses with the exception of the social work electives. The Senior Practicum (SOCW 453 and 456) is graded on a satisfactory/no-credit basis.

4. Satisfactory completion of junior-level field experience (100 hours) for two semesters in a social service agency approved by the director of field instruction in conjunction with SOCW 301 and SOCW 359.

5. Satisfactory completion of a minimum of 450 hours in a social service agency approved by the director of field instruction in conjunction with SOCW 453 and 456 (Senior Practicum). The practicum requires that students are available two days per week (Monday through Friday for one academic year) during daytime hours.

6. Additional credits to total 120.

To be admitted to the social work program, a student must have
1. completed at least 45 credits with a GPA of 2.500;
2. satisfactorily completed the NCLC first-year sequence or BIOL 103, BIOL 104, ENGL 101, SOCI 101, and PSYC 100;
3. earned at least a C in SOCW 301 and SOCW 351;
4. satisfactorily completed at least 60 hours in one semester in a social service agency approved by the director of field instruction in conjunction with SOCW 301; and
5. submitted an application for the social work major to the director of social work admissions. Sophomores should file this application between January 1 and March 15, juniors between September 1 and November 1. The student's application for admission to the social work major is reviewed for action by social work faculty members. A personal interview may be required.

There is no admission to the social work program in the summer. A student who has not met all criteria for admission to the major (including completion of junior field practica) by May 30 will not be considered for admission until the fall semester.

The social work faculty evaluate the student's performance periodically and may require a student to withdraw from the program when, in their judgment, performance is not satisfactory. The decision is based on the quality of academic and field performance as well as on personal fitness for the profession of social work. The student has the right to appeal.

Note: For social work majors, BIOL 103 and BIOL 104 are required for graduation.

SOCW 323, 351, and 357 are sequenced courses offered only during the fall semester. The second part, SOCW 324, 352, and 358/359, are only offered during the spring semester, and can only be taken upon successful completion of the first part (a grade of C or better). Graduation will be delayed if courses are not taken in proper sequence.

Students must have completed 6 credits of psychology before registering for PSYC 300.

◆ Minor in Social Work
A minor in social work requires 18 credits in SOCW 300, 301, 323, 351, and two social work electives. SOCW 357, 358, 359, 452, 453, 454, and 456 are not open to minors. See an advisor in the social work program for more information.

◆ Certificate in Child Welfare
The 18-credit child welfare certificate is available to undergraduate students majoring in social work, psychology, nursing, education, administration of justice, integrative studies, and other related majors. The certificate is beneficial for students interested in pediatrics, maternal and child health, youth recreation, school counseling, public social service, and diverse populations. Students complete course work and a supervised practicum. For information, contact Dr. Dennie Ritchie at (703) 993-2030.

Immunization and Fees
All students who are enrolled in a course that requires a field placement (SOCW 301, 359, 453, and 456) must have an annual tuberculosis screening (PPD). In addition, students must complete the entire hepatitis B immunization series in accordance with current U.S. Public Health Service recommendations. The cost of immunizations is the responsibility of the student. Some agencies used for field placements require fingerprinting, a criminal background check, and/or a child protective services check. Any cost related to this requirement is the responsibility of the student.

Insurance Coverage (For students enrolled in SOCW 301, 359, 453, 454, and 455.)
Students who participate in internships are covered for liability under Virginia's Self-Insured General Liability Insurance Plan and for medical malpractice under the Medical Malpractice Insurance Plan established by the Department of General Services, Division of Risk Management. These plans cover activities that the instructor has determined to be part of the student’s course work. Activities that are not part of the course practicum are not covered. (Exclusions in the plan are listed in Section VII.)

A copy of the Self-Insured Liability Plan for the Commonwealth of Virginia is available in the office of the director of field instruction.

George Mason University and the social work program are an equal opportunity and affirmative action institution and the program is committed to the principle that access to study or employment opportunities afforded by the university and program, including all benefits and privileges, be accorded to each person—student, faculty, or staff—on the basis of individual merit and without regard to race, color, religion, ethnic or national origin, veteran status, disability, sexual or political orientation, sex, or age (except where sex or age is a bona fide occupational qualification).

GRADUATE PROGRAMS

◆ Social Work, M.S.W.
The M.S.W. prepares students for advanced practice in social work. Following completion of a foundation year of study, students complete specialized course work in organizational management and social change. Students are expected to abide by the Code of Ethics of the National Association of Social Workers. No academic credit toward field experience or course work is given based on life or previous work experience(s).

To accommodate working students, M.S.W. courses are offered on the Arlington campus during late afternoon and
evening hours. Field placements, however, generally require availability during regular daytime hours.

Degree Requirements
To receive a master's in Social Work, students must successfully complete the following:

1. Foundation courses including: SOCW 623, 624, 651, 652, 657, 658, 670, 671
2. One elective from either SOCW 675 or SOCW 676
3. One elective chosen from among selected courses in: business administration, communication, conflict analysis and resolution, education, law, nursing/health science, psychology, public administration, public policy, sociology, or statistics
4. Concentration courses including: SOCW 684, SOCW 685, SOCW 686, SOCW 687, SOCW 688, SOCW 691
5. Successful completion of 900 hours of supervised field practicum in agencies approved by the Director of Field Education: 450 hours in conjunction with SOCW 672 and SOCW 673, and 450 hours in conjunction with SOCW 690
6. Successful completion of a culminating thesis project
7. Sixty (60) total credit hours

Admission to the M.S.W. program is for fall semester only. In addition to meeting the university's graduate admission requirements, students must have a minimum of 30 undergraduate credits in liberal arts, including at least 3 credits in each of the following: English composition, human biology, history or government, social sciences, and statistics.

Students may complete the M.S.W. program under a two-year or four-year plan. All courses are sequenced and must be taken in the order designated. Students should meet with their academic advisors to ensure timely completion of all degree requirements.

To remain in good standing, students must earn an A or B in each required course. A course in which the student earns a C may be repeated once (with the exception of SOCW 672, SOCW 673, SOCW 690, and SOCW 691, which may not be repeated). No more than 7 total credits of C may be repeated overall.

The social work faculty evaluate each student's performance periodically, and may require the student to withdraw from the program when, in their judgment, performance is not satisfactory. The decision is based on the quality of academic and field performance as well as on personal fitness for the profession of social work. The student has the right to appeal.

Insurance Coverage
Students engaged in internships are covered for liability under the Commonwealth of Virginia's Self Insured Liability Insurance Plan and covered for medical malpractice under the Medical Malpractice Insurance Plan, as established by the Department of General Services, Division of Risk Management. Only practicum activities that have been determined by the field instructor to be part of the course are covered. Students are encouraged to obtain professional liability coverage through NASW, although this additional coverage is optional.

Immunizations
All students who are enrolled in a course that requires a field placement (SOCW 672, SOCW 673, SOCW 690) must have an annual Tuberculosis Screening (PPD). In addition, students must complete the entire Hepatitis B immunization series in accordance with current United States Public Health Service recommendations. The cost of the immunizations is the responsibility of the student. Any cost related to this requirement is the responsibility of the student. Students can register for classes prior to the completion of the immunizations. Immunizations are program requirements and must be completed by the student even if they are not required by the agency. Documentation to verify immunization must be submitted to the MSW Program Administrative Assistant.

Sociology and Anthropology

Faculty
Robinson Professors: Bateson (Anthropology), Dumont (Anthropology), Weitzman (Sociology)
Professors: Avruch (Anthropology), Black (Anthropology), Borkman (Sociology), Dennis (Sociology), Dietz (Sociology, CAS Distinguished Professor), Horton (Sociology), Kolker (Sociology), Scimecca (Sociology, chair), Stone (Sociology), Williams (Anthropology)
Associate professors: Colvin (Sociology), Golumb (Anthropology), Guagnano (Sociology), Haines (Anthropology), Hanrahan (Sociology), Jacobs (Sociology), Kalof (Sociology), Lancaster (Anthropology), Palkovich (Anthropology), Rader (Sociology), Rosenblum (Sociology, vice president, University Life), Seigmann (Anthropology, Coordinator), Tavani (Sociology)
Assistant professors: Snead (Anthropology), Trencher (Anthropology)
Affiliate professor: Goode (Sociology)

Course Work
This department offers all course work designated ANTH, SOAN and SOCI in the "Course Descriptions" chapter of this catalog.

UNDERGRADUATE PROGRAMS

Anthropology, B.A.

Anthropology is the study of human beings and their cultures. It draws broadly from the social sciences, the humanities, and the natural sciences. Anthropology is thus an ideal undergraduate major, providing sound interdisciplinary preparation for a variety of careers. In addition to satisfying the university-wide general education requirements and the requirements for the B.A. degree in the College of Arts and Sciences, students majoring in anthropology must complete the 36-credit program of study indicated below. No more than 3 credits with a grade of D in the required courses in the anthropology major may be applied toward the degree.

1. A 9-credit core in anthropology:
   ANTH 114 Introduction to Cultural Anthropology
   ANTH 390 Theories, Methods, and Issues I
   ANTH 490 Theories, Methods, and Issues II

http://catalog.gmu.edu
2. A 9-credit four-field requirement:
   - Archaeology: ANTH 120 or ANTH 420
   - Biological Anthropology: ANTH 135 or ANTH 365
   - Linguistic Anthropology: ANTH 380
3. 18 credits of 300- and 400-level electives
SOCI 311 and 313 may apply toward the 18-credit elective requirement. LING 326 General Linguistics may substitute for ANTH 380. SOCI 311 may substitute for ANTH 390.

See an advisor to learn how anthropology majors may fulfill the university-wide requirements in global understanding, information technology, and synthesis as well as the CAS requirement in non-western culture.

Students wishing to pursue careers in anthropology should consider including ANTH 492 (or subfield specialty equivalents, such as ANTH 420, 450, 495, or 496) as an elective in their program of study.

**Writing-Intensive Requirement**
The university requires all students to complete at least one course designated "writing intensive" in their majors at the 300 level or above. Students majoring in anthropology may fulfill this requirement by successfully completing ANTH 490.

**Honors Program in Anthropology**
Anthropology majors who wish to pursue the Honors Program in Anthropology must meet the following criteria: a minimum GPA of 3.5, 60 credits, completion of ENGL 302 for the social sciences, 3.75 GPA in anthropology courses, and 15 credits of anthropology (ANTH 114, 120, 135, and two additional courses).

Candidates for honors in anthropology are expected to earn 6 credits in one of two possible sequences of special honors sections: ANTH 492h (for those focusing on sociocultural anthropology) or ANTH 420h (for those interested in archaeological or biological anthropology). All honors candidates will undertake additional research leading to the completion of an honors thesis in ANTH 499h. Interested students are encouraged to contact the anthropology coordinator at (703) 993-1334 for more information.

**Minor in Anthropology**
A minor in anthropology requires 21 credits. All electives require ANTH 114, 332, 120 or 135, and 430 or 450. See an advisor in the department for more information.

**Sociology, B.A.**
In addition to satisfying the university-wide general education requirements and the requirements for the B.A. degree in the College of Arts and Sciences, students majoring in sociology must take 35 credits of sociology, including 15 credits of core courses, SOCI 101, 303, 311, 313; and 412, and 18 additional credits at the 300 and 400 levels. ANTH 332 may apply toward the 35-credit sociology requirement.

No more than 6 credits with a grade of D in sociology, none of which can be in the core courses (SOCI 303, 311, 313, and 412), can be applied toward the degree.

See an advisor to learn how sociology majors may fulfill the university-wide requirements in global understanding, information technology, and synthesis as well as the CAS requirement in nonwestern culture.
Graduate Courses in Anthropology

Although a graduate program in anthropology is not yet available, there are graduate courses in anthropology offered in support of other graduate programs. See the "Course Descriptions" chapter of this catalog.

Women's Studies

Faculty

Course Work
The faculty in women's studies offers all course work designated WMST in the "Course Descriptions" chapter of this catalog.

UNDERGRADUATE PROGRAM

Minor in Women's Studies
Women's Studies is an interdisciplinary program open to the entire undergraduate student body.

Requirements
1. 6 credits of WMST 200 and 330
2. 15 credits selected from courses in women's studies or relevant course offerings in other departments, subject to approval of the director. No more than 6 of these credits may be taken in any one department.

GRADUATE PROGRAM

Certificate in Women's Studies
The graduate certificate is for students interested in understanding the social, political, and economic situations of women in their local, national, and global contexts. The certificate may be taken alone or in conjunction with another graduate program. Courses taken toward the certificate may also be used in a degree program, subject to the approval of the graduate coordinator in the respective program.

Admission
The certificate is open to all students who meet the university criteria for admission to graduate study. Students must submit an George Mason Application for Graduate Study.

Transfer Credit
Students may transfer up to 3 graduate credits earned at another accredited institution and 9 graduate credits earned at George Mason through Extended Studies toward the certificate, subject to the approval of the director and the dean.
Requirements
Students must complete 15 graduate credits distributed as follows and a capstone portfolio.

1. Two required courses (6 credits)
   - WMST 630 Feminist Theories Across the Disciplines
   - WMST 640 Women and Global Issues
2. Three electives (9 credits) chosen from relevant courses with approval of the director
   - Possible electives
     - ENGL 675 Feminist Theory and Criticism
     - HIST 630 U.S. Women's History
     - PHIL 658 Feminist Theory
     - SOCI 575 Women and the Law
     - SOCW 511 Status of Vulnerable and At Risk Women

3. Capstone portfolio
   Students synthesize their work in the certificate program by reflecting on how the issues, ideas, and theories raised in the core courses inform their understanding of women's issues within their area of interest. The portfolio includes 3–5 items produced in previous coursework and a 7–10 page essay which discusses them. Items selected may include course papers, performance videos, photos of exhibits, tapes of music, or other items as agreed on by the student and advisor. The portfolio must be approved by the advisor and submitted to the Women's Center where it will be presented, displayed, and archived.
New Century College

Web: www.ncc.gmu.edu
Phone: (703) 993-1436

As an integral part of the College of Arts and Sciences (CAS), New Century College (NCC) offers students a small college interdisciplinary education within the context of a large state university. Using a cohesive interdisciplinary faculty and borrowing faculty members from other disciplines, NCC provides a learning environment that integrates interdisciplinary knowledge with workplace and lifelong learning skills. In keeping with the goals of CAS, NCC has a strong commitment to enhancing technology skills, improving student writing, and providing challenging opportunities for students.

NCC meets this challenge by having students interact closely with faculty; engage in critical thinking, problem solving, creative activity, and leadership development; and participate in experiential education in the form of internships, co-ops, service learning, or study abroad. NCC educates students to develop original ideas, engage in active and reflective learning, master competency areas, and conduct independent inquiry with high ethical standards. Both the structure and curriculum of NCC respond to the needs of civic and corporate communities and provide instruction for a rapidly changing society.

There are four degree programs housed in NCC: Bachelor of Arts in Integrative Studies, Bachelor of Science in Integrative Studies, Bachelor of Individualized Study, and Bachelor of Arts in Interdisciplinary Studies.

Course Work
NCC offers all course work designated BAIS, BIS, and NCLC in the "Course Descriptions" chapter of this catalog.

UNDERGRADUATE PROGRAMS

Integrative Studies, B.A., B.S.

The curriculum is based upon intensive, interdisciplinary learning communities, coordinated with traditional academic programs. The result is an integrated program of study that emphasizes collaboration, experiential learning, and self-reflection. The program provides the option to create an interdisciplinary, integrated concentration. Although there are many possibilities, the following are some examples of the programs of study that have been created: pre-professional (medicine, law, education), family studies, arts administration, computer graphics and design, multimedia design, conflict transformation studies, liberal studies, nonprofit management, and leadership studies.

In the first year, students take four highly focused, interdisciplinary courses (eight credits) one course at a time. They "learn to learn" how to make distinctions, to appreciate different perspectives, and to find connections in what they learn. After the first year, the curriculum offers various learning communities that feature experiential learning and faculty-student research that address fundamental questions. Students complete their degree programs with an interdisciplinary concentration. Pre-professional majors follow a program of study best suited to their particular goals. The program requires mastery of essential competencies (communication, valuing, global perspectives, problem solving, group interaction, effective citizenship, aesthetic response, critical thinking, and information technology) assessed through freshman and graduation portfolios.

Admission Requirements

A student who meets George Mason University's general admission requirements may enroll in the integrative studies program. Admission to the program is based on the student's academic objectives and the likelihood that the student will benefit from the curriculum. Each student works with an advisor from the college's advising staff.

Degree Requirements

Students must complete an equivalent of 120 credits of course work with at least 24 credits in learning communities, 12 credits of experiential learning (see Curriculum Requirements), and 32 credits in general education. A student's concentration usually consists of 30 credits, which may draw from learning communities, experiential learning, independent study, and traditional university courses. Students must present a final, cumulative portfolio and a College Senior Exposition.

Curriculum Requirements

The integrative studies curriculum has three major components. Division I is the first year of common courses, experiences, and integrated learning. Thereafter, students pursue their academic and career goals through learning communities (Division II) and courses for their concentration (Division III). A student may join learning communities or take courses in other academic units in the university any time after Division I.

http://catalog.gmu.edu
General education requirements are met in Division I and II. Division I fulfills most general education requirements. Students may also test out of some requirements. The six-credit English composition requirement is met through completion of Division I and II with an overall 2,000 average. Students majoring in integrative studies fulfill the university writing-intensive requirement by completing their concentration. Most 300-level courses and above include at least one writing assignment that requires revision.

**Division I**, the first year. Division I is a four-unit common curriculum. Units 1 through 4 are each six or seven weeks long and are separated by two-week intersims or a winter intersession. The units meet Monday through Thursday and may include lectures and exams, but emphasize seminar discussions, collaborative assignments, problem-centered projects, and self-paced learning.

Unit 1 emphasizes composition and communication, computer applications, and analytical reasoning; Unit 2 studies the natural world and develops computational skills; Unit 3 studies the socially constructed world through the interdisciplinary study of western civilization; and Unit 4 studies the relationship between the individual and society. The intersessions are built into the curriculum to allow co-curricular activities, such as community service learning, leadership training, or specialized workshop courses, or to allow students to complete their work at their own pace. The winter intersession also allows for intensive short courses, study abroad, individualized projects, research, or experiential learning outside the college.

**Division II**, learning communities. Division II is constructed of learning communities, which combine subjects usually taught in separate courses into a single course of study. Learning communities offer the equivalent of between 3 and 9 credits of undergraduate work and replace the often fragmented classroom experience many students encounter in a series of unconnected course offerings. In interdisciplinary learning communities, faculty and students explore various ways to understand a topic. Learning communities also offer a greater sense of identity with an academic community, especially in the nonresidential college environment typical of a regional state university. Several learning communities are scheduled to make attendance easier for part-time students. Team teaching, collaborative projects; emphasis on writing and critical thinking; opportunity for independent study; and integrative, experiential learning are all important components of learning communities. A minimum of 24 credits in learning communities is required for graduation.

**Division III**, a concentration. Many learning communities have experiential learning attached, either as a part of the class or as an option for students to take. The concentration is the equivalent of a major in a traditional degree program. Students can complete an interdisciplinary concentration already established in the integrative studies curriculum or, in some cases, create with faculty a unique program of study to fit their particular interests and needs. The concentration comprises traditional courses, learning communities, independent study, seminars, guided research, and experiential learning. Students must present a portfolio of their work as part of a culminating College Senior Exposition. This is done through NCLC 491, Senior Capstone, which students are required to take two semesters prior to their graduation.

**Experiential learning requirement.** All students are required to participate in at least 12 credits of experiential learning.

A portion of the credits can be earned in various learning communities. Students may also meet this requirement through internships, study abroad, and experiential learning courses. This requirement reflects the college’s commitment to provide educational experiences that will prepare its graduates for the workplace and the demands of active and responsible citizenship. The faculty’s goal is twofold: to engage the workplace as a site of instruction and expose students to the variety of skills needed to succeed, and to combine work experience with academic study so that each will enrich the other. A maximum of 24 credits of experiential learning (or its equivalent) may be applied toward the B.A. or B.S. degree.

Experiential learning may include course field trips and off-campus learning experiences. Students may be responsible for their own transportation, including bus, subway, and carpooling. Student liability insurance for the experiential learning internship is provided by the university. Each student is responsible for his or her own health care, including emergency care. New Century College assumes no financial responsibility for the health care of students. An accident and health insurance plan is available through the university.

**Transfer Students**

NCC accepts students from other four-year institutions or community colleges, as well as from other academic units within George Mason University, into the integrative studies program after admission to the university. NCC’s academic advisors work with students to best use transfer credits and provide a plan for timely completion of the bachelor’s degree. All transfer students are required to meet with an academic advisor as soon as possible. For more information, contact an academic advisor at (703) 993-1436.

♦ **Interdisciplinary Minor in Multimedia**

NCC and the College of Visual and Performing Arts coordinate the interdisciplinary minor in Multimedia. See the “Interdisciplinary Minors” section of this chapter for a description of the minor.

♦ **Minor in Nonprofit Studies**

**Faculty**

Borkman, Lewis, Sacco, Stevenson (coordinator)

NCC and the Department of Public and International Affairs coordinate the minor in nonprofit studies.

The interdisciplinary minor in nonprofit studies provides the student with the basic skills and knowledge of nonprofit organization resource development, activities coordination, governance relations, and services that enable one to effectively perform the duties of an entry-level nonprofit organization administrator. Upon completion of the minor, the student will know the public-serving responsibilities, basic fund raising techniques, resource management tools, nonprofit financial accounting skills, and performance requirements of a private, nonprofit, charitable organization professional.

**Requirements**

Students must complete 16 credit hours, distributed as follows.

**Required: 3 courses (12 credits)**

- NCLC 331 The Nonprofit Sector (4 credits)
- GOVT 358 Nonprofit Financial Planning and Accounting (4 credits)
- NCLC 431 Principles of Fund Raising and Resource Development (4 credits)
Elective: 1 course (3 credits), chosen from
- GOVT 351 Administration in the Political System
- GOVT 359 Computers in Public Management
- MSOM 301 Managing People and Organizations
- MSOM 303 Marketing in a Digital World
- SOCI 492 Complex and Alternative Organizations
- SOCW 352 Social Policy and Social Justice II

Portfolio: 1 course (1 credit)
- NCLC 465 Independent Study (portfolio course) (1 credit)

Each of the required courses is writing intensive with a requirement of at least 3,500 words in logs, essays, and analyses. Writing assignments are aggregated with a cover document at the end of the program into a portfolio that documents the student's experience in studying the nonprofit world. A one-credit course is dedicated to the development of the portfolio.

Experiential learning: 135 hours
The candidate for the minor must complete 135 contact hours in research on, and service to, nonprofit organizations in the areas of operational procedures, financial accounting, and resource development. These hours are divided into three 45 contact hour experiential credit units that are included in the three required courses. The student signs an agreement with a nonprofit organization that describes the learning objectives, the tasks to be undertaken by the student, the outcomes of the experience, and some of the specific benefits that will accrue from the work.

Certificate in Leadership Studies
The certificate in leadership studies provides a curriculum and learning environment that includes theory, application, and reflection. This 24-credit certificate can be completed while pursuing an undergraduate degree, or after graduation. All students are required to complete a core of 9 credits and then choose from approved elective courses for the remaining credits. An internship is also required.

The certificate in leadership studies provides students with a broad understanding of leadership in contemporary times. To understand current issues, students in the courses examine historical perspectives and theories of leadership. Students gain an understanding of leadership concepts and behaviors, civic responsibility, creativity, communication, and change. In addition, students have the opportunity to practice and enhance their skills.

For more information, please contact the Center for Service and Leadership at (703) 993-2900, or New Century College at (703) 993-1436.

Interdisciplinary Studies, B.A.I.S.
The Bachelor of Arts in Interdisciplinary Studies is an honors degree offering high-achieving undergraduate students an alternative to traditional baccalaureate programs. With the guidance of a faculty committee, students develop a customized interdisciplinary program of study not available through traditional majors, double majors, or major and minor combinations. The program provides the option to create an interdisciplinary area of study that spans two or more academic disciplines. The resulting program of study cuts across traditional academic programs or collegiate units. Although the possibilities are endless, the following are some examples of programs of study that have been created: human resource and management, cultural ecology, environmental management and public policy, science writing, child and family welfare, international and political economics, media communication, philosophical and historical studies of science, art therapy, public policy studies, multimedia technology, political marketing, geographic information systems, and Renaissance studies.

Eligibility
Applicants to the program must be rising juniors who have accumulated at least 45 credits with a minimum GPA of 3.3. The GPA is determined by review of all George Mason University and previous academic work. At least 15 of the 45 credits must have been completed at George Mason. Freshmen and sophomores, and those in the process of fulfilling the minimum eligibility requirements, may be declared as pre-interdisciplinary studies.

Application and Acceptance
Students who meet eligibility requirements may complete an application to the program after an information/advising session with a B.A.I.S. program advisor. Appointments for these sessions may be made by calling (703) 993-1436. Students may be recommended by faculty or administrators or may nominate themselves.

Acceptance is based on assessment of the interdisciplinary nature of the program of study, the availability of courses relevant to the proposed program of study, the availability of faculty advisors, the student's GPA, and the likelihood that the student will benefit from the proposed program of study. Students should be able to show a high degree of academic achievement in the various disciplines that they incorporate into the interdisciplinary program of study.

Acceptance into the program is provisional until students have a faculty committee of two or three members, and an approved educational contract on file. Although B.A.I.S. staff members can assist, it is the student's responsibility to organize the committee. The committee consists of professors, at least one from the senior ranks, in areas of study contributing to the student's field of study. Wherever possible—Robinson Professors, outstanding scholars who are dedicated to undergraduate teaching, and whose teaching and scholarship concern broad and fundamental intellectual issues—are members of the student's committee. By a mutual decision of the student and committee, one member is chair of the committee, taking primary responsibility for contract development and changes. The B.A.I.S. program director must approve educational contracts and changes in contracts.

Requirements
Students must complete a minimum of 120 credits of course work. At least 30 credits must be completed at George Mason. A minimum of 45 credits must be in upper-level courses, including at least 12 credits of George Mason course work in the field of study.

In addition to fulfilling all university general education requirements for a B.A., students must complete at least 36 credits in their interdisciplinary area of study, including a minimum of 24 credits at the 300 and 400 level. Courses may be applied to the degree only if passed with minimum grade of 2.0. Students who are pursuing the B.A. in Interdisciplinary Studies as a second degree must present 36 George Mason University credits beyond those required by the first degree.
As part of the BAIS core concentration, the student completes four courses: BAIS 300 (3 credit hours), BAIS 390 (3 credit hours), BAIS 490 (3 credit hours) and BAIS 491 (1 credit hour). BAIS 490 and BAIS 491 are taken when no more than two courses remain in the core concentration. A student must include 3 credit hours of BAIS 489 Directed Readings as part of his/her core concentration. The senior thesis is evaluated by the faculty committee and usually is completed during the final semester of study (see BAIS Program guidelines). BAIS 490 fulfills the university's requirement that all students successfully complete at least one course designated as "writing intensive" at the 300 level or above.

Once admitted to the program, students become Interdisciplinary Scholars, which entitles them to priority registration and 24-hour access to the University Scholars Center study lounge and computer resource lab.

**Individualized Study, B.I.S.**

The mission of the Bachelor of Individualized Study degree is to provide a distinctive educational opportunity for students who bring to their college careers at George Mason prior coursework, accumulated knowledge and wisdom, maturity, and special expertise from work experiences. By virtue of these prior experiences, many such students have unique higher education needs. The B.I.S. degree is designed to meet these needs through an individualized program of study that enables students to integrate their previous experiences into their George Mason coursework to achieve their educational goals.

Students enter this program for many different reasons. Some are preparing for graduate and professional programs. Others need a gateway for professional advancement or career transition and validation. Still others want to complete their undergraduate degree for personal fulfillment.

**Eligibility Requirements**

Applicants to the B.I.S. program must be admitted to George Mason University, have completed high school at least seven years prior to admission, and have accumulated at least 30 credits with a minimum GPA of 2.0. At least 15 of the 30 credits required for B.I.S. program acceptance must have been earned through classroom instruction.

**Application and Acceptance**

B.I.S. program information and applications are available through the New Century College offices on the fourth floor of Enterprise Hall, (703) 993-1436, or online at [www.ncc.gmu.edu](http://www.ncc.gmu.edu). Anyone interested in the program should plan to attend a B.I.S. information session, generally scheduled twice a month. Reservations are required and can be made by calling New Century College. The B.I.S. application process is free, but applications are considered only after the applicant has gained admission to George Mason.

Acceptance into the B.I.S. program is based upon program eligibility requirements and an assessment of responses to essay questions posed on the application. Initial acceptance into the program is provisional. Once a student obtains a faculty advisor and receives all necessary approvals for their educational contract, they become full B.I.S. degree-seeking students.

It is university policy that students who are inactive for two years or more must reapply, or be readmitted (as appropriate) before continuing their studies. If readmission to the university is necessary, students must also reapply to the B.I.S. program.

**Requirements**

B.I.S. students complete a minimum of 120 credits of course work with at least 45 credits in upper-level courses (numbered at the 300 and 400 level). At least 30 credits must be completed at George Mason University.

**Individualized Core Concentration**

Working with the support of B.I.S. staff and a faculty advisor of their own choosing, B.I.S. students develop a core concentration to meet their academic needs and interests. B.I.S. students may incorporate into their concentrations previously earned college credits, non-traditional credit, and courses from George Mason.

The core concentration is 34 to 46 credits. At least 18 credits must be upper-division course work (300 and 400 level), 12 of which must be completed at George Mason. No more than 6 credits of D grades may be included in the core. Courses in the core may not be counted toward general education requirements.

As part of the B.I.S. core concentration, students complete four B.I.S. courses: BIS 300 Understanding Multidisciplinary Studies (3 credits), BIS 390 The Research Process (3 credits), BIS 490 Bachelor of Individualized Study Project (3 credits), and BIS 491 Senior Project Presentation (1 credit). A student also may include BIS 489 Directed Readings in the core concentration.

BIS 300 and BIS 390 must be completed prior to registration in BIS 490 and BIS 491. BIS 490 and BIS 491 are taken when no more than two courses remain in the core concentration. The type of final project conducted in BIS 490 varies according to the student's program. It may be a research paper, a participatory project, or a creative project, but it must be appropriate to the student's core concentration. A grade of 2.0 or better in BIS 490 is required to graduate with a B.I.S. degree. A committee consisting of the student's faculty advisor and at least one other faculty member or qualified professional evaluates the project.

The initial draft of a B.I.S. core concentration is assembled as a proposal and developed into a formal educational contract. Proposals are typically developed as a part of BIS 300 with the feedback and support of B.I.S. staff. The faculty advisor is responsible for reviewing the proposal with the student, providing appropriate feedback and suggestions, and helping the student develop the proposal into the formal educational contract. The proposal and then the contract must be approved by the faculty advisor and B.I.S. program, at which time the student's admission is changed from provisional to a full B.I.S. degree-seeking student.

All B.I.S. students are encouraged to obtain a faculty advisor and submit an educational contract as early as possible. Full degree-seeking status is required for enrollment in certain courses. Though earlier development of a contract is advised, the final deadline for submitting a B.I.S. contract is the last day to add a class in the term prior to the student's anticipated graduation date. In other words, a student planning to graduate in May must submit his or her contract to the B.I.S. office by the course add deadline for fall. The same deadline applies for contract amendments, which are required whenever changes to the contract are necessary.
A sample of previous individualized B.I.S core concentrations:
- Children's literature and illustration
- Convention management and planning
- Corporate/community relations
- Electronic publishing
- Environmental writing
- Health care administration
- Historical writing
- Human resources management
- Information systems administration
- International public relations
- Multicultural learning
- Performing arts management
- Political and social advocacy
- Procurement and contract management

**Writing-Intensive Requirement**
The university requires all students to complete at least one course designated “writing intensive” in their majors at the 300 level or above. B.I.S. students fulfill this requirement by successfully completing BIS 490.

**Credit for Nontraditional Modes of Learning**
The B.I.S. program allows students to receive college credit for learning acquired through a variety of nontraditional methods, including:
- College-level, non-traditional modes of learning offered by accredited institutions of higher education
- College-level technical or applied courses offered by accredited institutions of higher education
- Nationally-recognized exams programs such as the College Level Examination Program® (CLEP) and the Defense Activity for Non-Traditional Education Support (DANTES), when the particular exam has been approved for George Mason credit, up to 45 credit hours
- Industry, government or military training, if indexed and recommended as college-level credit by the American Council on Education (ACE), up to 45 credit hours
- Experiential learning (sometimes called “credit for life experience”) demonstrated by portfolios, up to 30 credit hours

The total combined credit for exams and ACE-approved training cannot exceed 60 credits. For example, if 45 credit hours are accepted by examination, a maximum of 15 credit hours can be accepted for ACE-approved training.

Although the B.I.S. program can accept credit as noted above, not all university and program requirements can be fulfilled by non-traditional means. Even students who transfer in significant numbers of traditional and non-traditional credit will be required to complete certain courses at George Mason.
School of Computational Sciences

We b: scs.gmu.edu
Phone: (703) 993-1990

GRADUATE PROGRAMS
The School of Computational Sciences offers the following academic programs:

- Ph.D. in Computational Sciences and Informatics
- Ph.D. in Bioinformatics
- M.S. in Computational Science
- M.S. in Earth Systems Science (joint with the College of Arts and Sciences)
- M.S. in New Professional Studies: Bioinformatics
- M.S. in New Professional Studies: Biotechnology
- M.S. in New Professional Studies: Forensic Biosciences
- Certificate in Computational Techniques and Applications

Administration
Menas Kafatos, Dean
Peter A. Becker, Assistant Dean for Graduate Studies

Introduction
The School of Computational Sciences (SCS) results from the recent merger of the Institute for Computational Sciences and Informatics and the Institute for Biosciences, Bioinformatics, and Biotechnology. This new school serves as the primary academic unit providing scientific and applications content to George Mason’s information technology focus. This content includes applications in the biological, physical, mathematical, and data sciences. Along with other units, SCS also contributes to the university’s focus on educational and research programs related to the environment.

Through its interdisciplinary and multidisciplinary activities, SCS seeks to integrate computation in the sciences, mathematics, and engineering to produce new knowledge and to develop new approaches to the solution of complex problems. SCS maintains extensive facilities on both the Fairfax and Prince William Campuses.

Faculty

http://catalog.gmu.edu
Course Work
The School of Computational Sciences offers all course work designated Bioinformatics (BINF), Computational Sciences and Informatics (CSI), or Molecular Biosciences and Informatics (MBI) in the “Course Descriptions” chapter of this catalog.

Admission Requirements
To apply, prospective students should forward a completed George Mason graduate application, two transcripts from each college and graduate institution attended, a current resume, and an expanded goals statement to the SCS Graduate Admissions Processing Center. Each doctoral or master’s program applicant should also include three letters of recommendation, and an official report of scores obtained on the GRE-General exam. The GRE-SUB is recommended if it is given in the student’s undergraduate major. The GRE requirement for admission to the doctoral programs will be waived if the student holds a master’s degree from a U.S. institution. TOEFL scores are also required for all foreign applicants. Note that transcripts originating from foreign countries must be evaluated by a U.S.-recognized agency.

Specific additional admission requirements for the various SCS programs are listed below:

- Applicants to either the doctoral program in computational sciences and informatics, the master’s program in computational science, or the certificate program in computational techniques and applications should have an academic background in physical or biological sciences, engineering, mathematics, or computer science. They should have undergraduate degrees from accredited institutions, with GPAs of at least 3.000 in their last 60 credits of study. Additionally, each applicant should have taken at least one course in differential equations and should have facility in using a high-level computer programming language.

- Applicants to the doctoral program in bioinformatics should have a B.A. or B.S. degree in biology or a related field, including undergraduate courses in molecular biology, cell biology, biochemistry, genetics, differential equations, data structures, and probability and statistics. They should also have experience using a high-level programming language. Admission to the program requires a minimum GPA of 3.250 in undergraduate work and a combined GRE score of 1100 (quantitative plus analytical).

- Applicants to the Earth systems science M.S. program should have a B.S. degree in Earth, environmental, or physical science. Previous course work should include two semesters each of calculus, chemistry, and physics, and one semester of statistics. They should have a minimum GPA of 3.000 in their undergraduate degree.

- Applicants to the new professional studies master’s program should have undergraduate or advanced science degrees in areas such as biochemistry, biology, chemistry, computer science, or molecular biology, with GPAs of at least 3.000 in their last 60 credits of study.

Fellowships and assistantships are generally available beginning in the fall semester. Those applying for fellowships and assistantships must submit completed applications by February 1 for fall admission; all other applications for fall admission are due by March 1. Applications for spring admission should be received by November 1 of the preceding year.

Degree Requirements
The program emphasizes three intellectual elements: common computational science topics; computationally intensive courses in specific areas of interest; and doctoral research. The course work is divided as follows:

- The common computational core courses: CSI 700, 701, 703, and 710
- The scientific core courses in one of the areas of concentration
- Scientific electives from specialty courses in the area of concentration, or individualized study based on professional experience and research
- General electives
- Three credits of colloquia or seminars, with at least one credit of CSI 899

The program requires 72 credits beyond the baccalaureate degree, with a minimum of 48 credits in course work, and 24 credits of dissertation research. For those holding master’s degrees, the 72 required credits may be reduced by up to 30 credits, depending on graduate courses completed. At the
end of the semester when course work is completed, the student must form a doctoral committee, which will write the student’s candidacy examination. The examination includes written, oral, and computational components. Upon passing the candidacy examination and submitting an acceptable dissertation proposal, the student is advanced to doctoral candidacy.

Students are encouraged to apply their knowledge to a broad range of natural science problems using computational skills and techniques missing from the more traditional degree programs in science and mathematics. Note that research opportunities are not limited to the listed areas, and many opportunities exist to create new areas of interdisciplinary research that would be difficult to accommodate within a traditional doctoral program. Students are to consult with their advisors to prepare their specific plans of study. Complete information regarding the curriculum requirements (including electives) for each of the areas of concentration is available at the School of Computational Sciences web site www.scs.gmu.edu. In addition to the common core of CSI 700, 701, 703, and 710, required scientific core courses for the specific areas of concentration are indicated in the following list.

Atmospheric Transport and Dispersion: CSI 655 and 755
Bioinformatics and Computational Biology: CSI 730, 731, and 732
Climate Dynamics and Global Change: CSI 751, 755, and 852; CSI 752 or 756
Computational Chemistry: CSI 711, 713, 782, and 783
Computational Finance: STAT 652 and 656; CSI 771 and 776; and two courses in finance
Computational Fluid Dynamics: CSI 721, 722, and 780; CSI 783 or 784; and CSI 785 or PHYS 513
Computational Intelligence and Knowledge Mining: CSI 771, 773, SYST 781, and IT 811
Computational Mathematics: CSI 740; MATH 677 or 678; two additional math courses
Computational Neuroscience: CSI 639, 734, and 735
Computational Physics: CSI 780; CSI 783 or 784; CSI 785 or PHYS 513; and one of CSI 782, 783, 784, 888, or PHYS 705
Computational Statistics: CSI 771 or 773; CSI 778; CSI 876 or 877; CSI 972 and CSI 973
Computer Design of Materials: CSI 685 or 687; CSI 780 and 783; CSI 782 or 786; and CSI 787 or 986
Earth Observing and Remote Sensing: CSI 750, 753, 754, and 757
High-Performance Computing: CSI 709, 909, and one of CSI 721, 754, 761, or 788
Space Sciences and Computational Astrophysics: CSI 661 and 780; CSI 783 or 784; CSI 785 or PHYS 513; and one of CSI 721, 761, or 788

Bioinformatics, Ph.D.

The main objective of the doctoral program in bioinformatics (BINF) is to train students to work as research scientists in academia, industry, and government. The program provides students with an interdisciplinary academic environment to comprehensively develop their abilities/intellects to successfully pursue a scientific career. Pre-doctoral students take a set of fundamental biosciences courses and a set of core courses in bioinformatics. All course requirements may be completed within the first two years of the program.

The BINF doctoral program has the following educational components: fundamental biosciences courses, bioinformatics core courses, electives, and dissertation research. All students are required to take a total of 48 credit hours of course work and 24 credit hours of dissertation research. For students entering the doctoral program with an M.S. or other graduate work, the number of total credits required may be reduced by a maximum of 30 credits.

Degree Requirements

The curriculum is divided into four logical areas: 12 credit hours of fundamental biosciences courses; 16 credit hours of core bioinformatics courses; a minimum of 20 credit hours of electives or independent research; and a minimum of 24 credit hours of dissertation research. The course work is organized as follows:

- The fundamental biosciences courses: BINF 701, 702, plus 3 credit hours each of BINF 703 and 704
- The core bioinformatics courses: CSI 700, BINF 705, 730, 731, and 732
- One of the computational emphasis courses: CSI 701, 703, or 710
- General electives

If the undergraduate record does not include basic biochemistry, the student will be required to take a basic biochemistry course prior to the BINF 701 Biochemical Systematics (Biochemistry). If the undergraduate record is otherwise insufficient, the student will be required to take prerequisite courses, some of which may not be applicable to the 48-hour course total for the bioinformatics Ph.D. Upon nearing completion of biosciences and bioinformatics core requirements, the student must form a dissertation committee, which will prepare the student’s candidacy examination. The examination consists of written and oral components. Each student also prepares a written dissertation proposal, which is presented to the committee. After successfully completing the examination and proposal requirements, the student is formally advanced to doctoral candidacy.

Computational Science, M.S.

The interdisciplinary master’s program in computational science addresses the growing national and regional demand for trained computational scientists. The proposed degree combines a solid foundation in information technology skills with computational courses in a variety of scientific areas. All courses are offered in the late afternoon or early evening to accommodate students with full-time employment outside the university.

The degree is centered on a strong computational component, which comprises 22 hours of course work. The remaining 9 hours represent the scientific component, and centers on specific scientific areas such as mathematics, physics, chemistry, biology, statistics, etc. This provides students with a flexible set of options that can be used to create their own customized curriculum under the guidance of a faculty advisor. Students are encouraged to undertake an optional master’s thesis or research project that allows them to gain useful experience in the development of simulations and other aspects of computational science.

http://catalog.gmu.edu
Degree Requirements

Candidates must successfully complete 31 credit hours as follows:

- 9 credit hours of computational core courses: CSI 700 plus two of CSI 701, 702, 703, 710
- 12 credit hours of computational techniques courses from the following list: CSI 654, 701, 702, 703, 709, 710, 721, 740, 744, 771, 773, MATH 686, CS 635, INFS 614
- 9 credit hours of computational science electives as approved by advisor
- 1 credit hour of seminar or colloquium
- Optional research component: 3 credit hours of CSI 798 or 6 credit hours of CSI 799; exercise of the research option results in a corresponding reduction in the computational science electives requirement

Earth Systems Science, M.S.

The interdisciplinary master’s program in Earth systems science (ESS) is offered jointly by SCS and the College of Arts and Sciences (Environmental Science and Policy; Department of Geography). This degree program addresses the growing national and regional demand for trained professionals in Earth systems science and applications. The ESS M.S. degree emphasizes a research-oriented global systems approach to the study of the atmosphere, hydrosphere and lithosphere, including their interrelationships and their interactions with the biosphere. Emphasis is on the observation and quantitative analysis of Earth systems. Students completing the program are qualified to pursue careers that require knowledge of the basics of Earth systems science and the requisite tools. Students are encouraged to undertake either an optional master’s thesis for more in-depth study or a research project. In the latter case, students will have to pass a qualifying exam.

Degree Requirements

Candidates must successfully complete 30 credit hours as follows:

- 9 credit hours of Earth science core: CSI 655, 656, and 657
- 3 credit hours of Earth observation courses: CSI 753 or GEOG 579
- 3 credit hours of quantitative techniques courses: CSI 754 or GEOG 585
- 3 credit hours of human and biological perspectives courses: one of CSI 750, 759; EVPP 577, 636; GEOG 575, 670
- 3 credit hours of colloquium/seminar: CSI 899 and 792
- 3-6 credit hours of research: CSI 798 or 799
- General electives

New Professional Studies, M.S.

SCS offers three tracks in the new professional studies program: forensic biosciences, bioinformatics, and biotechnology. The master's degree provides graduate education for professionals working at the interface of information technology and the biological sciences. As such, the program content is geared toward persons employed in science-based organizations that require bioinformatics and bioscience skills and expertise.

The degree incorporates action-oriented group learning as a way to integrate theory and practice. Grouped into teams, candidates are immersed in the practical problems of organizations while engaging with each other through collaborative technologies. By dealing with practical organizational issues, participants gain deeper insight into how complex organizations work and how to affect them. The program produces a tightly integrated learning experience and focuses on building a learning community.

Degree Requirements

Each of the three tracks requires a minimum of 33 credits. Four core courses (MNPS 700, 702, 703, 704) are required of all tracks. In addition to the minimum 33 credits, all students are required to take or to have met the requirements of CHEM 663-664 Biochemistry (6 credits). In addition to the core courses, the following courses are required for each track:

- Forensic Biosciences: MBI 530, 531, 533, 534, 537, 538, and 539
- Bioinformatics: MBI 530, 531, 532, 533, 536, and six credits from CSI 601-607
- Biotechnology: MBI 530, 531, 532, 533, 534, 535, and 536

Certificate in Computational Techniques and Applications

SCS offers a graduate certificate program in computational techniques and applications (CTA), which focuses on mastering a variety of basic computational skills. The CTA certificate is independent of the doctoral and master’s programs and is designed primarily for professionals in technical fields who may wish to upgrade their computer expertise. This program is also available as an option for prospective or currently enrolled doctoral or master’s students. The certificate program is composed of 15 credits of course work designed to provide an accelerated introduction to concepts in modern computation. Topics include operating systems, environments, languages, graphics, databases, and applications.

Nondegree status is available for professionals who are interested in taking a limited number of courses.

Facilities

Computation is recognized as a central feature of the instructional and research programs of SCS. The school, therefore, continues to establish world-class computational facilities. In addition, high-speed Internet connections permit interactive distance learning and access to remote databases.

The Fairfax Campus offers instruction in all areas of the SCS curriculum, and provides state-of-the-art computational laboratories and electronic classrooms for research and interactive instruction. The SCS Graduate Instructional Computational Facility houses 24 Silicon Graphics workstations clustered with a 100 GB RAIDS system. These machines are configured with state-of-the-art software for symbolic manipulation, modeling, simulation, data analysis, database management, and data visualization. Other advanced computing platforms within SCS include a high-performance parallel PC cluster with 134 processors, an SGI Origin 2000 workstation with 16 processors, an SGI Origin 200, an SGI Onyx with infinite reality graphics engine, and an Octane visualization workstation. SCS students are issued computer accounts and access to the SCS instructional facilities. Other computing platforms are available for research by graduate students.
SCS facilities on the Prince William Campus are partially shared with the American Type Culture Collection, the world's largest collection of living biological cultures. Facilities include molecular biology and biochemistry labs, computer labs, cold rooms, and instrument rooms, as well as faculty offices. Available computer facilities include more than 60 SGI workstations, including a four-processor Onyx, 18 Octanes, and more than 40 O2s. An SGI Origin 200 provides more than 65 GB of high-availability RAID disk storage. Other computational resources include SUN SparcStations, Macs, and PCs. All computers are connected via a high-speed (100 MB/sec) Ethernet LAN. Teaching facilities include three computer classrooms equipped with SGI workstations configured with advanced bioinformatics, visualization, and data-mining software. Three wet labs for teaching and training are supported by adjacent computer labs, lecture rooms, prep labs, and equipment labs, including three ABI 377 and two ABI 310 automated DNA analyzers.
| 146 School of Computational Sciences |
Institute for Conflict Analysis and Resolution

Faculty
Avruch, Blechman, Cheldelin, Cobb (director), Druckman, Jeong, LeBaron, Lyons, Mitchell, Pearson d'Estree, Rubenstein, Sandole, Sluzki, Warfield

Associate Faculty
Assefa, Baker, Black, Brown, Davis, Gortner, Katz, McFerson, Paden, Scimecca, Stone, Taylor, Wilkins

Administration
Sara Cobb, Director

Course Work
The Institute for Conflict Analysis and Resolution (ICAR) offers all course work designated CONF in the “Course Descriptions” chapter of this catalog.

NOTE: The ICAR curriculum is being revised for fall 2003. Please call for more information.

GRADUATE PROGRAMS

Conflict Analysis and Resolution, M.S.
The Master of Science in Conflict Analysis and Resolution, offered by the Institute for Conflict Analysis and Resolution, is a two-year professional program that prepares students for practice and further academic work by integrating conflict analysis and resolution theory, research, and practical technique. Students study the theory, methods, and ethical perspectives of the field and apply this knowledge in laboratory simulations and workshops, internships, and field practica. Graduates of the program work in a variety of settings where conflict resolution is useful—businesses, unions, government agencies, religious groups, court systems, educational institutions, community centers, international relief and development organizations, conflict resolution consulting firms, and where interest groups are in conflict with current and emergent public policy.

Admission Requirements
In addition to meeting all admission requirements for graduate study, an applicant to the M.S. program must submit the following:
1. All undergraduate and graduate transcripts
2. Three letters of recommendation, one of which should be from a faculty member in the applicant's undergraduate or graduate major field
3. A four- to five-page essay stating the applicant's goals and reasons for seeking admission to the program. The GRE or other standardized test is not required, but may be submitted. The TOEFL is required for foreign students. See Admission of International Students in the Admission Chapter.

Background courses in the social sciences, as well as prior work experience, are desirable. Prior graduate academic work is evaluated on an individual basis for possible transfer credit and fulfillment of program requirements; normally, the university does not permit any reduction in the total credits required for the degree. Although students may enroll on a full- or part-time basis, entry into the program is in the fall semester only.

Degree Requirements

A total of 41 credits is required: 15 credits are required core courses, 15 credits are selectives (students can choose from a defined list), and 11 credits are electives (students may choose appropriate graduate courses that expand their education relevant to their areas of interest). The choice of electives can vary significantly according to each student's individual goals or needs. Each student, therefore, should develop a program of study that should be discussed once each semester with his/her advisor and updated as appropriate.

Required Courses

Students take 15 credits of required course work. These courses are usually offered in the fall semester:

- CONF 501 Overview of the field of conflict analysis and resolution
- CONF 610 Introduction to research
- CONF 713 Introduction to application at the interpersonal and small group level

Courses usually offered in the spring semester:

- CONF 601 Theories of Conflict and Conflict Resolution
- CONF 642 Integration of Theory and Practice

Selective Courses

Students take 15 credits of selective course work.

Students must select at least 2 courses (6 credits) from the following list:

- CONF 720, 730, or 740 Introduction to areas of study
- CONF 701, 702, 709, 802, 803 Advanced theory
- CONF 703, 714, 715 Advanced practice
- CONF 611 Advanced research

Students must complete 2 courses (6 credits) of integrative work:

- CONF 690 Practicum in Conflict Analysis and Resolution
- CONF 694 Internship
- CONF 697 Directed Reading
- CONF 799 Master's Thesis

Elective Courses

Students must complete 11 credits of relevant elective course work. ICAR supports three primary areas of study:

1. 72X series: Courses numbered 72X focus on conflict related to diversity, cultural, and regional issues.
2. 73X series: Courses numbered 73X focus on aspects of structural or institutional conflict.

3. 74X series: Courses numbered 74X focus on practice and application of conflict analysis and resolution to various situations.

Once students have taken CONF 720, 730, or 740, they may construct plans of study that cross these emphases and may choose approved graduate courses from related disciplines. CONF 695 and CONF 795 may be repeated for credit as electives. Courses not used in the selective blocks may be used as electives.

Directed Readings

Only two directed readings (CONF 697) may be applied toward requirements for a master's degree.

Field Opportunities

Internship. ICAR's internship option is available throughout the academic year to M.S. and Ph.D. students as three-credit-hour elective opportunities to experientially apply theory to practice. With the assistance of ICAR's Internship Coordinator, students locate suitable organizations or other opportunities "in the field" where they can assist site supervisors in relevant aspects of conflict analysis and resolution. Frequently, this takes place where public agencies have formulated or intend to formulate policies that one or more segments of the population are in conflict with. Although internships can be done throughout the year, enrollment occurs only during the summer term (CONF 694). Additional Information on ICAR Field Opportunities and Internships can be found in the ICAR Student Handbook.

APT. The Applied Practice and Theory (APT) program is a six-credit course running yearlong. It is designed to take the concepts presented in class and practiced in labs into real situations with conflict and consequences. Students work in teams integrating research and practice with theory development and applied ethics.

◆ Certificate in Conflict Resolution for Health Professionals

ICAR jointly offers a certificate program for health professionals. For more information, see the "College of Nursing and Health Science" chapter.

◆ Introductory Courses for Non-Majors

Introductory courses in conflict studies for non-majors will also be offered each semester on the Arlington Campus.

Conflict Analysis and Resolution, Ph.D.

The doctoral program, the first of its kind in the United States, provides advanced study for students in the fields of conflict and conflict resolution. Students are prepared for careers as researchers, theoreticians, and teachers in higher education, and as policy administrators, analysts, and consultants in both the public and private sectors.

The program stresses a close link between knowledge of theory and of process in the resolution of conflict. For this, training in the methods of research and analysis is necessary and is emphasized. In addition, students are expected to obtain a background in a substantive area of conflict, usually related to the topic of the dissertation.
Admission Requirements
In addition to the three requirements listed for applicants to the M.S. program, requirements for the Ph.D. program include a written sample of work that shows the applicant's potential for completing dissertation research in a doctoral program. Although students may enroll on a full- or part-time basis, entry into the program is in the fall semester only.

Degree Requirements
For students with a master's degree, a total of 57 credits are required. The semester in which courses are usually offered is indicated in parentheses.

Required Core Doctoral Courses
Students take 24 credits of required course work; each course is 3 credits:
- CONF 703 Conceptions of Practice
- or
- CONF 713 Interpersonal and Intergroup Conflict
- CONF 801 Introduction to Conflict Analysis and Resolution
- CONF 802 Micro Theories
- CONF 803 Macro Theories
- CONF 810 Philosophy of the Social Sciences
- CONF 811 Advanced Research Methods I *
- CONF 812 Advanced Research Methods II
- CONF 900 Integrating Theory, Practice, and Method in Conflict Analysis (spring)

Selective Courses
Students must take 2 (6 credits) of the following:
- CONF 601, 701, 702, 709, 901 Advanced theory
- CONF 703, 714, 715 Advanced practice
- CONF 795 Advanced methods

Elective Courses
A total of 15 credits of electives from among any appropriate graduate courses is required, provided that one is in the diversity, cultural, and regional area of study (72X series), one is in the structural or institutional conflict area of study (73X series), and one is in the conflict analysis and resolution area of study (74X series). The intent is for students to build an area of study and skills that will be needed in their dissertation work. These courses are to be completed before comprehensive exams.
- CONF 695, 795, and 895 can be repeated for credit as electives.

Directed Readings
Only two directed readings (CONF 897) may normally be applied toward doctoral elective requirements.

Dissertation Units
CONF 998 (up to 6 credits) Doctoral Dissertation Proposal**; CONF 999 (up to 12 credits) Doctoral Dissertation Research*** for a total of 12 credits.

* CONF 811 has a prerequisite, "demonstrated competence in social statistics." This means that the entering student may be required to take an advanced course in statistics, STAT 510 (fall) or STAT 550 (spring), before registering for CONF 811. Such a course is not, however, counted toward the total credits needed for the degree.

** All CONF 998 courses are graded In Progress (IP) until completion of the proposal. At that time an appropriate grade is issued.

*** All CONF 999 courses are graded In Progress (IP) until the dissertation defense is successfully completed. At that time an appropriate grade is issued.

Credit for Prior Study
Students with an M.S. in Conflict Analysis and Resolution from George Mason University may have the course total required for doctoral degree, reduced by up to 18 credits. The actual number of the credit reduction is determined in consultation with the student's advisor and the program coordinator, after a review of courses taken.

Entering the Doctoral Program without a Master's Degree
Students may be admitted to the doctoral program directly without completion of a relevant master's degree (in conflict analysis and resolution or a related field). Such students are required to take 15 additional hours of credit at the beginning of their doctoral course of study, including: CONF 601, 720 or 730 or 740, and 799.

Foreign Language Requirement
Every doctoral student must show competence in a foreign language (that is, a language other than the native tongue), preferably before "comps." This requirement must be completed before beginning the dissertation. On no account are dissertations accepted without evidence of meeting this requirement. Overseas students may use English as their foreign language and the TOEFL examination as a demonstration of competency. The Department of Modern and Classical Languages has ruled that American Sign Language or computer languages cannot be used to fulfill this requirement.

Advancement to Ph.D. Candidacy
Upon completing course work (except dissertation) listed on the Program of Studies and passing written comprehensive exams, students will be advanced to candidacy. A candidate is permitted six years from the advancement date to complete the dissertation.
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Graduate School of Education

Web: gse.gmu.edu
Phone: (703) 993-2010

Undergraduate Minors
Special Education:
• Early Childhood Special Education
• Emotional Disturbance/Learning Disabilities
• Severe Disabilities

Health, Fitness, and Recreation Resources:
• Exercise Science
• Health Promotion
• Sport Management
• Tourism and Events Management

Undergraduate Initial Teacher Licensure Programs
• Art Education (PK–12)
• Dance Education (PK–12)
• Health/Physical Education (PK–12)
• Music Education (PK–12)

Undergraduate Degree Programs
(Health, Fitness, and Recreation Resources)
• Physical Education, B.S.Ed. (Teacher licensure in Health and Physical Education PK–12)
• Health, Fitness, and Recreation Resources, B.S. with concentrations in:
• Athletic Training
• Exercise Science
• Health Promotion
• Parks and Outdoor Recreation
• Sport Management
• Therapeutic Recreation
• Tourism and Events Management

Graduate Initial Teacher Licensure Programs
• Early Childhood Education (Unified Transformative Early Education Model—UTEEM) with M.Ed.
• Elementary Education (PK–6) with M.Ed. Option
• English as a Second Language (PK–12) with M.Ed. Option
• FAST TRAIN (Elementary PK–6) with M.Ed. Option
• Foreign Language or Latin (PK–12) with M.Ed. Option
• Secondary Education (6–12) with M.Ed. Option
• Special Education with M.Ed.

Graduate Degree Programs
• Counseling and Development, M.Ed.
• Curriculum and Instruction, M.Ed.
• Adult Education
• Advanced Studies in Teaching and Learning
• Instructional Technology
• Multilingual/Multicultural Education
• Education Leadership, M.Ed.
Graduate School of Education

Specializations

- New Professional Studies: Teaching, M.A.
- Special Education, M.Ed.
- Education, Ph.D.

Graduate Degree Programs (Health, Fitness, and Recreation Resources)

- Exercise, Fitness, and Health Promotion, M.S.
- Recreation Resources Management, M.A.I.S.

Graduate Certificate Programs

- Advanced Studies in Teaching and Learning
- Alternative Education
- Applied Behavior Analysis
- Assistive Technology
- Early Childhood Education
- History
- Instructional Technology
- Integration of Technology in Schools
- Literacy
- Mathematics
- Multimedia Development
- Post-Master's Counseling Licensure
- School Counseling Leadership
- Science

The Graduate School of Education is committed to excellence, innovation, and collaboration in research and in the preparation of professionals for the highest levels of practice and service in diverse schools, organizations, and communities.

The Graduate School of Education (GSE), advantageously located in the National Capital Region, provides leadership in transforming schools, organizations, and communities through research, teaching, and collaboration. GSE faculty prepare scholars and practitioners through multidisciplinary programs of study that facilitate the understanding, integration, and application of knowledge. Through research activities, faculty and students expand and refine the knowledge base for teaching and learning. In response to the richness and complexity of a pluralistic society, GSE infuses diversity into its academic programs and research. Faculty develop and support knowledgeable, caring, and reflective professionals who facilitate excellence and equity for all learners. GSE students and faculty demonstrate their growth and development in ways meaningful to their communities and professional organizations. Innovative programs and the integration of technology provide the opportunity for students to develop, examine, evaluate, and practice professional knowledge, skills, and dispositions.

The Graduate School of Education also encompasses degree programs under the Department of Health, Fitness, and Recreation Resources.

Administration

Jeffrey Gorrell, Dean
Martin E. Ford, Senior Associate Dean
Mark B. Goor, Associate Dean
Bonnie M. Anderson, Director of Student and Faculty Services
Paula A. Johnson, Coordinator of Field Relations
David K. Wiggins, Interim Chair, Health, Fitness, and Recreation Resources

Faculty

Professors: Behrmann, Bemak, Bowen (dean emeritus), Collier, Ford, Galluzzo, Gorrell, Isenberg, Jacob, Kavale, Kelly, Levy, Martin, Mastropieri, Mellander (dean emeritus), Scruggs, Shakerle, Spikell, Williams

Associate professors: Burns, Chung, DeMulder, Duck, Dunklee, Dzama, Given, Haley, Hanrahan, Maxwell, McDonald, Norton, Pierce, Razeghi, Rigby, Sanchez, Sprague, Sterling, Sturtevant, C. Thomas, W. Thomas, Thorp, Upperman, White

Assistant professors: Bannan-Ritland, Brazer, Castle, Clark, Dabbagh, Dunlap, Dunne, Fox, Givens, Gordon, Groth, Hicks, Kaffenberger, Kayler, Kidd, Kitsantas, McCarron, Moyer-Packenham, Murphy, Osterling, Talleyrand, Varrella, Winters

Instructor: Warrick


Course Work

GSE programs offer all course work designated EDAE, EDAL, EDCD, EDCI, EDIT, EDLE, EDRD, EDRS, EDSE, EDUC, EDUT, and IETT.

Admission

For information about undergraduate initial teacher licensure for the music education programs in the instrumental or vocal/choral emphasis, contact the Music Department at (703) 993-3778; for the art education program, contact the Art and Visual Technology Department at (703) 993-8898; for the dance education program, contact the Dance Department at (703) 993-1114; and for the health/physical education program, contact the Department of Health, Fitness, and Recreation Resources (HFRR) at (703) 993-2060. See the HFRR section in this chapter.

Information about graduate initial teacher licensure (with an option for an M.Ed. in Curriculum and Instruction in early childhood education, elementary education, secondary education, English as a second language, or foreign languages or for an M.Ed. in Special Education) is available in the Application for Graduate Study and in program brochures available in the GSE Office of Student and Faculty Services (Robinson Hall, Room A307). More specific information is available at monthly information sessions, “Think You Want to be a Teacher?” Call (703) 993-2892/4648 for dates and times. Distributed at these sessions are the Application for Graduate Study, Praxis registration brochures, program brochures and requirements, and other essential information.

Information about master of education degree programs (M.Ed. in Counseling and Development, Curriculum and Instruction, Education Leadership, and Special Education) and graduate certificate programs can be obtained from the program information specialists in Robinson Hall, Room A307, at (703) 993-2892/4648. Information about the M.A. in New Professional Studies: Teaching can be obtained from the Initiatives in Educational Transformation office at (703) 993-8320. For information about the adult education concentration in the M.Ed. in Curriculum and Instruction, contact the Office of Adult Learning and Professional Development at (703) 993-3675.

http://catalog.gmu.edu
Information about the doctoral program is available in the Ph.D. in Education Program Office at (703) 993-2011.

Application Deadlines
Generally, the application deadlines are April 1 for fall, November 1 for spring, and March 1 for summer. Some programs have different application deadlines. Consult the Application for Graduate Study or the web site at http://gse.gmu.edu, or contact the GSE Admissions Office in Robinson Hall, Room A308, at (703) 993-2144 for specifics.

Admission Requirements for Graduate Programs
1. Baccalaureate degree from an accredited institution of higher education.
2. A 3.00 GPA (on a 4.00 scale) or better in the last 60 credits of undergraduate study or successful post-baccalaureate course work. Some programs may offer provisional admission to applicants with a lower GPA if there is additional evidence that the applicant can succeed in a graduate program.
3. Three letters of recommendation written on the form provided in the Application for Graduate Study.
4. A goal statement. Refer to the Application for Graduate Study.
5. Two official copies of transcripts from each institution attended. Transcript request forms are available in the Application for Graduate Study. Unofficial copies of George Mason transcripts are acceptable.
6. Completed application form including a Virginia Domicile Classification form. Refer to the Application for Graduate Study.
7. Nonrefundable application fee, payable by check, money order, or credit card. Refer to the Application for Graduate Study.
8. Standardized test scores as required by some programs.
9. Departmental forms as required by some programs.
10. Experience or licensure as required by some programs.
11. Interview and writing sample as required by some programs.

MINORS
Undergraduate Special Education Minors
These 15-credit minors in special education provide undergraduate students with background knowledge in special education in one of three specializations: Emotional Disturbance/Learning Disabilities, Severe Disabilities, or Early Childhood Special Education. Completion of these minors will partially fulfill requirements for licensure in special education in Virginia. The courses will count toward program requirements of a master’s degree in special education.

PROFESSIONAL TEACHER LICENSURE
The Graduate School of Education is responsible for professional courses, special standards, and licensure recommendation for students desiring to complete requirements for licensure programs approved by the state and by the National Council for the Accreditation of Teacher Education (NCATE) to prepare teachers, administrators, counselors, and related instructional personnel.

The 1999–2000 Praxis exams pass rates for Mason’s teacher education program completers can be found at http://gse.gmu.edu.

Undergraduate Initial Teacher Licensure Programs

♦ Art Education (PK–12) Pending approval, this teacher licensure program is being developed for implementation in fall 2002 to prepare art teachers to be provisionally licensed by a hiring school division. Implementation as a state-approved program offering full licensure is anticipated for fall 2003. Contact the Art and Visual Technology Department at (703) 993-8898.

♦ Dance Education (PK–12) Pending approval, this teacher licensure program is being developed for implementation in fall 2002 to prepare dance teachers to be provisionally licensed by a hiring school division. Implementation as a state-approved program offering full licensure is anticipated for fall 2003. Contact the Dance Department at (703) 993-1114.

♦ Health/Physical Education (PK–12) This teacher licensure program is available in the Department of Health, Fitness, and Recreation Resources. For information, refer to the department’s section in this chapter or call (703) 993-2060.

♦ Music Education (PK–12) Teacher licensure programs are available in instrumental or vocal/choral music education. Contact the Music Department at (703) 993-3778.

Graduate Initial Teacher Licensure Programs
For more information on these programs and for the dates and times of “Think You Want to Be a Teacher?” monthly information sessions, call (703) 993-2892/4648, or consult the web site at http://gse.gmu.edu. For FAST TRAIN information, call (703) 993-3689 or consult the web site.

♦ Early Childhood Education (Unified Transformative Early Education Model—UITEEM) This 63-credit triple-licensure program leads to an M.Ed. in Curriculum and Instruction and prepares professionals with the knowledge, skills, and professional dispositions needed to work with culturally, linguistically, and ability-diverse young children and their families in schools and diverse community settings. Students completing this program are licensed in early childhood education (PK–3), English as a second language (PK–12), and early childhood special education (birth–age 5). Participation requires a full-time, primarily daytime commitment for one summer and two academic years of integrated study and ongoing practice as an intern in diverse school and community settings. Specific content/endorsement courses are required. Students are admitted for the fall term.

♦ Elementary Education (PK–6) This licensure program with an optional M.Ed. in Curriculum and Instruction prepares professionals with the knowledge, skills, and professional dispositions needed to teach children in grades prekindergarten through six. The program has a licensure component of 32 credits and requires an additional 15 credits for completion of the M.Ed. Specific
content/endorsement courses are required. There are full-time and part-time program options; both require a student teaching internship. Full-time students are admitted for the spring term; part-time students are admitted for the fall term.

❖ English as a Second Language (PK–12)
This licensure program with an optional M.Ed. in Curriculum and Instruction prepares professionals with the knowledge, skills, and professional dispositions needed to teach culturally and linguistically diverse populations in grades prekindergarten through twelve. The program has a licensure component of 27 credits and requires an additional 15 credits for completion of the M.Ed. Internship experiences at the elementary and middle or secondary levels are required. Students whose first language is not English are required to pass an oral and written proficiency assessment in English. Six credits of a foreign language are required. Students are admitted each term.

❖ FAST TRAIN (Elementary PK–6)
FAST TRAIN is an alternative teacher licensure program that prepares educators for international teaching assignments. The curriculum for licensure in elementary education PK–6 consists of six required education courses offered over one year. Upon successful completion of course work and passing scores on the Praxis exams, participants receive a Statement of Eligibility. After completion of an internship, requirement overseas, either one term of student teaching or one year of teaching in an international school abroad, students can receive the elementary PK–6 Virginia license. The program can be completed on a part-time or full-time basis, though either schedule requires a year of enrollment. FAST TRAIN courses are applicable to an M.Ed. in Curriculum and Instruction with an emphasis in multicultural/multilingual education. For information about admission, contact the coordinator in Krug Hall, Room 2130, call (703) 993-3602, or consult http://gse.gmu.edu/programs/fastrain.

❖ Foreign Language or Latin (PK–12)
This licensure program with an optional M.Ed. in Curriculum and Instruction prepares professionals with the knowledge, skills, and professional dispositions needed to teach specific foreign languages (Spanish, German, French, Russian, or Japanese) or Latin to students in grades prekindergarten through twelve. The program has a licensure component of 27 credits and requires an additional 15 credits for completion of the M.Ed. Internship experiences at the elementary and middle or secondary levels are required. Six credits of a foreign language and a language proficiency test are required. Students are admitted each term.

❖ Secondary Education (6–12)
This licensure program with an optional M.Ed. in Curriculum and Instruction prepares professionals with the knowledge, skills, and professional dispositions needed to teach adolescents in grades six through twelve. The program is structured to meet the needs of aspiring educators, career changers, and provisionally licensed teachers with a 15-credit licensure component plus a 6-credit internship, and an additional 12 credits for completion of the M.Ed. Three different internship options are available to meet the needs of most individuals. Specific licensure areas include biology, chemistry, earth science, English, history/social science, mathematics, and physics. Specific content/endorsement courses are required in these areas. Add-on endorsements are available in speech communication, English as a second language, and algebra I. Students are admitted each term.

❖ Special Education
This licensure program with an M.Ed. in Special Education prepares professionals with the knowledge, skills, and professional dispositions needed to teach children with special needs in three concentration areas: emotional disturbance/learning disabilities (K–12), severe disabilities (K–12), and early childhood special education (birth to age 5). All programs require a student teaching internship. Course requirements vary from 33 to 54 credits depending on the program and prior course work. Students are admitted each term.

GRADUATE DEGREE PROGRAMS
For more information about these programs, call (703) 993-2892/4648 or consult the web site at http://gse.gmu.edu.

❖ Counseling and Development, M.Ed.
This program prepares students for careers as licensed school counselors (45 credits) or counselors in community agencies (52 credits). The program emphasizes the integration of theory and practice and culminates in an internship in an appropriate setting. Degree applicants must have an undergraduate degree and at least 1,000 hours of counseling-related experiences. Those with a master's degree in education or a related profession who are seeking licensure either as a school counselor or a professional counselor may apply to the post-master's in counseling licensure graduate certificate program. A graduate certificate is also available in school counseling leadership. See Graduate Certificate Programs for a description of these certificates. Students are admitted for fall and spring terms.

❖ Curriculum and Instruction, M.Ed.
This degree is offered for those preparing for initial teacher licensure (see descriptions under Graduate Initial Teacher Licensure Programs), and also in four other concentrations for those who are licensed teachers or are experienced educators or trainers. Those concentrations are as follows:

❖ Adult Education
This degree program prepares professionals in a variety of roles to guide and facilitate the learning of other adults in their own fields. The program includes a 12-credit core (two 6-credit courses), which is offered in a weekend format to a cohort of students at approximately three-week intervals over 10 months (September to June). Students may enter the cohort in either September or February. The remaining 18 credits of course requirements, including 12 credits of individualized emphasis, are taken at the student's own pace. Current students include staff developers, adult literacy educators, park service employees, military and workplace trainers, and health care professionals. For information, call the Office of Adult Learning and Professional Development at (703) 993-3675 or consult the web site at http://gse.gmu.edu.

❖ Advanced Studies in Teaching and Learning
This degree program develops teacher leaders who practice teaching skills aligned with the five propositions of the National Board for Professional Teaching Standards and develops teacher expertise in an emphasis area of choice: alternative
education, early childhood education, history, instructional technology, literacy, mathematics, and science. Emphasis areas in mathematics, science, and history are aligned with the Virginia Standards of Learning. The program develops teacher leaders who practice reflection through action research, problem-based learning, and self-inquiry, and develops teacher expertise in an emphasis that will identify the teacher as a potential leader in that area. The 30-credit program includes a common core of 12 credits and 18 credits in emphasis courses including restricted electives.

The program has three alternatives:
1. Educators without a master's degree may apply for the entire 30-credit degree program.
2. Educators with or without a master’s degree who would like advanced preparation in a particular field may apply for an 18-credit graduate certificate in alternative education, early childhood education, history, instructional technology, literacy (which leads to a Virginia reading specialist license), mathematics, or science. See Graduate Certificate Programs for a description of these certificates.
3. Educators with or without a master's degree who would like advanced preparation in teacher leadership or who are interested in applying for certification by the National Board for Professional Teaching Standards may apply for a 12-credit graduate certificate in advanced studies in teaching and learning consisting of the core courses. See Graduate Certificate Programs for a description of this certificate.

**Instructional Technology**
This degree program provides professionals with the specialized knowledge and skills needed to apply a wide range of computer and telecommunications technologies in achieving educational goals within school, community, and corporate or public settings. Three emphases serve the various needs and interests of specific types of instructional technology clients: instructional design and development, integration of technology in schools, and assistive/special education technology. All emphases include internships, practica, or relevant projects. Required course work varies from 36 to 40 credits. In addition, three graduate certificate programs in integration of technology in schools, multimedia development, and assistive technology are available for students who are interested in shorter, focused course sequences. Students are admitted each term.

**Multilingual/Multicultural Education**
This 30-credit degree program prepares professionals to work with a diverse population of individuals. It provides master’s degree courses for licensed teachers. It is not an initial teacher licensure program, but courses partially satisfy the requirements for an add-on endorsement in English as a Second Language (ESL) PK–12. Six credits of a foreign language are required. Students are admitted each term.

**Education Leadership, M.Ed.**
This degree program prepares candidates for leadership, managerial, and supervisory roles in a variety of educational settings in the public and private sectors. Experienced teachers who complete this program are eligible for Virginia licensure in administration and supervision PK–12. The program includes a 21-credit administration and supervision PK–12 licensure component, including a 3-credit internship for individuals who hold a master's degree, and requires an additional 9 credits for those who do not hold a master's degree. Students are admitted in fall and spring terms. Programs are also available in the mathematics or science education leadership concentration for those who desire to be specialists in the teaching of mathematics (K–8) or science (K–12).

**New Professional Studies: Teaching, M.A.**
A teaching track of the New Professional Studies program is offered to teams of experienced teachers. Participants follow a two-year, three-summer integrated program of school-based research linked to a subject specialization.

Students complete 30 credits of course work. During the first year, they complete a research project in their own classrooms. In the second year, they complete a team research project that spans classrooms. Teams are expected to meet weekly and are asked to journal and participate in web-based discussions tied to classroom work. Reflective practice, classroom research, and a focus on student learning equip teachers to begin the National Board for Professional Teaching Standards certification process.

Specific information about required course work is available from the Initiatives in Educational Transformation administrative office at the Prince William Campus, Manassas, VA 20110. Call (703) 993-8320, or send email to iet@gmu.edu.

**Special Education, M.Ed.**
This degree program leads to a master of education with licensure in a concentration of special education: emotional disturbance/learning disabilities (K–12), severe disabilities (K–12), or early childhood special education (birth to age 5).

All programs require a student teaching internship. Course requirements vary from 33 to 54 credits, depending on the concentration and prior course work. Students are admitted each term.

**Education, Ph.D.**
The Ph.D. in Education provides advanced professional education for experienced educational practitioners pursuing or planning careers in educational settings. The Ph.D. requires a minimum of 85 credits beyond the baccalaureate degree or a minimum of 55 credits beyond the master's degree. A limited number of graduate credits taken previously may be applied to the program. However, an individual’s total program typically requires 10 more credits than those minimum requirements, depending on the person’s goals, program requirements, and previous preparation. With the guidance of faculty, students develop individual programs of study in concert with their goals, program requirements, and self-assessed skills and knowledge. Each student’s program must include study in a professional field such as education administration, instructional technology, special education, curriculum, instruction, bilingual education, counseling and development, early childhood education, or literacy. The specific nature of courses is determined by the student in conjunction with a faculty doctoral advising committee upon completing two semesters in the Ph.D. program. Students also complete a minor area of study consisting of 12 credits.

To complete the Ph.D. program, each student must demonstrate competence in oral and written English, computer
literacy; mastery of the knowledge and skills in the area of professional expertise; and the ability to apply general and specific knowledge and skills to significant educational problems. Students demonstrate these competencies by successfully completing courses and seminars, by completing a doctoral portfolio, and by preparing and orally defending a doctoral dissertation. Students have five years from the time they enroll in their first class to complete all course work and the doctoral portfolio. Five additional years, starting with the date on which students are advanced to candidacy, are allowed to complete the dissertation.

Admission Requirements
Candidates are admitted to study by GSE. Admission is highly selective. Applicants must fulfill the following program admission requirements:
1. A minimum of three years of successful experience as a practitioner in an educational setting
2. A baccalaureate and/or master's degree from an accredited institution
3. Demonstrated high intellectual capability
4. Demonstrated leadership potential
5. Three letters of recommendation
6. GRE general test scores and the writing assessment
7. A written goals statement relating study in the program to educational and career plans
For further information about admission and program requirements, contact the Ph.D. in Education Program Office at (703) 993-2011. Completed applications must be submitted to the GSE Graduate Admissions Office by February 1 for admission for the following summer or fall, or by September 1 for admission for the following spring.

GRADUATE CERTIFICATE PROGRAMS
♦ Certificate in Advanced Studies in Teaching and Learning
This 12-credit certificate program includes a common core of courses aligned with the standards of the National Board for Professional Teaching Standards. This certificate offers advanced preparation for instructional leadership and is designed to prepare teachers to apply for national board certification.

♦ Certificate in Alternative Education
This 18-credit certificate program is designed for professionals who are interested in or are currently working in alternative education settings. It offers the knowledge and skills necessary to work effectively with at-risk students, their families, and involved agencies.

♦ Certificate in Applied Behavior Analysis
This 12-credit certificate program is designed to increase the professional training of individuals responsible for designing, implementing, and monitoring behavioral treatment programs in schools and in agencies such as psychiatric hospitals and training centers for people with mental retardation.

♦ Certificate in Assistive Technology
This 15-credit certificate program provides supplemental training for practitioners, families, and caregivers who use assistive technology with people with disabilities with whom they work. The certificate is appropriate for general and special educators, related service personnel (OT, PT, SLP, etc.), adult service providers, and families and caregivers who work with those with disabilities and need to apply assistive technology solutions within their specific discipline or school, work, home, or community setting.

♦ Certificate in Early Childhood Education
This 18-credit certificate is designed for early childhood professionals who work in various roles with young children and their families. It focuses on the practice and the study of early childhood education and is based on the Early Childhood Generalist Standards for the National Board for Professional Teaching Standards.

♦ Certificate in History
This 18-credit certificate is designed for PK–12 classroom teachers who wish to gain depth in history content to become building leaders in their discipline.

♦ Certificate in Instructional Technology
This 18-credit certificate is designed for PK–12 classroom teachers who wish to gain depth in instructional technology content to become building leaders in their discipline.

♦ Certificate in Integration of Technology in Schools
This 12-credit certificate program is offered to teachers who wish to gain the necessary knowledge and skills for integrating technology into the K–12 curriculum and is designed to fulfill the state-mandated technology competencies for teachers.

♦ Certificate in Literacy
This 18-credit certificate is designed for teachers who have a master's degree and are seeking a Virginia reading specialist license. Training is provided in the areas of literacy foundations from birth to adulthood and literacy assessments for groups and individuals. An advanced seminar focuses on literacy program supervision, staff development, and research-based inquiry.

♦ Certificate in Mathematics
This 18-credit certificate is designed for PK–12 classroom teachers who wish to gain depth in math content to become building leaders in their discipline.

♦ Certificate in Multimedia Development
This 15-credit certificate program is offered to those who would like to learn the technology associated with multimedia development. This program provides students with an introduction to the design and development of educational and training products and with training on current and timely technology products.

♦ Certificate in Post-Master's Counseling Licensure
This 15-credit graduate certificate program offers courses toward school counseling and community agency counseling licensure for post-master's degree students.

♦ Certificate in School Counseling Leadership
This 15-credit certificate program provides comprehensive training to middle and high school counselors for leadership and administrative roles in secondary counseling programs.

http://catalog.gmu.edu
Certificate in Science

This 18-credit certificate provides course work in the area of science related to the Virginia Standards of Learning. Students are prepared to be lead teachers on either of two levels: K-6 or 6-12.

Health, Fitness, and Recreation Resources

The Department of Health, Fitness, and Recreation Resources, (703) 993-2060, in the Graduate School of Education prepares students for careers in health and physical education, athletic training, parks and outdoor recreation, therapeutic recreation, exercise science, health promotion, tourism and events management, and sport management. The B.S.Ed in Physical Education prepares students for a career in teaching (PK-12) in public and private schools. The B.S. in Health, Fitness, and Recreation Resources prepares students for supervisory and management careers in private and public parks, recreation systems, therapeutic recreation communities, health promotion agencies, sport management organizations, athletic training facilities, and tourism and events management sites. The M.S. in Exercise, Fitness, and Health Promotion prepares professionals for advanced work in the field. The M.A.I.S. concentration in Recreation Resources Management is designed for practicing professionals and students seeking advanced careers and furthering their knowledge in the field of recreation and natural resources management.

Faculty

Professors: Brayley, Ruhling, Weaver, D. Wiggins
Associate Professors: D. Anderson, Bever, Kozlowski, Miller, Rikard, Rodgers, Schack
Assistant Professors: Banville, Bowen, Daniels, Lozar, Mincey, B. Wiggins
Instructors: Johnson, Norden, Shaffer

Course Work

The department offers all course work designated EFHP, HEAL, PHED, PRLS, SPMT, and TOUR in the “Course Descriptions” chapter of this catalog. Lifelong fitness courses are offered for elective credit to George Mason students. These courses are included under PHED.

UNDERGRADUATE MINORS

Minor in Exercise Science

Students must complete 15 credits distributed as follows:

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHED 200</td>
<td>3</td>
</tr>
<tr>
<td>PHED 300</td>
<td>3</td>
</tr>
<tr>
<td>PHED 365</td>
<td>3</td>
</tr>
<tr>
<td>HEAL 330</td>
<td>3</td>
</tr>
</tbody>
</table>

Minor in Health Promotion

Students must complete 18 credits distributed as follows:

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHED 200</td>
<td>3</td>
</tr>
<tr>
<td>PRLS 310 or HEAL 323</td>
<td>3</td>
</tr>
<tr>
<td>HEAL 450</td>
<td>3</td>
</tr>
<tr>
<td>HEAL 370</td>
<td>3</td>
</tr>
<tr>
<td>HEAL 372</td>
<td>3</td>
</tr>
<tr>
<td>HEAL 430</td>
<td>3</td>
</tr>
</tbody>
</table>

Minor in Sport Management

Students must complete 18 credits distributed as follows:

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPMT 201</td>
<td>3</td>
</tr>
<tr>
<td>SPMT 302</td>
<td>3</td>
</tr>
<tr>
<td>SPMT 318</td>
<td>3</td>
</tr>
<tr>
<td>SPMT 320</td>
<td>3</td>
</tr>
<tr>
<td>SPMT 412</td>
<td>3</td>
</tr>
<tr>
<td>SPMT 480</td>
<td>3</td>
</tr>
</tbody>
</table>

Minor in Tourism and Events Management

Students must complete no fewer than 18 credits of study. At least 9 credits of the minor must be completed at George Mason University. No more than 3 credits of a D grade in the minor are accepted. Required courses are as follows:

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>TOUR 200</td>
<td>3</td>
</tr>
<tr>
<td>TOUR 312</td>
<td>3</td>
</tr>
<tr>
<td>TOUR 320</td>
<td>3</td>
</tr>
<tr>
<td>TOUR 330</td>
<td>3</td>
</tr>
<tr>
<td>TOUR 352</td>
<td>3</td>
</tr>
</tbody>
</table>

The remaining 3 credits requirement may be met by successful completion of one of the following courses:

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>PRLS 310</td>
<td>3</td>
</tr>
<tr>
<td>TOUR 340</td>
<td>3</td>
</tr>
<tr>
<td>TOUR 430</td>
<td>3</td>
</tr>
<tr>
<td>TOUR 440</td>
<td>3</td>
</tr>
<tr>
<td>TOUR 412</td>
<td>3</td>
</tr>
</tbody>
</table>

UNDERGRADUATE PROGRAMS

Physical Education, B.S.Ed.

This degree prepares students for a career in teaching.

Teacher Licensure in Health and Physical Education PK–12 (PHED)

The teacher education program is accredited and approved by the National Council for Accreditation of Teacher Education and the Virginia State Department of Education. The application process for admission follows, depending on the applicant:

Four-Year Students: Students entering as freshmen can apply to the PHED program after taking a minimum of 45 credits, attaining a cumulative GPA of 2.500, and submitting scores for all three parts of the Praxis I test. Students must be currently enrolled in PHED 201 or 202.

Transfer Students: Degree-seeking students can apply by using their cumulative GPA of 2.500 or higher for a minimum of 45 credits from their previous university, or they can complete 12 credits at George Mason University with a minimum of a 2.500 GPA. They must submit scores on all parts of Praxis I.

Students who already have a degree from any discipline and are seeking licensure can apply if they have a cumulative GPA of 2.500 or higher on their last 60 credits of course work from their previous university or after completing 12 credits at George Mason.

Degree Requirements

The degree requires a minimum of 126 credits with the final semester devoted to student teaching. To enroll in student teaching, students must have a minimum 2.500 GPA or higher in their last 60 credits of course work. They must submit scores on all parts of Praxis I.

http://catalog.gmu.edu
MAJORS ONLY: Students are not permitted to enroll in the following courses until they have met application requirements: HEAL 405, PHED 306, 308, 373, 375, 403, 404, and 415.

Student Teaching Internship Application
Student teaching applications are available from the Department of Health, Fitness, and Recreation Resources (at the Prince William and Fairfax Campuses) and the Office of Student and Faculty Services (Graduate School of Education, Robinson Hall). The application must be completed one semester before taking PHED 415 Student Teaching in Physical Education.

Application deadlines for student teaching internships: fall semester—February 1 (advisor), February 15 (Office of Student and Faculty Services); spring semester—September 1 (advisor), September 15 (Office of Student and Faculty Services).

Students must maintain a GPA of at least 2.500 during their last 60 degree-specific credits.

General Education Requirements

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Written communication</td>
<td>6</td>
</tr>
<tr>
<td>Oral communication</td>
<td>3</td>
</tr>
<tr>
<td>Information technology</td>
<td>3</td>
</tr>
<tr>
<td>Quantitative reasoning</td>
<td>3</td>
</tr>
<tr>
<td>Literature</td>
<td>3</td>
</tr>
<tr>
<td>Arts</td>
<td>3</td>
</tr>
<tr>
<td>U.S. history</td>
<td>3</td>
</tr>
<tr>
<td>Western civilization</td>
<td>3</td>
</tr>
<tr>
<td>Social and behavioral science</td>
<td>3</td>
</tr>
<tr>
<td>Global understanding</td>
<td>3</td>
</tr>
<tr>
<td>Natural science</td>
<td>8 (PHED majors are required to take BIOL 124 and 125 to meet state licensure)</td>
</tr>
</tbody>
</table>

Synthesis

(PHED students are required to take PHED 415.) 9

Professional Sequence

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>EDRD 300</td>
<td>3</td>
</tr>
<tr>
<td>EDUC 300 or 522</td>
<td>3</td>
</tr>
<tr>
<td>HEAL 110, 205, 220, 310, 325, 330, 405</td>
<td>22</td>
</tr>
<tr>
<td>PHED 200, 201, 202, 300, 304, 306, 308, 365, 373, 375, 403, 404, 450</td>
<td>39</td>
</tr>
<tr>
<td>PRLS 316, 410, 460</td>
<td>9</td>
</tr>
</tbody>
</table>

Total credits 126

Health, Fitness, and Recreation Resources, B.S.
Concentrations include the following:

◆ Athletic Training (ATT)

Athletic training provides educational and clinical experiences concerning the management of injuries and health problems associated with physical activity. The goal is to provide educational and clinical experiences that will equip students with the knowledge and skills that must be mastered within an entry-level athletic training program. Students complete supervised clinical assignments in areas that will prepare them for such career settings as secondary schools, colleges and universities, professional sports programs, sports medicine clinics, industry, and military training programs, as well as other allied health care settings.

The athletic training program is in candidacy for accreditation by the Commission on Accreditation of Allied Health Education Programs (CAAHEP). Awarding of accreditation by CAAHEP is not guaranteed. Copies of the technical standards are in the Admissions Office, the program director's office, and in HFRR administrative offices.

◆ Exercise Science (ES)

Exercise science provides an emphasis on promotion of healthy lifestyles outside school settings. This degree prepares students for supervisory and managerial careers in private and public fitness agencies and clinical and public safety settings. Many choose to complete an undergraduate degree in exercise science and then go elsewhere for graduate degrees in physical therapy. Students complete supervised internships in professional settings. There is a minor in Exercise Science.

◆ Health Promotion (HPR)

Health promotion prepares students for supervisory and managerial careers in voluntary health organizations and nonprofit and managed care organizations, as well as hospital wellness centers, health departments, and health clubs. The degree includes courses on topics such as nutrition, contemporary health problems, and community health systems. Students complete supervised internships in professional settings. A health education certificate is available. (See department web site at www.gmu.edu/departments/hfrr). There is a minor in Health Promotion.

◆ Parks and Outdoor Recreation (POR)

Parks and outdoor recreation majors learn about the contribution of public recreation and parks to the well-being and quality of life of the public. The curriculum includes courses in natural resources, outdoor recreation programming, and environmental education. Graduates in the degree have gone on to become professionals in public agencies, nonprofit organizations, corporations, and environmental management positions. Students complete supervised internships in professional settings.

◆ Sport Management (SPM)

Sport management students prepare for management positions in the sport industry, which is the 11th-largest industry in the United States. Included among its many professional positions are marketing coordinators, event management specialists, athletic directors, program coordinators, public relations managers, and human resource specialists. The program is seeking certification by the North American Society for Sport Management (NASSM). Awarding of accreditation by NASSM is not guaranteed. Students complete course work in sport marketing and finance, sport and ethics, and a supervised internship in a professional setting. There is a minor in Sport Management.

◆ Therapeutic Recreation (TR)

Therapeutic recreation students prepare to provide community-based recreation services for people with disabilities. Completion of the foundations course, as well as issues and assessment courses, prepares students for an internship under a certified therapeutic recreation specialist and prepares them to sit for the National Exam for Therapeutic Recreation Specialists. Graduates find employment in local, state, and federal recreation settings, nonprofit organizations, and educational and clinical institutions working with all ages of the life span.

http://catalog.gmu.edu
Tourism and Events Management (TEM)

Tourism and Events Management students prepare to enter a diverse profession in the world's third-largest industry. Built on the curricula cornerstones of resort management, environmental tourism, event management, and cultural and heritage tourism, the courses equip students with understanding, knowledge, skills, and experience in managing the tourism experience for the benefit of the traveler, the host, and the supporting industry. Tourism and Events Management graduates are employed in commercial, private, and public agencies, and in a wide variety of jobs and many geographic or business settings.

Certificates

Students also may complete a certificate program outside Health, Fitness, and Recreation Resources in environmental management (27 credits, see the Biology section of the "College of Arts and Sciences" chapter) and gerontology (24 credits, see the "College of Nursing and Health Science" chapter). Parks and outdoor recreation students interested in the environmental management certificate should take BIOL 213 and either BIOL 303 or 304 instead of BIOL 103 and 104; students interested in the gerontology certificate should take BIOL 124 and 125.

General Education Requirements

| Credits |
|-----------------|-----------------|
| Written communication | 6 |
| Oral communication | 3 |
| Information technology | 3 |
| Quantitative reasoning | 3 |
| Literature | 3 |
| Arts | 3 |
| U.S. history | 3 |
| Western civilization | 3 |
| Social and behavioral science | 3 |
| Global understanding | 3 |
| Natural science | 8 |
| Athletic training, exercise science, health promotion, and therapeutic recreation concentrations | 120 |
| Parks and outdoor recreation students interested in the environmental management certificate | 120 |
| Tourism and events management students | 120 |

Exercise science (ES)

| Credits |
|-----------------|-----------------|
| HEAL 205, 220, 323, 330, 350, 490 | 28 |
| PHED 200, 300, 304, 365, 410, 450, 480 | 21 |
| PRLS 310, 410, 405, 411, 450, 460 | 18 |
| Electives | 12 |
| **Total** | **120** |

Health promotion (HPR)

| Credits |
|-----------------|-----------------|
| HEAL 205, 220, 323, 330, 350, 370, 372, 430, 450, 470, 490 | 43 |
| PHED 200, 365, 410 | 9 |
| PRLS 310, 410, 411, 450, 460 | 15 |
| Electives | 12 |
| **Total** | **120** |

Parks and outdoor recreation (POR)

| Credits |
|-----------------|-----------------|
| HEAL 205, 323, 350 | 10 |
| PHED 200, 304, 410 | 9 |
| PRLS 310, 405, 410, 411, 450, 460 | 18 |
| SPMT 201, 302, 318, 320, 412, 465, 490 | 30 |
| Electives | 12 |
| **Total** | **120** |

Sport management (SPM)

| Credits |
|-----------------|-----------------|
| HEAL 205, 323, 350 | 10 |
| PHED 200, 304, 410 | 9 |
| PRLS 310, 405, 410, 411, 450, 460 | 18 |
| SPMT 201, 302, 318, 320, 412, 465, 490 | 30 |
| Electives | 12 |
| **Total** | **120** |

Therapeutic recreation (TR)

| Credits |
|-----------------|-----------------|
| HEAL 205, 323, 350 | 10 |
| PHED 200 | 3 |
| PRLS 210, 310, 316, 317, 405, 410, 411, 416, 418, 450, 460, 490, 503 | 51 |
| PSYC 211, 325 | 6 |
| Electives | 9 |
| **Total** | **120** |

Tourism and events management (TEM)

| Credits |
|-----------------|-----------------|
| HEAL 323, 350 | 6 |
| PRLS 310, 317, 405, 410, 411, 450, 460 | 21 |
| TOUR 200, 241, 312, 320, 330, 340, 352, 412, 420, 430, 440, 470, 480, 490 | 53 |
| **Total** | **121** |

**GRADUATE PROGRAMS**

Exercise, Fitness, and Health Promotion, M.S.

This program prepares professionals in the fields of health and physical education, fitness, and health promotion/disease prevention to either pursue advanced academic training (doctoral program) or more adequately serve their communities.

Admission Requirements

In addition to fulfilling graduate admission requirements, the applicant must do the following:

1. Submit three letters of recommendation
2. Provide transcripts of all college coursework
3. Forward GRE or MAT scores to George Mason University

http://catalog.gmu.edu
4. Submit a written goals statement (500-1,000 words) explaining how study in the M.S. in Exercise, Fitness, and Health Promotion program relates to the applicant's educational and career plans.

5. Have completed undergraduate courses in human anatomy, physiology, nutrition, exercise physiology, and kinesiology.

Applicants who do not meet the above requirements may be offered provisional or nondegree status in accordance with general regulations of the Graduate Council. Admission decisions are made whenever applicants' files are complete. Candidates may enroll in any term during the following year, although fall enrollment is recommended given the course sequence.

Degree Requirements

The following courses, totaling 30 credits, constitute the degree requirements:

- **Core**
  - EFHP 606 Foundations of Exercise, Fitness, and Health Promotion: 3 credits
  - EFHP 610 Advanced Exercise Physiology: 3 credits
  - EFHP 611 Fitness Assessment: Theory and Practice: 3 credits
  - EFHP 614 Advanced Exercise Nutrition: 3 credits
  - EFHP 618 Exercise and Sport Psychology: 3 credits
  - EFHP 623 Research Design and Statistical Reasoning: 3 credits

- **Electives**
  - 6 credits (thesis option) or 12 credits (nonthesis option)

**Thesis Option**

1. 18 credits compose the core.
2. 6 credits compose the electives.
3. 6 credits compose the thesis.

Students choosing to do a thesis must recruit an advisor to supervise thesis work and lead the thesis committee. The advisor must be a member of the exercise, fitness, and health promotion graduate faculty. Students may not register for thesis credit until a proposal has been approved by the graduate coordinator after consulting with the thesis advisor. The graduate coordinator appoints two members to the thesis committee, one of whom may be outside the program, on the basis of recommendations from the student and thesis advisor.

**Nonthesis Option**

1. 18 credits compose the core.
2. 12 credits compose the electives.

Students who choose the 12-credit electives option must complete a written comprehensive examination during the semester or summer, at the conclusion of which they expect all course requirements for the degree to be completed.

Distance Education Program

**Concentration in Recreation Resources Management, M.A.I.S.**

The Department of Health, Fitness, and Recreation Resources also offers a concentration in recreation resources management in the Master of Arts in Interdisciplinary Studies program. It is designed for practicing professionals and students seeking advanced careers and furthering their knowledge in the field of recreation and natural resources management. This 36-hour degree program immerses students in the latest theories, policies, laws, and research related to managing the use of public lands for recreation. For more information, see the Interdisciplinary Studies section in the "College of Arts and Sciences" chapter.

Admission Requirements

Applicants to the M.A.I.S. concentration in Recreation Resources Management must fulfill the graduate admission requirements of George Mason's College of Arts and Sciences (CAS). Students who are admitted to the M.A.I.S. program must show a capacity for original thought in cross-disciplinary research. Prospective students must complete a George Mason graduate application, which can be obtained by calling the CAS Graduate Admissions Office at (703) 993-2400. In addition to fulfilling graduate admission requirements, the applicant must provide the following:

1. Transcripts from all colleges and universities attended with a 3.250 GPA (on a 4.000 scale) or better in the last 60 hours of undergraduate study.
2. Three letters of reference.
3. Statement explaining why the individualized concentration meets educational needs and goals.
4. Resume.
5. Scores from either the GRE or the MAT, the GMAT, or the LSAT may be substituted if taken within the last five years. If the applicant has a master's degree, the test requirement may be waived.

Students admitted provisionally must achieve a 3.250 GPA in the first 12 credits of graduate work to advance to degree status. If they fail to do so, they will be terminated from the program.

International students on F-1 or J-1 visas should consult the University Catalog or George Mason's web site at www.gmu.edu for admission procedures and out-of-state rates.

Degree Requirements

A contract with a clearly identified cognate must be approved at or before the time the student completes 9 credits to be applied to graduation. A maximum of 12 credits can be transferred to the degree program. Cognates must be a minimum of 9 credits; they need not have the same prefix.

**Distribution:**

<table>
<thead>
<tr>
<th>Credits</th>
<th>Core</th>
</tr>
</thead>
<tbody>
<tr>
<td>18-21</td>
<td>PRLS 531 Natural Resources</td>
</tr>
<tr>
<td></td>
<td>Recreation Planning</td>
</tr>
<tr>
<td></td>
<td>PRLS 533 Visitor Services</td>
</tr>
<tr>
<td></td>
<td>PRLS 535 Evaluating Recreation Outcomes</td>
</tr>
<tr>
<td></td>
<td>PRLS 598 Confronting the Digital Domain</td>
</tr>
<tr>
<td></td>
<td>PRLS 560 Liability and Risk Management</td>
</tr>
<tr>
<td></td>
<td>MAIS 798 Project</td>
</tr>
<tr>
<td>or</td>
<td>MAIS 799 Thesis</td>
</tr>
<tr>
<td></td>
<td>Cognates</td>
</tr>
<tr>
<td>9-12</td>
<td>Electives</td>
</tr>
</tbody>
</table>

Students choosing to do a thesis must recruit an advisor to supervise thesis work and lead the thesis committee. The advisor must be a member of the exercise, fitness, and health promotion graduate faculty. Students may not register for thesis credit until a proposal has been approved by the graduate coordinator after consulting with the thesis advisor. The graduate coordinator appoints two members to the thesis committee, one of whom may be outside the program, on the basis of recommendations from the student and thesis advisor.
Cognate courses are groups of elective courses that form a coherent focus. They need not have the same prefix, and can be taken from different areas such as natural resource interpretation, cultural resource interpretation, research and measurement, ethics and values, communication, organizational behavior, or other areas agreed upon by the student and advisor.
The School of Information Technology and Engineering (IT &E) at George Mason University is concerned primarily with study areas that involve integrating the information bases for modern engineering with the more conventional physical and materials science approach. The careful integration of these areas results in a unique academic experience for highly motivated students.

IT &E offers 22 degree programs that concentrate on important contemporary technological issues and needs. Six bachelor's degree programs are offered: civil and infrastructure engineering, computer engineering, computer science, electrical engineering, information technology, and systems engineering. Minors in information technology, computer science, and data analysis are also available.

Twelve master's degree programs are available: civil and infrastructure engineering, computer engineering, computer science, e-commerce, electrical engineering, enterprise engineering and policy, information systems, operations research, software engineering, statistical science, systems engineering, and telecommunications. Three doctoral programs are offered: a cross-disciplinary program in information technology, and more focused programs in computer science and in electrical and computer engineering. In addition, the Engineer degree in Information Technology provides post-master's training in an application area. Undergraduate certificates are offered in applied statistics, information technology, and operations research and engineering. For graduate students, certificate programs are offered in electronic commerce; command, control, communications, and intelligence; communications and networking; computational modeling; systems engineering for computer, information, and software-intensive systems; federal statistics; information engineering; information systems security; military operations research; signal processing; software engineering; VSLI design/manufacturing; discovery, design and innovation; computer networking; network technologies and applications; wireless communications; and telecommunications systems modeling.

The undergraduate degree programs prepare graduates to enter directly into professional employment or to continue studies at the graduate level. The requirements for the
School of Information Technology and Engineering

The undergraduate education mission of the School of Information Technology and Engineering is to provide a quality education to support the needs of Virginia and the nation.

The goal of the IT&E undergraduate programs is to graduate students who
• are technically competent,
• are prepared for ethical professional practice,
• can communicate effectively,
• can work as members or leaders of technical teams,
• are prepared for a lifetime of learning, and
• understand the global nature and impact of information technology and engineering.

Bachelor of Science

The following general requirements for a bachelor of science degree must be completed by all undergraduate students in majors in IT&E:

1. At least 120 credits of academic work
2. At least 6 credits of English composition, 3 credits of literature, and 3 credits of oral communication general education electives
3. At least 3 credits of U.S. history, 3 credits of Western civilization, 3 credits of social studies, and 3 credits of global/international issues general education electives
4. The requirements listed in the following sections for the specific IT&E majors, which include university requirements for mathematics, IT competency and ethics, and synthesis.

Freshmen who are undecided about their specific majors within IT&E may select IT&E Undeclared as their majors. Sample schedules that fulfill degree requirements for individual programs within IT&E departments are available from the departments. With approval of departmental advisors, some courses may be taken out of the indicated sequences, particularly in the case of English, literature, and social science courses.

Students should consult the Baccalaureate Degree Requirements section in the “Academic Policies” chapter in this catalog for detailed information concerning requirements for graduation, residence, and academic quality for graduation. Students should also consult the “Academic Policies” chapter of this catalog for additional university requirements for minor programs. The requirements for the B.I.S. degree can be found in the New Century College section of the “College of Arts and Sciences” chapter. The requirements for the civil and infrastructure engineering, computer engineering, computer science, electrical engineering, and systems engineering undergraduate degree programs are provided in the academic departments’ sections of this chapter. The requirements for the B.S. degree in information technology are provided in the interdisciplinary section of this chapter. A student majoring in an IT&E program is expected to have an acceptable plan of study, formulated by the student and his or her advisor, on file in the student’s department.

Writing-Intensive Requirement

The university requires all undergraduate students to successfully complete a course, or combination of courses, designated “writing intensive” in their majors at the 300 level or above. To determine the writing-intensive course requirements for specific degrees, please refer to the major program descriptions in the following department sections.

B.S./Accelerated M.S. Programs

A number of the B.S. degree programs offered within IT&E may be packaged with some of the M.S. degree programs in ways that reduce the total number of credits required. Details may be found in the following department sections.

Certificate in Information Technology

The certificate in information technology (IT) is designed primarily for those students who have earned a nontechnical bachelor's degree or an associate's degree. The IT certificate allows students with nontechnical backgrounds to augment the knowledge gained through their major-related courses with additional computer and information technology knowledge and skills to improve their attractiveness to employers in the high-technology community. The IT certificate requires 15 credits of core courses. Beyond these requirements, the student is free to define a technical focus area. The focus area must be composed of at least three courses (9 credits). Elective courses selected for the technical focus area must be approved by the IT&E program advisor for the IT certificate.

Core Courses

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>IT 101 Introduction to Information Technology</td>
<td>3</td>
</tr>
<tr>
<td>IT 103 Introduction to Computing</td>
<td>3</td>
</tr>
<tr>
<td>IT 108 Programming Fundamentals</td>
<td>3</td>
</tr>
</tbody>
</table>

Two of the following courses:

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>IT 212 How Computers Work</td>
<td>3</td>
</tr>
<tr>
<td>IT 213 Multimedia and Computer Graphics</td>
<td>3</td>
</tr>
<tr>
<td>IT 214 Database Fundamentals</td>
<td>3</td>
</tr>
<tr>
<td>IT 250 Introductory Statistics I</td>
<td>3</td>
</tr>
</tbody>
</table>
School of Information Technology and Engineering 165

Minor in Information Technology

The information technology (IT) minor is designed primarily for those non-IT&E majors who desire to augment the knowledge gained through their major-related courses with additional computer and information technology knowledge and skills to improve their attractiveness to employers in the high-technology community. The IT minor requires 9 credits of core courses. Beyond these requirements, the student is free to define a technical focus area, e.g., in information security. Focus areas are composed of at least two courses (6 credits). Students pursuing the IT Minor should obtain a list of approved electives from the IT&E Student Services Office.

Core Courses .............................................................. 9
IT 101 Introduction to Information Technology .......... 3
IT 103 Introduction to Computing .............. 3
IT 108 Programming Fundamentals .................. 3

Master of Science

Degree Requirements

IT&E offers 12 master of science programs in its academic units. Policies regarding admission and degree requirements are provided in the department sections that follow.

<table>
<thead>
<tr>
<th>M.S. Degree</th>
<th>Department</th>
</tr>
</thead>
<tbody>
<tr>
<td>Civil and Infrastructure Engineering</td>
<td>Civil, Environmental, and Infrastructure Engineering</td>
</tr>
<tr>
<td>Computer Engineering</td>
<td>Electrical and Computer Engineering</td>
</tr>
<tr>
<td>Computer Science</td>
<td>Computer Science</td>
</tr>
<tr>
<td>E-Commerce</td>
<td>Interdisciplinary Programs</td>
</tr>
<tr>
<td>Electrical Engineering</td>
<td>Interdisciplinary Programs</td>
</tr>
<tr>
<td>Enterprise Engineering and Policy</td>
<td>Information and Software Engineering</td>
</tr>
<tr>
<td>Information Systems</td>
<td>Information and Software Engineering</td>
</tr>
<tr>
<td>Operations Research</td>
<td>Systems Engineering and Operations Research</td>
</tr>
<tr>
<td>Software Engineering</td>
<td>Information and Software Engineering</td>
</tr>
<tr>
<td>Statistical Science</td>
<td>Applied and Engineering Statistics</td>
</tr>
<tr>
<td>Systems Engineering</td>
<td>Systems Engineering and Operations Research</td>
</tr>
<tr>
<td>Telecommunications</td>
<td>Interdisciplinary Programs</td>
</tr>
</tbody>
</table>

Engineer Degree in Information Technology

The Engineer Degree in Information Technology allows a student to combine the advanced course work of the Ph.D. degree in Information Technology with an applied project. It is suitable for students seeking specialized training, but who do not wish to complete an extended research project.

For complete details, see the section on Interdisciplinary Programs in this chapter.

Nondegree Graduate Program

Admission to graduate study in nondegree status is available for those individuals who do not wish to pursue a degree but are interested in taking graduate courses offered by IT&E. To be admitted to nondegree status, a student must meet the following requirements. For routine admission, a student should have a 3.00 GPA or higher and a B.S. degree (preferably in a discipline in the potential degree area of interest), and must have met the course prerequisites as listed in the various departments. Admission criteria for students with a GPA below 3.00 or those with a nonengineering background are varied, and applications are reviewed within departments on an individual basis.

Students who later choose to seek admission to one of the IT&E graduate degree programs must reapply for admission to a degree program and supply the additional required materials with the new application. If admitted to the degree program, the student may request that up to 12 credits taken in nondegree status be approved for transfer for a degree. Admission to nondegree status does not automatically guarantee admission to the degree program at a later date. Applicants may obtain more information by contacting the IT&E Student Services Office, Room 160, Science and Technology II, (703) 993-1505, or by contacting the individual departments.

University Computing Capability

Academic computing capability is provided by laboratories offering a large number of individual student computers, as well as campuswide networking facilities. All laboratories are networked and include access to local and remote servers as well as the Internet.

IT&E provides multiple labs equipped with Microsoft NT workstations, Windows PCs, Sun workstations, Network Computing Device workstations, and SGI graphical workstations, as well as workstations of other manufacturers. The IT&E central system computers are clustered into UNIX and NT networks that support the student labs as well as faculty and departmental machines.

Software includes compilers for a variety of programming languages and software tools supporting engineering design, graphics, neural networks, and high-performance/parallel computing. Specialized facilities are available for artificial intelligence, software engineering, image processing and computer vision, virtual reality, and parallel and distributed computing research.

Doctor of Philosophy

IT&E offers a Ph.D. in Computer Science, a Ph.D. in Electrical and Computer Engineering, and a Ph.D. in Information Technology. The Ph.D. in Computer Science is described in the Computer Science section of this chapter, and the Ph.D. in Electrical and Computer Engineering is described in the Electrical and Computer Engineering section. The Ph.D. in Information Technology is a program that builds on a fundamental core and emphasizes cross-disciplinary efforts among the 12 master's programs in IT&E, as well as with related units at George Mason University. Specific entrance and degree requirements for this doctoral program are found in the Interdisciplinary Graduate Programs section of this chapter.
Applied and Engineering Statistics

Web: galaxy.gmu.edu/stats/aes.html
Phone: (703) 993-3645

Faculty
Professors: Carr, Gantz, Gentle, Wegman
Associate professors: Bolstein (chair), Habib, J. Miller, C. Sutton
Assistant professor: Bell
Adjunct professors: Faxon, Marchette, Papp, Sims, Sirgany, Solka
Visiting Assistant professor: Aitkin

Course Work
The Applied and Engineering Statistics Department offers all courses designated STAT in the “Course Descriptions” chapter of this catalog.

Statistical methods and methods for data analysis are crucial for researching and exploring the natural sciences, the social sciences, business, nursing, education, and engineering. The Applied and Engineering Statistics Department offers a variety of introductory courses as well as more advanced course work in specialized statistical methodology and applications. The focus of the department's offerings is applied, with special emphasis on computing, graphics and visualization, federal and survey statistics, and engineering applications of statistics and data analysis.

Introductory courses are targeted for undergraduates in the College of Arts and Sciences and in the College of Nursing and Health Science, as well as in the School of Information Technology and Engineering. The STAT 250-350 sequence is targeted for general audiences while the STAT 344-354 sequence is targeted for technical and scientific audiences. STAT 362 deals with computer statistical packages and is appropriate as a second or third course for students from a wide variety of backgrounds.

Although the department does not offer an undergraduate degree in statistics, it does offer a certificate program in applied statistics and a minor in data analysis. Also, a variety of advanced undergraduate courses are available for inclusion in other degree programs.

UNDERGRADUATE PROGRAMS

Certificate in Applied Statistics

The Department of Applied and Engineering Statistics offers a certificate program to complement undergraduate degree programs in computer science, systems engineering, electrical engineering, civil and infrastructure engineering, and mathematics. Undergraduates majoring in other discipline areas may be admitted to the certificate program at the discretion of the department.

Because the demand for people with interdisciplinary training, which includes a background in statistics and data analysis, is great in the Washington metropolitan area, this program expands the career options available to students. Inquiries should be directed to the Department of Applied and Engineering Statistics. Students who plan to work toward the certificate should seek advice from the department's undergraduate coordinator.

Certificate Requirements

This certificate program requires 24 credits, consisting of STAT 344, 362, and 354 or 554, along with five courses chosen from STAT 455, 463, 474, 498, 499, 544, 574; OR 435, 442, 481; and SYST 473.

Minor in Data Analysis

The undergraduate minor in data analysis is designed to provide students with a background in data analysis and statistical methodology. The minor is intended to complement undergraduate degree programs in the School of Information Technology and Engineering and the College of Arts and Sciences, especially computer science, economics, geography, mathematics, public administration, sociology, and systems engineering.

Requirements

The minor requires 15 credits consisting of a core sequence of 6 credits plus 9 credits of electives. Grades of C or better are required in all courses. At least 9 of the 15 credits must be in STAT courses.

To satisfy the core requirement, the student must complete one of the following sequences with grades of C or better: STAT 250-350 or STAT 344-354. STAT 544-554 may be substituted for STAT 344-354. Mathematics majors may substitute MATH 351-352 for STAT 344-354, provided the 9 elective credits are all STAT courses. The 9 elective credits must be chosen from a list of courses approved by the undergraduate program coordinator in the Department of Applied and Engineering Statistics. Courses currently approved for the minor are STAT 362, 455, 463, 474; CEIE 410; CS 450, 480; ECON 345; GEOG 300, 311; GOVT 400; OR 435; SOCI 405; and SYST 473.

B.S./Accelerated M.S. in Statistical Science

The B.S./Accelerated M.S. degree option provides a way for a George Mason student to earn an M.S. in Statistical Science in less time than if he or she first graduated from a suitable George Mason B.S. program and then applied to the M.S. program.

Admission Requirements

To enroll, the student must begin his or her M.S. work within six months following completion of a B.S. degree in any one of the IT&E major areas, or a B.S. in Mathematics from the College of Arts and Sciences. Admission is guaranteed to any student with an overall GPA of 3.000 in courses taken after the first two undergraduate years (60 credits) and with grades of B or better in the two 500-level STAT courses selected from STAT 544, 554, and 574.

Degree Requirements

The B.S./Accelerated M.S. program consists of a minimum of 144 credits that satisfy the requirements for both the B.S. in the student's undergraduate major and the M.S. in Statistical Science, with 6 credits of overlap. Twenty-four credits are required for the M.S., provided that the student has taken two of the following three courses as part of his or her B.S. course work: STAT 544, 554, and 574.

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The core course work covers the basic elements of statistics at the graduate level. STAT 544 covers the major mathematical framework for statistical theory and practice. STAT 652 provides basic statistical theory. After completing this course, students have the theoretical basis from which statistical methods are derived.

STAT 554 is a survey of statistical methods that have become the backbone of statistical practice. Focus in this course is on techniques that quantify random behavior. The final core course is STAT 656, which focuses on determining the relationship between two or more quantities possibly measured with error.

The prospective M.S. student builds on these core requirements by choosing one of five defined emphases or by designing a customized curriculum with the concurrence of his or her advisor. The defined emphases are (1) applied statistics, (2) computational statistics, (3) engineering statistics, (4) federal statistics, and (5) statistical signal processing.

Other courses may be chosen from any graduate STAT courses except STAT 510, 530, 700, and 701. Only one of STAT 501-503 can be applied towards the degree requirements. STAT 779 and 789 may be repeated for credit with approval of the graduate coordinator. Also, certain courses from other departments may be chosen with approval of the department chair, generally not to exceed 6 credits.

The prospective student selects either the professional or research option, depending on his or her career ambitions. This choice is to be made no later than the end of the semester in which the student has completed 15 credits.

**Professional Option**

The professional option focuses on the completion of course work in modern statistical theory and practice. A total of 30 credits is required for the degree. Twelve credits must be in the core courses taken by all M.S. students, with 18 additional credits taken from the approved list or with the approval of the student's advisor. Students electing this option are encouraged to pursue a broad background in statistical science and may wish to concentrate on applications of statistical methodology to other disciplines.

A student who selects the professional option may elect to write a master's essay that is not an original research report but a scholarly essay on a topic of current interest in the statistical science discipline. The essay is usually about 20 to 25 pages long and demonstrates the student's ability to read and synthesize the current technical literature into a scholarly essay. The essay is evaluated by the student's advisor, taking into account the comprehensiveness of the coverage of the scientific literature, the accuracy of presentation and interpretation, and the literary style. Students are notified of their evaluations and may be required to revise their essays to develop their skills in preparing reports on technical subjects. The essay is normally written in the context of STAT 798 Master's Essay. Students who complete the essay take 27 credits of course work and 3 credits of STAT 798 Master's Essay. Students opting not to write an essay must take 30 credits of course work.

**Research Option**

The research option requires 30 credits, of which 6 credits must be in independent research (thesis). Research is done under the guidance of a faculty member. Research may be carried out at the university or, if appropriate, at nearby institutions.

In addition to the general requirements that apply to all master's degrees at the university, all students must complete the 12-credit core requirements for the degree:

- STAT 544 Applied Probability
- STAT 554 Applied Statistics
- STAT 652 Statistical Inference
- STAT 656 Regression Analysis
facilities. For example, students may pursue research at their places of employment on topics of interest to their employers, provided the research meets the standards of the university. The remaining 24 credits must include the 12 core credits and elective courses taken from the approved list or added with the consent of the thesis advisor.

In addition to satisfying the general university requirements for a master's degree, candidates with the research option must do the following:

1. Submit a thesis or report based on the research to the student's thesis committee, which must give preliminary approval. The composition and appointment of this committee follows graduate program policies.
2. Pass a final oral examination that concentrates on, but is not limited to, the area on which the thesis or report is written. The examination is administered by the student's thesis committee, and all interested members of the graduate faculty are invited to attend and participate in the questioning. The thesis committee makes the final decision on whether the candidate passes or fails.

◆ Certificate in Federal Statistics
The graduate certificate in federal statistics is a professional program targeted at upgrading the skills of practitioners. The federal statistical system is a complex data collection and analysis system that requires a wide variety of multidisciplinary skills for its maintenance. The federal statistics certificate is intended to respond to the need for broad training in statistics; survey methods; data analysis, including graphics and data visualization; databases and data security; parallel computation and related technology; geographic information systems; and issues of statistics and public policy.

The certificate program is extremely flexible and can be tailored to the needs of students within the federal statistical sector, but is also intended to be responsive to the needs of those in state and local governments and those in the private sector involved in the collection, interpretation, or statistical analysis of federal data.

Admission Requirements
Potential candidates should have a bachelor's degree, including at least two courses in calculus and one course in probability or statistics at the 300 level or higher. The recommended minimum preparation would include MATH 113-114 and STAT 344 or their equivalents. Students with a minimal background in mathematics or statistics should consider taking STAT 530, which is intended to enhance a student's background in calculus, matrix algebra, and probability. It does not count towards the certificate. Candidates must also be computer literate. Applicants typically have degrees in such fields as sociology, economics, engineering, mathematics, statistics, and business. Candidates should inquire with the certificate coordinator for details of program planning. Courses are offered in late afternoon and evening and are particularly suitable for part-time students.

Certificate Requirements
The certificate program consists of 15 credits (five courses), which are selected from the certificate program courses and elective courses. The certificate courses are aimed at building the foundations of statistical analysis and survey methods. The courses consist of the following:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>STAT 510</td>
<td>Statistical Foundations for Technical Decision Making</td>
</tr>
<tr>
<td>STAT 554</td>
<td>Applied Statistics</td>
</tr>
<tr>
<td>STAT 574</td>
<td>Survey Sampling I</td>
</tr>
<tr>
<td>STAT 634</td>
<td>Case Studies in Data Analysis</td>
</tr>
<tr>
<td>STAT 663</td>
<td>Statistical Graphics and Data Exploration</td>
</tr>
<tr>
<td>STAT 665</td>
<td>Categorical Data Analysis</td>
</tr>
<tr>
<td>STAT 673</td>
<td>Statistical Methods for Longitudinal Data Analysis</td>
</tr>
<tr>
<td>STAT 674</td>
<td>Survey Sampling II</td>
</tr>
<tr>
<td>STAT 779</td>
<td>Topics in Survey Design and Analysis</td>
</tr>
</tbody>
</table>

All of these courses, with the exception of STAT 510, may be used for credit toward the M.S. in Statistical Science. Credit is not granted for both STAT 510 and STAT 554.

For the certificate program, the student may choose any three of the certificate courses plus two elective courses chosen with the consent of the certificate coordinator. The electives are intended to provide a broad background supportive of the multidisciplinary needs of complex statistical systems. They include courses from computer science, economics, geography, information systems, marketing, operations research, psychology, public administration, sociology, and statistics. Some courses may have prerequisites for which the student must qualify or seek a waiver from the appropriate instructor. A cumulative GPA of 3.000 is required, and no more than one course with a grade of C may be applied toward the certificate. Only one of STAT 501-503 can be applied towards the 15 credits required for the certificate.

◆ Certificate in Signal Processing
The Department of Applied and Engineering Statistics, in conjunction with the Department of Electrical and Computer Engineering, offers the certificate in signal processing, which provides graduate students with a program of courses and laboratory experience. Course work for the graduate certificate can be used for credit toward the M.S. in Statistical Science as well as the M.S. in Electrical Engineering. The primary purpose is to provide a well-defined target for students who want to advance or update their knowledge in this fast-moving field. The certificate may be pursued concurrently with any of the graduate degree programs in the School of Information Technology and Engineering.

Admission Requirements
The certificate program in signal processing is open to all students who hold a bachelor's degree in any scientific or engineering discipline from an accredited university.

Certificate Requirements
The certificate consists of five graduate courses (15 credits) in signal processing. A cumulative GPA of 3.000 is required, and no more than one course with a grade of C may be applied toward the certificate. The certificate courses consist of two required foundation courses and three elective courses. See the list of courses under Certificate in Signal Processing in the Electrical and Computer Engineering section of this chapter.

■ Ph.D. Study in Statistics
Doctoral study in statistics is available through two of the university's Ph.D. programs. The Ph.D. in Information Technology has an emphasis in statistical science with an engineering focus. In addition, the Ph.D. in Computational Science.
School of Information Technology and Engineering

Course Work
The Civil, Environmental, and Infrastructure Engineering Department offers courses with the designator CEIE in the "Course Descriptions" chapter of this catalog.

UNDERGRADUATE PROGRAM

Civil and Infrastructure Engineering, B.S.
The bachelor's degree program includes a solid foundation in the theory of civil and infrastructure engineering. Students benefit from exposure to practical civil, environmental, and infrastructure engineering problems and their solutions in the classroom, lab, and field. Students also have the opportunity to work as junior engineers each summer. The goal of the department is to graduate students who are prepared to

- solve problems in the civil engineering domain, including (1) integrating traditional civil engineering disciplines such as transportation, environment, structures, construction, and water; (2) incorporating such elements as social, political, and economic considerations; and (3) including a conscious life-cycle costing philosophy;
- develop and apply information technology to civil engineering problems;
- communicate effectively in written, oral, and visual ways;
- pursue a lifelong process of learning; and
- enter the civil engineering profession as productive engineers.

The civil engineer can look forward to a career in local, state, and federal government organizations and architectural/engineering firms that specialize in land development, transportation, water resources, environment, construction, and other related civil engineering fields. The program also prepares students for continuing graduate studies.

Degree Requirements
Degree requirements for the B.S. in Civil and Infrastructure Engineering include 120 credit hours distributed in courses in three main areas: mathematics and basic science; humanities and social sciences; and civil engineering analysis and design.

The prerequisite structure for these courses is extensive and complex. The sample schedule below provides not only a listing of the course requirements, but also a guide to the progression of the courses to satisfy all prerequisites.

Students are required to see their faculty advisors at least once each semester to plan for the following semester's registration. Each student is expected to complete an approved plan of study, which constitutes a learning plan for the degree program.

A variety of classes will count for credit as CEIE technical electives. All electives must be selected with the advice and approval of the academic advisor. Paid internships during the summer (CEIE 197/198/199, 297/298/299, and 397/398/399) may also be used as technical electives.

Writing-Intensive Requirement
The university's writing-intensive requirement for civil and infrastructure engineering majors is satisfied by the successful completion of CEIE 360.

http://catalog.gmu.edu
### Sample Schedule

The following table presents a sample schedule that an undergraduate civil and infrastructure engineering major would follow to obtain a bachelor's degree.

#### First Semester

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH 113</td>
<td>Analytic Geometry and Calculus I</td>
<td>4</td>
</tr>
<tr>
<td>ENGR 107</td>
<td>Introduction to Engineering</td>
<td>2</td>
</tr>
<tr>
<td>ENGL 101</td>
<td>Composition</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 251</td>
<td>General Chemistry for Engineers</td>
<td>4</td>
</tr>
<tr>
<td>CS 112</td>
<td>Computer Science I</td>
<td>4</td>
</tr>
</tbody>
</table>

**TOTAL:** 17

#### Second Semester

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH 114</td>
<td>Analytic Geometry and Calculus II</td>
<td>4</td>
</tr>
<tr>
<td>PHYS 160</td>
<td>University Physics I</td>
<td>4</td>
</tr>
<tr>
<td>ENGR 183</td>
<td>Engineering Computer Graphics</td>
<td>3</td>
</tr>
<tr>
<td>ECON 103</td>
<td>Contemporary Microeconomic Principles</td>
<td>3</td>
</tr>
</tbody>
</table>

**TOTAL:** 14

#### Third Semester

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CEIE 290</td>
<td>Engineering Computation and Design</td>
<td>3</td>
</tr>
<tr>
<td>MATH 213</td>
<td>Analytic Geometry and Calculus III</td>
<td>3</td>
</tr>
<tr>
<td>PHYS 260</td>
<td>University Physics II</td>
<td>3</td>
</tr>
<tr>
<td>PHYS 261</td>
<td>University Physics II</td>
<td>3</td>
</tr>
<tr>
<td>ENGR 210</td>
<td>Statics and Dynamics</td>
<td>1</td>
</tr>
<tr>
<td>STAT 344</td>
<td>Probability and Statistics for Engineers and Scientists I</td>
<td>3</td>
</tr>
</tbody>
</table>

**TOTAL:** 13

#### Fourth Semester

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CEIE 230</td>
<td>Hydraulics</td>
<td>3</td>
</tr>
<tr>
<td>COMM 100</td>
<td>Oral Communication</td>
<td>3</td>
</tr>
<tr>
<td>MATH 214</td>
<td>Elementary Differential Equations</td>
<td>3</td>
</tr>
<tr>
<td>ENGR 210</td>
<td>Statics and Dynamics</td>
<td>3</td>
</tr>
<tr>
<td>STAT 344</td>
<td>Probability and Statistics for Engineers and Scientists I</td>
<td>3</td>
</tr>
</tbody>
</table>

**TOTAL:** 13

#### Fifth Semester

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CEIE 301</td>
<td>Civil Engineering and Economic Models in Civil Engineering</td>
<td>3</td>
</tr>
<tr>
<td>CEIE 360</td>
<td>Introduction to Transportation Engineering</td>
<td>3</td>
</tr>
<tr>
<td>ENGR 310</td>
<td>Mechanics of Materials</td>
<td>3</td>
</tr>
<tr>
<td>HIST 120</td>
<td>U.S. History general education</td>
<td>3</td>
</tr>
<tr>
<td>HIST 100</td>
<td>Western civilization general education course</td>
<td>3</td>
</tr>
</tbody>
</table>

**TOTAL:** 15

#### Sixth Semester

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CEIE 305</td>
<td>Soil Mechanics</td>
<td>3</td>
</tr>
<tr>
<td>CEIE 311</td>
<td>Structural Analysis</td>
<td>3</td>
</tr>
<tr>
<td>CEIE 340</td>
<td>Water Resources Engineering</td>
<td>3</td>
</tr>
<tr>
<td>PHYS 266</td>
<td>Introduction to Thermodynamics</td>
<td>1</td>
</tr>
<tr>
<td>ENGL 302</td>
<td>Advanced Composition</td>
<td>3</td>
</tr>
<tr>
<td>Global/international issues general education course</td>
<td>3</td>
<td></td>
</tr>
</tbody>
</table>

**TOTAL:** 16

#### Seventh Semester

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CEIE 367</td>
<td>Behavior of Concrete and Steel Structures</td>
<td>3</td>
</tr>
<tr>
<td>CEIE 400</td>
<td>Civil Engineering Planning and Management</td>
<td>3</td>
</tr>
<tr>
<td>CEIE 440</td>
<td>Water Supply and Distribution Management</td>
<td>3</td>
</tr>
<tr>
<td>CEIE 455</td>
<td>Introduction to Environmental Engineering</td>
<td>3</td>
</tr>
<tr>
<td>CEIE technical elective</td>
<td>3</td>
<td></td>
</tr>
</tbody>
</table>

**TOTAL:** 15

#### Eighth Semester

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CEIE 463</td>
<td>Construction Systems</td>
<td>3</td>
</tr>
<tr>
<td>CEIE 490</td>
<td>Senior Design Project</td>
<td>3</td>
</tr>
<tr>
<td>CEIE environmental technical elective</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>CEIE transportation technical elective</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>CEIE technical elective</td>
<td>3</td>
<td></td>
</tr>
</tbody>
</table>

**TOTAL:** 15

### B.S./Accelerated M.S. in Civil and Infrastructure Engineering

The B.S./Accelerated M.S. degree option provides a way for a George Mason student to earn an M.S. in Civil and Infrastructure Engineering in less time than if he or she graduated from the B.S. program and then applied to the M.S. program. The B.S./Accelerated M.S. program can be completed in 144 credits.

#### Admission Requirements

George Mason students in the B.S. in Civil and Infrastructure Engineering program may apply for the B.S./Accelerated M.S. in Civil and Infrastructure Engineering program if they have earned 90 undergraduate credits with an overall GPA of at least 3.300, or if their GPA in ENGR and CEIE courses is at least 3.300. Students who have not yet finished 90 credits may be accepted provisionally subject to satisfactory completion of 90 credits. All other criteria for admission into the B.S./Accelerated M.S. program are identical to criteria for admission into the M.S. program.

#### Degree Requirements

Students must complete 144 credit hours that satisfy both the requirements for the B.S. program and the M.S. program. Students will register for 6 credit hours of CEIE 500-level courses in place of undergraduate technical elective courses. The CEIE 500-level courses selected for this purpose must be approved by the students’ academic advisors. Students will complete all M.S. requirements and may apply the two CEIE 500-level courses included in the B.S. program toward satisfaction of these requirements.

#### Conferral of Degrees

Students in the B.S./Accelerated M.S. in Civil and Infrastructure Engineering program may apply to have the B.S. degree conferred during the semester in which they expect to complete the B.S. requirements. The master’s degree will be granted upon completion of the M.S. requirements.

### GRADUATE PROGRAM

#### Civil and Infrastructure Engineering, M.S.

The M.S. program educates students in the theory and practice of civil, environmental and infrastructure engineering.
Information technology and automated tools for analyzing and solving urban systems problems are important components of the program. The civil and infrastructure engineer can look forward to pursuing a career in the private and public sectors or to continuing graduate study toward the Ph.D.

Admission Requirements
To be considered for admission to the program, a candidate must
1. satisfy the general university requirements for admission to a graduate program;
2. have earned a baccalaureate degree in engineering, physical sciences, economics, or other civil and infrastructure engineering-related field; and
3. have three letters of reference submitted by former professors or supervisors.

Acceptance to the degree program is based on an assessment of the applicant's capacity to pursue these graduate studies successfully. Consideration is given to the applicant's undergraduate record, any previous graduate work, professional work experience, the letters of reference, and any recent Graduate Record Examination (GRE) scores (required for international students). Well-qualified students who present minor admission deficiencies may be admitted subject to completing an articulation program. Courses taken in the articulation program extend the minimum requirements for the degree.

Degree Requirements
The M.S. in Civil and Infrastructure Engineering program includes three core courses, electives selected by the student with the aid of a faculty advisor, a thesis or civil and infrastructure engineering project, and a seminar requirement. Students must complete a faculty-approved plan of study with a minimum of 30 credits of graduate work, including the thesis (6 credits) or the research project (3 credits).

Core Courses
Students must complete the following three core courses. These courses provide a common background for understanding the breadth and complexity of civil and infrastructure engineering, and for introducing the application of information technology and the systems approach to analyzing and solving problems in civil and infrastructure engineering.

CEIE 601 Infrastructure Modeling
CEIE 605 Infrastructure Systems Analysis
CEIE 685 Civil Engineering Information Management

Emphases
Each student must select an additional five or six electives that together constitute an emphasis area. With the prior approval of a faculty advisor, a student may design his or her own emphasis, or may select from one of several standard emphases, including the following:

Information Technology in Civil Engineering
Infrastructure Management
Land Development Engineering
Transportation Systems
Water and Environmental Systems

Project or Thesis
Students must complete a project (3 credits) or thesis (6 credits) under the direction of a CEIE faculty member.

Under the project option, the student completes 3 credits of CEIE 798 in which he or she prepares and presents a scholarly paper. The scholarly paper is a technical report on an independent study, laboratory or computer experimentation, or literature search on a current civil and infrastructure engineering topic, selected under the guidance of a faculty advisor. The student must demonstrate knowledge of the topic and make a satisfactory technical presentation of the paper in the CEIE graduate seminar (CEIE 795).

Under the thesis option, the student completes 6 credits of CEIE 799. The master's thesis must reflect a significant independent research effort. The work is conducted under the guidance of a thesis advisor, and the final written thesis and oral defense are approved by a three-member faculty committee. In addition, the student must make a satisfactory presentation of the thesis in the CEIE graduate seminar. The thesis is particularly recommended for those students who wish to develop and document their research skills, and/or who contemplate subsequent enrollment in a Ph.D. program.

Seminar Requirement
All degree candidates must attend a minimum of 10 graduate seminars approved by the CEIE department for the degree program.

Ph.D. Study in Civil, Environmental, and Infrastructure Engineering

Doctoral study in civil, environmental, and infrastructure engineering is available through the Ph.D. in Information Technology program, which offers advanced courses in this discipline. The doctoral program allows the student to take a broad range of courses and research options.

Computer Science

Web: cs.gmu.edu
Phone: (703) 993-1530

Faculty
Professors: DeJong, Denning, Hamburger (Chair), Menasce, Pullen, Rine, Sood, Tecuci, Wechsler
Associate professors: Carver, Chen, Pullen, Richards, Setia, Simon, Wang, White
Assistant professors: Aydin, Duric, Huang, Kosecka, Luke, Simon
Instructors: Maddox, Maney, Marchant, McJunkin, Nordstrom, Schorlng, Singh
Adjunct professors: Baldo, Berlin, Brandwine, Curts, Doughty, Hwang, Jamison, Kahrl, Kaznachey, Mayo, Nguyen, Rosene, Smeltzer

Introduction
Computer science is the discipline concerned with the design, implementation, and maintenance of the computer systems used in almost all other professions. Computer scientists must be well grounded in the technologies needed for the acquisition, representation, storage, transmission, transformation, and use of information in digital form and must be capable of working closely with members of other professions associated with computing.
Course Work
The Computer Science Department offers all courses designated CS in the "Course Descriptions" chapter of this catalog as well as some of the IT courses.

UNDERGRADUATE PROGRAMS

Computer Science, B.S.
George Mason's computer science program is accredited by the Computer Science Accreditation Board.

For the B.S. degree, students must complete 120 credits, including the general education requirements and all of the following:
2. Senior computer science: Any four of the following: CS 440, 450, 451, 455, 471, 475, 480, 482, 490, and 491. Total credits: 12.
3. Mathematics: MATH 113, 114, 125; and any MATH course numbered above 300 (except MATH 351). Students may need to choose electives to satisfy the prerequisites of these courses. In particular, those planning to take MATH 352 may replace MATH 112, 211; MATH 113, 125, or 126.
4. Computer science-related courses: 6 credits chosen from MATH 351; OR 335, 441, 442; MATH 352, 451, 455, 471, 475, 480, 482, 490, and 491.
5. Natural sciences: 12 credits in natural science courses intended for scientists and engineers. Two of the courses for this requirement must have laboratory components and must constitute a sequence. A list of relevant courses can be obtained from the department office.
6. COMM 100 or 104: Computer science students in either course must make a technical presentation. The course fulfills the general education requirement in oral communication for IT&E students.

Students should consult the sample schedule below and ensure that course prerequisites are satisfied. Students should obtain computer-generated audits periodically to ensure that degree requirements are met.

Sample Schedule
The following table presents a sample schedule that an undergraduate computer science major would follow to obtain a bachelor's degree.

<table>
<thead>
<tr>
<th>First Semester</th>
<th>Second Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH 113 Analytic Geometry and Calculus I</td>
<td>CS 211 Computer Science II</td>
</tr>
<tr>
<td>CS 112 Computer Science I</td>
<td>MATH 114 Analytic Geometry and Calculus II</td>
</tr>
<tr>
<td>ENGL 101 Composition</td>
<td>TOTAL</td>
</tr>
<tr>
<td>HIST 100 History of Western Civilization*</td>
<td>TOTAL</td>
</tr>
<tr>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>TOTAL</td>
<td>TOTAL</td>
</tr>
<tr>
<td>14</td>
<td>15</td>
</tr>
</tbody>
</table>

Each course must be completed with a grade of C or better. Students should take MATH 113 during the fall semester.

General education course* ........................................ 3
Literature general education course .................. 3
TOTAL ................................................................. 13

Third Semester
CS 265 Assembly Language Programming . . 3
MATH 213 Analytic Geometry and Calculus III | HIST 120 U.S. History general education* ... 3
Social and behavioral science general education* ........................................ 3
Elective .................................................... 3
CS 105 Computer Ethics and Society .......... 1
TOTAL ................................................................. 16

Fourth Semester
CS 310 Computer Science III .................. 3
MATH 125 Discrete Mathematics I .......... 3
ENGL 302 Advanced Composition ............. 3
Natural science course .................. 4
COMM 100 Oral Communication or 104 Presenting with Technology .......... 3
TOTAL ................................................................. 16

Fifth Semester
CS 330 Formal Methods and Models ............ 3
CS 421 Introduction to Software Engineering .......... 3
ECE 301 Digital Electronics .................. 3
MATH 203 Matrix Algebra .................. 3
Elective .................................................... 3
TOTAL ................................................................. 15

Sixth Semester
CS 365 Computer Systems Architecture ........ 3
Senior computer science course .............. 3
STAT 344 Probability and Statistics for Engineers and Scientists I .......... 3
Computer science-related elective .......... 3
Elective .................................................... 3
TOTAL ................................................................. 15

Seventh Semester
Senior computer science course .............. 3
CS 483 Data Structures and Analysis of Algorithms ............. 3
OR 481 Numerical Methods in Engineering .......... 3
Computer science-related elective .......... 3
Natural science with lab .................. 4
TOTAL ................................................................. 16

Eighth Semester
Senior computer science courses (2) ........ 6
Natural science with lab .................. 4
Global understanding general education ........ 3
Synthesis general education ............. 3
TOTAL ................................................................. 16

*These 12 credits must satisfy the general education component of the IT&E degree requirements. See the third item in the list of bachelor of science degree requirements at the front of this chapter.

Change of Major
Students requesting a change of major to computer science must have a GPA of at least 2.750 and have successfully completed two of these courses: CS 112, 211; MATH 113, 114, or 125.
Advanced Placement and Credit by Examination
Some students may receive credit for IT 103, CS 112, CS 211, or CS 265 by passing departmentally administered examinations. In addition, a score of 3 on the Advanced Placement (AP) Computer Science examination qualifies the student for credit in CS 112. An AP score of 4, together with demonstrated competence in the programming language used in CS 211, qualifies the student for credit in CS 211. A score of 4 on the International Baccalaureate (IB) program computer science examination qualifies the student for credit in CS 112, and a score of 5 or more qualifies the student for credit in CS 211.

Writing-Intensive Requirement
Computer science majors complete the writing-intensive requirement through a planned sequence of projects and reports integral to the following computer science courses: CS 105, 211, 332, 421, 471, 480, and 490. In all these courses, faculty members provide feedback on students' expository writing.

Grades
A student must earn a C or better in any course intended to satisfy a prerequisite for a computer science course. Computer science majors may not use more than one course with a grade of D toward the departmental requirements.

Cooperative Education
A computer science major may participate in the George Mason cooperative education program or in a work-study program in the Washington, D.C.-Northern Virginia area.

B.S./Accelerated M.S. in Computer Science
The B.S./Accelerated M.S. in Computer Science program is for those interested in immediately continuing on to graduate studies in computer science.

Admission Requirements
Students in the B.S. program may apply for the B.S./Accelerated M.S. in Computer Science program if they have earned 90 undergraduate credits with an overall GPA of at least 3.00. Criteria for admission to the B.S./Accelerated M.S. program are identical to the criteria for admission to the M.S. program.

Degree Requirements
1. Students have to complete 144 credits that satisfy both the requirements for the B.S. program and those for the M.S. program, with 6 credits overlap.
2. Students register for 6 credits of CS 500-level core courses in place of the corresponding CS 400-level courses required for the undergraduate degree requirements. That is, students must register for two of the following courses: CS 540, 571, 580, and 583, in place of the corresponding 400-level courses.
3. Students in the B.S./Accelerated M.S. program are permitted to take additional graduate core courses in their undergraduate programs. In such cases, the students must satisfy the core requirements for the M.S. by taking more advanced courses from the same concentration. For example, if CS 580 and CS 583 are the two overlapping core courses, and the student also takes CS 540 as part of his or her B.S. program, then the student needs to take a more advanced course from the concentration (systems) corresponding to CS 540, to satisfy the core requirements for the M.S.

Degree Conferral
Students in the B.S./Accelerated M.S. program may apply to have the B.S. degree conferred during the semester in which they expect to complete the B.S. requirements. At the completion of the M.S. requirements, a master's degree is granted.

Minor in Computer Science
A minor in computer science requires the completion of 17 credits. Required courses are CS 105, 112, 211, and 310. Two additional computer science courses should be selected from the following: CS 225, 330, 332, 363, 365, 421, 450, 455, 471, 480, and 483. Students should pay careful attention to prerequisites when selecting courses.

Double Major in Computer Science and Computer Engineering
Computer science majors can earn a double major in computer science and computer engineering if they complete an additional 17 credits of courses beyond the 120 credits required for the computer science degree. The additional 17 credits must be part of an approved plan of study. Details are available at the IT&E web site, ite.gmu.edu.

GRADUATE PROGRAMS
In addition to offering the M.S. and Ph.D. in Computer Science, the department participates in the Ph.D. in Information Technology.

Computer Science, M.S.
The M.S. in Computer Science is for those interested in computer science with optional M.S. concentrations in artificial intelligence, software engineering, parallel/distributed computing, image processing/graphics, computer systems, networks, and information security. A list of the courses in each of these concentrations is available in the department office. A student can specialize by taking at least 12 non-core credits, including an M.S. thesis or project, from one concentration.

A certificate in software engineering is also available with an M.S. in Computer Science. For information on this certificate, please refer to the software engineering program. Appropriate courses may be transferred, with an advisor's approval, into the George Mason degree program. Students may take courses through the Commonwealth Graduate Engineering Program.

Admission Requirements
Students seeking admission to the M.S. in Computer Science program must satisfy the following requirements:
1. Fulfill admission requirements for graduate study at George Mason University.
2. Hold a baccalaureate degree that includes CS 310 Computer Science III, CS 330 Formal Methods and Models, CS 265 Assembly Language Programming, and CS 365 Computer Systems Architecture. Students also should have completed one year of mathematics beyond first-year calculus, including a substantial course in discrete mathematics (e.g., MATH 125). Students with some deficiencies in preparation may be admitted provisionally pending completion of foundation courses in mathematics or computer science. Undergraduate credit earned for this purpose may not be applied toward the graduate degree.
3. Have a cumulative GPA of 3.000 for the last two years of undergraduate work, preferably with a major in a technical field such as computer science, mathematics, physics, engineering, or information systems.
4. Submit transcripts of all postsecondary education; a self-assessment form (normally included in the application package or available from the department); three letters of recommendation; and an official Graduate Record Examination (GRE) report.

Degree Requirements
In addition to the general requirements of the university, completion of this program requires 30 credits of graduate courses, as follows:

1. Core Courses: 12 credits consisting of
   - CS 540 Language Processors
   - CS 571 Operating Systems
   - CS 580 Introduction to Artificial Intelligence
   - CS 583 Analysis of Algorithms

2. Additional Courses: 18 credits of computer science or computer science-related* courses:
   - At least 15 of these credits must qualify as advanced* by having suitable graduate courses as prerequisites.
   - At least 9 of these credits must be in courses specifically designated CS.

3. Breadth: The courses in requirement 2 above must include entries in three different concentration areas.* Courses listed under more than one concentration count only once for satisfying this requirement.

4. Project/Thesis (optional): 3 of the advanced credits may be replaced by a project (3 credits of CS 798) or a thesis (3 to 6 credits of CS 799). The project or thesis must be guided and approved by a committee of three appropriate faculty members and presented at an appropriate forum. Theses must meet relevant university requirements.

* The Department of Computer Science maintains a list of computer science-related courses, indicating which are at an advanced level. These are available on the web and in the department office, as are lists of courses in the concentration areas.

Certificate in Computer Networking
When brought together to form computer networks, the technologies of computing and communications exhibit a synergy that is revolutionizing our world. As a result, in-depth knowledge of the new discipline of computer networking increasingly is in demand as a basis for design and deployment of new information systems of all sorts, ranging from aspects of the global Internet to distributed systems in a wide variety of application domains. The courses for this certificate have been selected to provide a solid basis for understanding the core software and communications technologies upon which today's networks are based, and how they may be combined to create effective computer networks. Courses included cover both mainstream and leading-edge technology considerations, ensuring that the student is prepared to function at the professional level in this fast-moving and technologically challenging field. Course work toward the graduate certificate can be used for credit toward the M.S. in Computer Science with a specialization in networks. However, the certificate also may be pursued concurrently with any of the graduate degree programs in the School of Information Technology and Engineering.

Admission Requirements
The certificate program in communications and networking is open to all students who are eligible for entrance into the master's degree program in computer science or in any scientific or engineering discipline at George Mason University.

Certificate Requirements
To obtain the certificate, candidates must complete the following courses, for a total of 15 credits:

- Required of all students (6 credits):
  1. CS 571 Operating Systems
  2. CS 656 Computer Communications and Networking

Plus one or both of the following (3 or 6 credits):
  1. CS 755 Advanced Computer Networks
  2. CS 756 Performance Analysis of Computer Networks

Plus one or two of the following elective courses (3 or 6 credits):
  1. ECE 542 Computer Network Architectures and Protocols
  2. ECE 642 Design and Analysis of Computer Communication Networks
  3. ECE 742 High-Speed Networks
  4. INF 762 Information Systems Security
  5. INF 766 Internet Security Protocols
  6. IT 657 Advanced Network Science

Computer Science, Ph.D.
Because research in computer science at George Mason is distributed across the Department of Computer Science and the Department of Information and Software Engineering, the Ph.D. program is coordinated by a committee drawn from these two departments.

The program is designed for breadth, depth, flexibility, and interaction. In recognition of the diverse forms of preparation and experience that students may possess, the foundational breadth requirement takes the form of a qualifying examination rather than specified course work. Standard courses are available to help prepare for these exams but not all students need all the courses. In the next phase, individuals pursue unique combinations of courses, including individual study, selected with the guidance of their advisory committees. This advanced work leads to a comprehensive examination and culminates in a dissertation. The general doctoral requirements of George Mason University apply to this program.

Admission Requirements
Applicants are evaluated on an individual basis by the Ph.D. Admissions Committee. A master of science degree with a
very strong background in computer science or a closely related field, such as software engineering or information systems, is required. The admission process involves submitting the application for admission, all postsecondary transcripts, Graduate Record Examination scores in computer science, three letters of reference, a resume, and a short statement of career goals and aspirations. Application forms are available online at www.admissions.gmu.edu.

Qualifying Examination
Students take a written qualifying examination, given twice a year, in the fall and spring semesters. This must be done before continuing beyond 36 credits. Students must choose four areas in which to be examined, one of which must be algorithms and theory. The other three are chosen from among the following: language processing and formal models, artificial intelligence, computer systems, software engineering, and information engineering. The exams are pass/fail. To qualify, a student must pass all four examinations. A student who passes three of four at the first attempt is permitted to retake the one failed examination. A student who passes fewer than three examinations must retake an entire set of examinations. Any retaking must occur within a year of the original examinations. Failure after two attempts is grounds for dismissal from the program.

Course Requirements
In addition to courses taken to prepare for the qualifying exam, students must take at least eight courses, including two computer science courses at the 600 level or above; CS 700 Quantitative Methods and Experimental Design in Computer Science; and five other courses in computer science at the 700 level or above, chosen from a list maintained by the program.

Planning and Advising
The student forms a faculty advisory committee to advise in establishing and carrying out a plan of study that meets the above requirements and will prepare the student properly for the dissertation phase. The members and chair of this advising committee must qualify as a dissertation committee, as specified below. Normally some or all of the members will later belong to the student’s dissertation committee, so these individuals will be able to ensure relevance of the plan of study to an emerging dissertation topic.

Seminar
Each Ph.D. student is required to attend a seminar series in the first year, at which faculty members present their own computer science research. The purpose of the seminar is to provide common experiences for new students, to familiarize new students with the computer science research done in the school, and to help them choose a dissertation director and committee.

Comprehensive Examination
Each student must take a combined written and oral comprehensive examination after completion of all course requirements. The purpose of this examination is to evaluate the student’s knowledge and ability to complete a Ph.D. dissertation. The student must pass both the written and oral parts. Each can be retaken no more than once if it is failed.

Dissertation Committee Selection
The student forms a dissertation supervisory committee consisting of four or five appropriately qualified individuals, three of whom must be tenured or tenure-track faculty members in the Computer Science Department and/or Information and Software Engineering Department. Committee membership must transcend a single department. It is recommended that the committee include a member outside the two departments. The chair of the supervisory committee, who is also the dissertation director, must be tenured or tenure-track in the School of Information Technology and Engineering. The committee must be approved by the chair of the Computer Science Department and the associate dean for graduate studies of IT&E.

Dissertation Proposal Defense
Each student prepares a written dissertation proposal, which is presented to the supervisory committee. The student may enroll in CS 998 Doctoral Dissertation Proposal to complete this effort. The committee assesses the proposal and assists the student in fulfilling his/her responsibility to have a clear topic with the potential to make a significant contribution to the field, along with a clear methodology. The committee also assesses whether the student has the intellectual background and the resources to have a good chance of completing a successful dissertation in a timely manner. After successfully completing this requirement, the student is formally advanced to candidacy for the Ph.D. degree.

Dissertation and Defense
The Ph.D. dissertation corresponds to a maximum of 24 credits from CS 998 and CS 999, at least 12 of them in CS 999, after advancement to candidacy. The work must represent an achievement in research; must be a significant contribution to its field; and should be deemed publishable in refereed journals or refereed conferences. The document must meet format guidelines specified by the Guide for Preparing Graduate Theses, Dissertations, and Projects.

The student prepares to defend the dissertation in consultation with the dissertation director. Normally, there is a predefense with only the committee members present. There must be a public defense at a date that is agreed upon by all members of the committee and is preceded by at least two weeks of public announcement by the program. The dissertation must be made available to the committee at least two weeks in advance. If the candidate successfully defends the dissertation, the committee recommends that the final form of the dissertation be completed, and that the graduate faculty of George Mason University accept the candidate for the Ph.D. degree.

Electrical and Computer Engineering

Web: ece.gmu.edu
Phone: (703) 993-1569

Faculty
Professors: Allnutt, Black, Cook, Ephraim, Gertler, Griffths, Ioannou, Jabbari, Levis, Manitius (Chair), Mulpuri, Tabak, Van Trees

http://catalog.gmu.edu
Career opportunities exist in the areas of engineering research and development, system design, system integration, engineering management, engineering consultancy, technical sales, patent law and many others. The program provides a strong preparation for graduate study.

The requirements for the degree may be satisfied on a part-time or co-op basis. Cooperative education provides students with the opportunity to integrate paid, career-related work experience with classroom learning. In addition to the usual financial aid available to all students through the Office of Student Financial Aid, electrical engineering majors are eligible to apply at the Electrical and Computer Engineering Department for several scholarships provided by professional societies and industrial organizations, such as the Armed Forces Communications and Electronics Association, the Association of Old Crows, the Institute of Electrical and Electronic Engineers, and Rockwell International.

Concentrations

Computer engineering, communications/signal processing, control systems, and electronics concentrations are available within the electrical engineering baccalaureate program. Completion of specific senior-level courses leads to one of these designations on the student's transcript upon graduation.

Degree Requirements

All electrical engineering students are required to see their major advisor before course registration each semester. Students interested in electrical engineering who are not declared majors also are invited to obtain advising at the Electrical and Computer Engineering Department office. Students are strongly encouraged to follow the sample schedule below to ensure that course prerequisites are satisfied.

The 120 credit hours of courses required for the B.S. in Electrical Engineering are as follows:

Electrical and computer engineering: ECE 101, 201, 220, 280, 305, 320, 331, 332, 333, 334, 421, 433, 445, 460, 491, 492, 493

Computer science: CS 112, 211

Advanced ECE labs (2 credits)

ECE technical electives (9 credits)

Engineering: ENGR 107

English: ENGL 101, 302; COMM 100

Literature (3 credits)

Economics: ECON 103

Global/international issues general education course (3 credits)

SYNTHESIS general education course (3 credits)

Western civilization general education course (3 credits)

U.S. history general education course (3 credits)

Note: The general education courses should be selected from the department's list of approved courses. The ECE technical electives should be selected from the department's list of approved courses. The required design content must be satisfied by these technical electives.

Sample Schedule

The following table presents a sample schedule that an undergraduate electrical engineering major would follow to obtain a bachelor's degree.
### School of Information Technology and Engineering

First Semester
- MATH 113 Analytic Geometry and Calculus I 4
- ENGR 107 Introduction to Engineering 2
- CS 112 Computer Science I 4
- ENGL 101 Composition 3
- ECON 103 Contemporary Microeconomic Principles 3
- TOTAL 16

Second Semester
- MATH 114 Analytic Geometry and Calculus II 4
- ECE 101 Introduction to Information Technology 3
- PHYS 160 University Physics I 4
- CS 211 Computer Science II 3
- TOTAL 14

Third Semester
- MATH 213 Analytic Geometry and Calculus III 3
- MATH 203 Matrix Algebra 3
- PHYS 260 University Physics II 3
- PHYS 261 University Physics II Laboratory 1
- ECE 201 Introduction to Electrical Engineering 3
- Literature general education course 3
- TOTAL 16

Fourth Semester
- MATH 214 Elementary Differential Equations 3
- PHYS 262 University Physics III 3
- PHYS 263 University Physics III Laboratory 1
- ECE 280 Electric Circuit Analysis 5
- ECE 220 Signals and Systems I 3
- TOTAL 15

Fifth Semester
- ECE 320 Signals and Systems II 3
- ECE 331 Digital System Design 3
- ECE 332 Digital Electronics and Logic Design Lab 1
- ECE 333 Linear Electronics I 3
- ECE 334 Linear Electronics I Lab 1
- STAT 346 Probability for Engineers 3
- HIST 120 U.S. History general education 3
- TOTAL 17

Sixth Semester
- ECE 421 Classical Systems and Control Theory 3
- ECE 433 Linear Electronics II 3
- ECE 445 Computer Organization 3
- ECE 460 Communication and Information Theory 3
- COMM 100 Oral Communication 3
- TOTAL 15

Seventh Semester
- HIST 100 Western civilization general education 3
- ENGL 302 Advanced Composition (for natural sciences) 3
- ECE 305 Electromagnetic Theory 3
- Advanced engineering lab 1
- Technical elective 3
- ECE 491 Engineering Senior Seminar 1
- ECE 492 Senior Advanced Design Project I 1
- TOTAL 12

Eighth Semester
- ECE 493 Senior Advanced Design Project II 2
- Advanced engineering lab 1
- Technical elective 3
- Technical elective 3
- Global/international issues general education course 3
- TOTAL 17

### Change of Major
Students who want to change their majors to electrical engineering must have at least a 2.750 GPA in all math, physics, engineering, and computer science courses, and should have successfully completed MATH 114.

### Writing-Intensive Requirement
The university writing-intensive requirement is satisfied by completion of ECE 492 and 493 Senior Advanced Design Project I and II. Faculty provide feedback on student writing. Drafts and revisions are required.

### Computer Engineering, B.S.

The field of computer engineering can be described as a blend of electrical engineering and computer science. It is an amalgam of the computer hardware orientation of an electrical engineering program and the operating systems and languages of a computer science program. Computer engineers are involved in research, development, design, production, and operation of a wide variety of digital systems, from integrated circuits to computer systems and large-scale computer networks. Reflecting the industry trend to integrate hardware and software development, the computer engineering program is built around software, running on advanced hardware, that can simulate and assist in the design of new digital systems. Advanced software, such as VHDL, and software tools, such as logic and system design tools by Mentor Graphics and Cadence Design Systems, can be used to model hardware and hardware functionality from the system and architecture level down to the gate level and can include relations to integrated circuit fabrication technology. Design and testing methodology involving these tools is taught in the program.

Career opportunities exist in the areas of engineering research and development, product design, digital system design and integration, engineering management, engineering consultancy, technical sales, patent law and many others. The program provides a strong preparation for graduate study.

The bachelor's program in computer engineering at George Mason is accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology (ABET), 111 Market Place, Suite 1050, Baltimore, Md. 21202-4012; telephone (410) 347-7700. The computer engineering program is staffed by 25 full-time professors, including five fellows of IEEE or other professional societies.

The curriculum provides a strong background in the fundamentals of computer engineering. A number of technical
elective concentrations are offered, ranging from strongly hardware oriented to strongly software oriented. A major project with appropriate planning, documentation, and oral and written reports is required.

The requirements for the degree may be satisfied on a part-time or co-op basis. Cooperative education provides students with the opportunity to integrate paid, career-related work experience with classroom learning. In addition to the usual financial aid available to all students through the Office of Student Financial Aid, computer engineering majors are eligible to apply at the Electrical and Computer Engineering Department for several scholarships provided by professional societies and industrial organizations, such as the Armed Forces Communications and Electronics Association, the Association of Old Crows, the Institute of Electrical and Electronic Engineers, and Rockwell International.

Degree Requirements

All computer engineering students are required to see their major advisors before course registration each semester. Students interested in computer engineering who are not declared majors are also invited to obtain advising at the Electrical and Computer Engineering Department office. Students are strongly encouraged to obtain and follow the sample schedule below to ensure that course prerequisites are satisfied.

The 120 credit hours of courses required for the B.S. in Computer Engineering are as follows:

- Electrical and computer engineering: ECE 201, 220, 280, 331, 332, 333, 334, 442, 445, 447, 449, 491
- Computer science: CS 112, 211, 265, 310, 471
- Computer science or electrical and computer engineering: ECE 465 or CS 455
- Technical elective lab (1 credit)
- Technical electives (9 credits)
- Engineering: ENGR 107
- English: ENGL 101, 302, COMM 100
- Literature general education course (3 credits)
- Economics: ECON 103
- Western civilization general education course (3 credits)
- U.S. history general education course (3 credits)
- Global/international issues general education course (3 credits)
- Mathematics: MATH 113, 114, 125, 203, 213, 214; STAT 346
- Physics: PHYS 160, 260, 261, 262

Note: The general education courses should be selected from the department's list of approved courses. The technical electives and technical elective lab should be selected from the department's list of approved technical elective concentrations. Students are also encouraged to propose additional technical elective concentrations for approval.

Sample Schedule

The following table presents a sample schedule that an undergraduate computer engineering major would pursue to obtain a bachelor's degree.

<table>
<thead>
<tr>
<th>First Semester</th>
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<tbody>
<tr>
<td>MATH 113 Analytic Geometry and Calculus I</td>
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<tr>
<td>ENGR 107 Engineering Fundamentals</td>
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<tr>
<th>Second Semester</th>
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<tbody>
<tr>
<td>MATH 114 Analytic Geometry and Calculus II</td>
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<tr>
<td>ECE 201 Introduction to Electrical Engineering</td>
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<tr>
<td>PHYS 160 University Physics I</td>
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<tr>
<td>CS 211 Computer Science II</td>
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<table>
<thead>
<tr>
<th>Third Semester</th>
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</thead>
<tbody>
<tr>
<td>MATH 213 Analytic Geometry and Calculus III</td>
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<tr>
<td>MATH 203 Matrix Algebra</td>
</tr>
<tr>
<td>PHYS 260 University Physics II</td>
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<tr>
<td>PHYS 261 University Physics II Laboratory</td>
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<tr>
<td>CS 310 Computer Science III</td>
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<tr>
<td>Literature general education course</td>
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<tr>
<th>Fourth Semester</th>
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<tbody>
<tr>
<td>MATH 214 Elementary Differential Equations</td>
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<tr>
<td>ECE 331 Digital System Design</td>
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<tr>
<td>ECE 332 Digital Electronics and Logic Design Lab</td>
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<tr>
<th>Fifth Semester</th>
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<tbody>
<tr>
<td>ECE 333 Linear Electronics I</td>
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<tr>
<td>ECE 334 Linear Electronics I Lab</td>
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<tr>
<td>ECE 445 Computer Organization</td>
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<tr>
<td>PHYS 262 University Physics III</td>
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<tr>
<td>STAT 346 Probability for Engineers</td>
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<td>ENGL 302 Advanced Composition (for natural sciences)</td>
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<tr>
<th>Sixth Semester</th>
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<tbody>
<tr>
<td>CS 265 Assembly Language Programming</td>
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<tr>
<td>CS 455 Computer Networking Systems (or ECE 465 Computer Networking Protocols)</td>
</tr>
<tr>
<td>CS 471 Operating Systems</td>
</tr>
<tr>
<td>ECE 442 Digital Computer Design and Interfacing</td>
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<tr>
<td>Western civilization general education course</td>
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<table>
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<tr>
<th>Seventh Semester</th>
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<tbody>
<tr>
<td>ECE 447 Single-Chip Microcomputers</td>
</tr>
<tr>
<td>ECON 103 Contemporary Microeconomic Principles</td>
</tr>
<tr>
<td>Technical elective</td>
</tr>
<tr>
<td>MATH 125 Discrete Mathematics I</td>
</tr>
<tr>
<td>HIST 120 U.S. History general education course</td>
</tr>
</tbody>
</table>

TOTAL 178
Change of Major
Students who want to change their majors to computer engineering must have at least a 2.750 GPA in all math, physics, engineering, and computer science courses, and should have successfully completed MATH 114.

Writing-Intensive Requirement
The university writing-intensive requirement is satisfied by completion of ECE 445 and 447, in which various aspects of project documentation and reports are prepared and critiqued. Faculty provide feedback on student writing. Drafts and revisions are required.

■ B.S. in Computer Engineering with a Minor in Computer Science
Computer engineering majors can earn a minor in computer science upon taking an additional 1-credit course, CS 105 Computer Ethics and Society.

■ Double Major in Computer Engineering and Computer Science
Computer engineering majors can earn a double major in computer engineering and computer science if they complete an additional 14 credits of courses according to an approved plan of study. Details are available in the departmental brochures or at the IT&E web site, ite.gmu.edu.

■ B.S./Accelerated M.S. in Electrical Engineering or Computer Engineering
The B.S./Accelerated M.S. program is intended for those highly capable students who are interested in immediately continuing their undergraduate academic program in electrical or computer engineering into a graduate program in their respective discipline. This program allows for the completion of both a bachelor's degree and a master's degree in electrical engineering or in computer engineering in five years, with 144 credit hours.

Admission Requirements
1. Students in the electrical engineering program or computer engineering program can apply for the B.S./Accelerated M.S. in Electrical Engineering or Computer Engineering during the semester in which they expect to complete 90 undergraduate credits applicable toward the B.S. degree.
2. An overall GPA of at least 3.500 at the time of application is required.
3. Criteria for admission to the B.S./Accelerated M.S. program in Electrical Engineering or Computer Engineering is identical to the criteria for admission to the M.S. in Electrical Engineering or M.S. in Computer Engineering programs.

4. Application is made using the regular graduate program application forms and all normal requirements must be met. Additionally, an Accelerated Program application form specifying the overlapping courses and detailing the 3.500 undergraduate GPA must be submitted for approval.

Degree Requirements
1. Students must complete 144 credit hours that satisfy all the requirements for both the B.S. degree and the M.S. degree, with 6 credit hours overlap.
2. Students will take 6 credit hours of 500-level courses either as part of their technical electives or substituting for required courses as part of their 120-credit hour undergraduate program. The specific courses that may be taken and applied to the accelerated program will be specified by the ECE Department, for each of the two (electrical engineering and computer engineering) programs.
3. Students in the B.S./Accelerated M.S. program may take additional graduate level courses as part of their B.S. technical electives with their advisor's approval. These additional graduate level courses will not count toward the M.S. degree.
4. Students admitted to the accelerated program must maintain an overall GPA of at least 3.500 during their entire B.S./M.S. program, and must present a GPA of at least 3.500 for the 24 credit hours of graduate work submitted for the M.S. degree.

Degree Conferral
Students in the B.S./Accelerated M.S. program may apply to have the B.S. (in electrical engineering or computer engineering) conferred during the semester in which they expect to complete the B.S. requirements. At the completion of the M.S. requirements the M.S. degree will be awarded.

GRADUATE PROGRAMS
Graduate programs leading to the M.S. and Ph.D. degrees in engineering prepare students for careers in industry, government, and academia. Graduate certificate programs provide well-defined targets for students who want to advance or update their knowledge in selected areas. The Ph.D. in Electrical and Computer Engineering, the M.S. degrees in Computer Engineering and Electrical Engineering, and certificates in communications and networking, signal processing, and VLSI design/manufacturing are offered by the Department of Electrical and Computer Engineering. The Ph.D. in Information Technology is offered by the School of Information Technology and Engineering, and includes a number of courses with an electrical engineering or computer engineering emphasis. Details about these programs are available at the School of Information Technology and Engineering web site, ite.gmu.edu.

The department is committed to high standards of teaching and research excellence in the vibrant areas of communications, digital systems design, computer networks, microprocessor and embedded systems, distributed computing, signal and image processing, control systems, intelligent systems, microelectronics, electromagnetics, and optoelectronics. The department recognizes the need to augment and enhance these areas through the use of modern information technology. Graduate students are offered a progressive environment with ample opportunities for the type of advanced engineering
research that will be needed to confront the complex realities of the 21st century.

The courses in these programs are offered during the evening or late afternoon hours to permit persons who are employed full time to enroll in the programs. For those who enter the programs on a full-time basis, some financial aid may be available in various forms such as teaching assistantships, research assistantships, and workstudy and co-op agreements with local industry.

Admission
Admission is strictly competitive. The department's policy is to admit only those students who have demonstrated a potential for outstanding performance in their graduate work.

Admission Categories
Each student may be admitted into one of the following categories: degree, provisional, or nondegree. Provisional admission is for anyone whose past performance provides reasonable, but not strong, evidence of his or her ability to pursue graduate work. To advance to degree status, a provisional student must achieve a 3.000 GPA after 12 credits, must remove all undergraduate deficiencies by completing the corresponding courses with grades of B or better, and must receive Bs or better in two core courses specific to the student’s selected program and emphasis. The nondegree category is used primarily by students who wish to take courses but do not necessarily wish to pursue a degree. Nondegree students who wish to enter degree programs must formally apply for admission.

Admission Requirements
To be considered for admission to the master's program, each applicant should have the following:

1. A baccalaureate degree in electrical engineering, computer engineering, or a closely related discipline from an accredited program with a reputation for high academic standards
2. A grade average of B or better during the last 60 credits
3. Three letters of recommendation, preferably from academic references or from references in industry or government who hold advanced degrees and are familiar with the applicant's professional accomplishments
4. A detailed statement of career goals and aspirations
5. For a student who has not earned a bachelor's degree from a U.S. university, satisfactory performance on the Graduate Record Examination; and for a student whose native language is not English, a minimum score of 575 on the TOEFL. (A minimum score of 600 is required for applicants who wish to be considered for a graduate teaching assistantship.)

Non-ECE Students
Students with B.S. or M.S. degrees in ECE related disciplines (for example, computer science, mathematics, mechanical engineering, physics, electrical engineering technology) are encouraged to apply for admission. Such students may initially be admitted into the provisional category and advance to degree status by satisfying the requirements described in the Admissions Categories section. Such students may also be advised to take some courses from the undergraduate electrical or computer engineering curriculum, according to their intended areas of emphasis and specific backgrounds.

Electrical Engineering, M.S.
The electrical engineering program offers the following emphases: communications, signal processing, control and robotics, microelectronics, electromagnetics, and optoelectronics. Computer engineering remains a valid emphasis within the electrical engineering program; however, students interested in this emphasis are encouraged to pursue the M.S. in Computer Engineering instead.

Course Work
Each student must complete a minimum of 30 graduate credits beyond the bachelor's degree. This work must represent a cohesive set of courses leading to comprehensive knowledge in one area. It cannot be a set of disjointed courses. The plan of study for the degree must include the following:

1. A minimum of two core courses (with a B or better in each) from the following:
   - ECE 521 Modern Systems Theory
   - ECE 528 Random Processes in Electrical and Computer Engineering
   - ECE 548 Sequential Machine Theory or ECE 546 Parallel Computer Architectures
   - ECE 584 Semiconductor Device Fundamentals or ECE 565 Introduction to Optical Electronics

2. A minimum of three courses, with a B or better in each, at the 600 level or above (not including ECE 798 or 799) from a chosen emphasis, including approved doctoral courses (800-900 level).

3. A maximum of 6 credits of non-ECE courses, subject to prior departmental approval. Approved IT courses (including doctoral, 800-900-level courses) that cover ECE topics may be taken for credit toward an M.S. in Electrical Engineering, subject to prior departmental approval, in addition to the 6 credits of non-ECE courses.

Computer Engineering, M.S.
The computer engineering field is at the interface between the computer science and electrical engineering disciplines, as it involves knowledge of both hardware and software development. The major distinction between computer engineering and computer science is that the computer engineer is more concerned with the physical implementation of computing devices, the interaction between hardware and software, and the methodologies for designing digital systems. The major distinction between computer engineering and electrical engineering is that the computer engineer is more concerned with the computational aspects of electrical engineering problems and the implementation of these solutions in digital devices. The computer engineering program offers the following emphases: digital systems design, computer networks, distributed computing systems, microprocessor and embedded systems, and network and system security.

Course Work
Each student must complete a minimum of 30 graduate credits beyond the bachelor's degree. This work must represent a cohesive set of courses leading to comprehensive knowledge in one area of computer engineering. It can not be a set of disjointed courses. The plan of study for the degree must include the following:

1. Two core courses (with a B or better in each) as appropriate for a given emphasis of computer engineering:
   - Digital Systems Design: ECE 545 and ECE 586
Computer Networks: ECE 542 and CS 571  
Distributed Computing Systems: ECE 546 and CS 571  
Microprocessor and Embedded Systems: ECE 511 and CS 571  
Network and System Security: ECE 542 and CS 571

2. A minimum of three courses, with a grade of B or better in each, at the 600 level and above (not including ECE 798 or 799) from a chosen emphasis, including approved doctoral courses (800-900 level).

3. A maximum of 6 credits of courses that are not on the list of approved computer engineering courses, subject to prior departmental approval. IT courses (including doctoral, 800-900-level courses) that cover computer engineering topics may be taken for credit toward the M.S. in Computer Engineering, subject to prior departmental approval, in addition to the 6 credits of non-computer engineering courses.

4. The remaining courses must be taken from the list of approved computer engineering courses (available through the ECE and Computer Science Department offices, and on the web), which includes selected courses offered by both departments.

5. The plan of study will normally have no fewer than 15 credit hours of courses designated ECE.

A nonstandard emphasis may be created when appropriate, with the approval of the computer engineering graduate program coordinator. This emphasis must include components of both hardware and software development, and the corresponding plan of study must be composed of courses from both the ECE and Computer Science Departments.

**Degree Requirements Common to the M.S. in Computer Engineering and the M.S. in Electrical Engineering**

**Student Advising**

Newly admitted graduate students must consult with the ECE graduate coordinator before they register for classes. Students should make an appointment by calling the ECE office. Each student is expected to select an emphasis from those available in each M.S. degree program. The student then is assigned an academic advisor from that area.

**Plan of Study**

Before the end of the second semester, each student must submit a plan of study (approved by his or her academic advisor) to the graduate coordinator’s office. This plan should be kept up to date by regular consultation with the student’s academic advisor. A final, signed version of this plan of study must be turned in when the student submits a graduation application.

**Seminar Requirement**

All degree candidates must attend a minimum of 10 graduate seminars approved for the given degree program.

**GPA Requirements**

A maximum of 6 credit hours of courses with grades of C, C+, or B- may be applied toward the degree. The student must present a GPA of at least 3.000 for all courses submitted for the degree.

**Graduation Requirements**

To complete the requirements for graduation, students may select one of the following options:

**Thesis Option**

Thesis students must complete ECE 799 Master’s Thesis (6 credits) and 24 credits of course work. The thesis is particularly recommended for those students who wish to develop and document their research skills, and/or who contemplate subsequent enrollment in a Ph.D. program. The thesis involves a research effort, which is conducted under the guidance of a faculty advisor. In some cases, permission may be granted to complete a portion of the work at the student's place of employment. The final written thesis and oral defense are approved by the student’s advisory committee. For the electrical engineering program, this committee consists of at least three full-time faculty members, including two from the student’s major area and one from outside the area. For the computer engineering program, this committee includes faculty members from the ECE and Computer Science Departments, including at least two affiliated with the M.S. in Computer Engineering program (one of whom must be from the ECE Department) and one from outside the M.S. in Computer Engineering program. Thesis students may not register for ECE 798 Research Project. Students must register for at least 3 credits of thesis for their first thesis semester. Following their first thesis semester, they must register for at least 1 credit of thesis each fall and spring semester until graduation.

**Scholarly Paper Option**

Students who select this option must complete 30 credits of course work or 27 credits of course work plus ECE 798 Research Project, and must present a scholarly paper. The scholarly paper is a technical report on an independent study, laboratory or computer experimentation, or literature search done by the student on a current scientific or technological topic, such as a survey of some new technologies or new methodologies, or a case study of new applications, on a theme selected under the guidance of a faculty advisor. The student must demonstrate knowledge of the topic and make a satisfactory technical presentation of the paper in the graduate seminar. The scholarly paper and the final presentation must be approved by the student’s advisory committee. When a student elects to submit an ECE 798 final report as a scholarly paper, it is expected that the 3 credits of effort in ECE 798 will result in a much more substantial paper than a scholarly paper submitted in addition to 30 credits of regular course work.

**Certificate in Communications and Networking**

The certificate in communications and networking provides graduate students with the opportunity to reach a demonstrated level of competence in communications and networking. Course work toward the graduate certificate may be used for credit toward the M.S. in Electrical Engineering or Computer Engineering. However, the primary purpose of the certificate is to provide a well-defined target for students who want to advance their knowledge of modern communications but do not necessarily want to complete all the requirements for the M.S. degree. The certificate may be pursued concurrently with any of the graduate degree programs in the School of Information Technology and Engineering.
Admission Requirements
The certificate program in communications and networking is open to all students who hold B.S. degrees in scientific and engineering disciplines from accredited universities.

Certificate Requirements
The certificate is awarded upon completion of five graduate courses (15 credits) in the area of communications and networking. A cumulative GPA of 3.000 is required, and at most one course with a grade of C may be applied toward the certificate. The certificate courses comprise two required foundation courses and three elective courses.

Foundation Courses
ECE 528 Random Processes in Electrical and Computer Engineering
ECE 542 Computer Network Architectures and Protocols or CS 656 Computer Communications and Networking

Elective Courses
After completing the foundation courses, students can choose elective courses by taking three courses from the list below.

ECE 535 Digital Signal Processing
ECE 565 Introduction to Optical Electronics
ECE 567 Optical Fiber Communications
ECE 630 Statistical Communication Theory
ECE 633 Coding Theory
ECE 635 Adaptive Signal Processing
ECE 642 Design and Analysis of Computer Communication Networks
ECE 643 Telecommunications Switching Systems
ECE 646 Cryptography and Computer Network Security
ECE 665 Fourier Optics and Holography
ECE 731 Digital Communications
ECE 732 Mobile Communication Systems
ECE 734 Detection and Estimation Theory
ECE 735 Data Compression
ECE 737 Spread Spectrum Communications
ECE 738 Advanced Digital Signal Processing
ECE 739 Satellite Communications
ECE 741 Wireless Networks
ECE 742 High-Speed Networks
IT 834 Telecommunications Networks
IT 886 Information Theory
OR 635 Discrete System Simulation
OR 643 Network Modeling
OR 647 Queueing Theory

Certificate in Signal Processing
The certificate in signal processing provides graduate students with a concise sequence of courses and laboratory experiences within the wide field of signal processing. Course work toward the graduate certificate may be used for credit toward the M.S. in Electrical Engineering, Computer Engineering, or Statistical Science. However, the primary purpose of the certificate is to provide a well-defined target for students who want to advance or update their knowledge in this fast-moving field but do not necessarily wish to complete all the requirements for the M.S. degree. The certificate may be pursued concurrently with any of the graduate degree programs in the School of Information Technology and Engineering.

Admission Requirements
The certificate program in signal processing is open to all students who hold B.S. degrees in scientific and engineering disciplines from accredited universities, and hold graduate status (either degree or nondegree) in the School of Information Technology and Engineering.

Certificate Requirements
The certificate is awarded upon completion of five graduate courses (15 credits) in signal processing. A cumulative GPA of 3.000 is required, and at most one course with a grade of C may be applied toward the certificate. The certificate courses comprise two foundation courses taken by all students and three elective courses.

Foundation Courses
ECE 528 Random Processes in Electrical and Computer Engineering,
or STAT 544 Applied Probability
ECE 535 Digital Signal Processing

Elective Courses
After completing the two foundation courses, students can choose elective courses by taking three courses from the list below.

ECE 537 Introduction to Digital Image Processing
ECE 635 Adaptive Signal Processing
ECE 638 Fast Algorithms and Architectures for Digital Signal Processing
or IT 838 Signal Processing Algorithms and Architectures
ECE 644 Architectures and Algorithms for Image Processing
ECE 665 Fourier Optics and Holography
ECE 728 Random Processes in Electrical and Computer Engineering II
ECE 734/IT 830 Detection and Estimation Theory
ECE 735 Data Compression
or IT 832 Speech and Image Coding
ECE 738 Advanced Digital Signal Processing
ECE 749 Neural Networks for Control
or IT 844 Pattern Recognition
STAT 652 Statistical Inference
STAT 658 Time Series Analysis and Forecasting
STAT 662 Multivariate Statistical Methods
IT 746 Calculus of Random Signals
IT 837/ECE 754 Optimum Array Processing I
IT 838 Signal Processing Algorithms and Architectures
or ECE 638 Fast Algorithms and Architectures for Digital Signal Processing
IT 841/ECE 722 Kalman Filtering with Applications
IT 885/ECE 752 Spectral Estimation
IT 886/ECE 751 Information Theory
IT 930 Multichannel Statistical Signal Processing
IT 934 Advanced Topics in Detection and Estimation
IT 937/ECE 755 Optimum Array Processing II
IT 941 System Identification and Adaptive Control
IT 978/CSI 978 Statistical Analysis of Signals

Certificate in VLSI Design/Manufacturing
The primary purpose of the certificate is to provide a well-targeted graduate continuing education opportunity for people working in Northern Virginia's semiconductor and intellectual property business. This certificate is intended for students who want to advance their knowledge of very
large-scale integration (VLSI) design or VLSI manufacturing but do not necessarily wish to complete all requirements for the M.S. in Electrical Engineering or Computer Engineering. The course work is designed so that graduate students can reach a demonstrated level of competence either in VLSI design or VLSI manufacturing. Course work toward the graduate certificate may be used for credit toward the M.S. in Electrical Engineering or Computer Engineering. The certificate may be pursued concurrently with any of the graduate degree programs in the School of Information Technology and Engineering.

Admission Requirements
The certificate program in VLSI design/manufacturing is open to all students who hold B.S. degrees in scientific and engineering disciplines and hold graduate student status (degree or nondegree) in the School of Information Technology and Engineering. Students with nonscientific and nonengineering degrees are required to take remedial courses before being admitted into the certificate program.

Certificate Requirements
The certificate is awarded upon completion of five graduate courses (15 credits): a required foundation course, a compulsory core course, and three elective courses. A cumulative GPA of 3.000 is required, and only one course with a grade of C may be applied toward the certificate. At most, one course may be transferred from graduate course work at other accredited universities.

After completing the foundation course (ECE 684), students can choose one of the two concentrations, VLSI design or VLSI manufacturing, by taking four courses in that concentration, one of which will be the core course in that area.

Foundation Course
ECE 684 MOS Device Electronics

VLSI Design Concentration
Core Course
ECE 586 Digital Integrated Circuits

Electives
ECE 545 Introduction to VHDL
ECE 587 Design of Analog Integrated Circuits
ECE 645 Computer Arithmetic: Hardware and Software Implementations
ECE 680 Physical VLSI Design
ECE 681 VLSI Design Automation
ECE 682 VLSI Test Concepts

VLSI Manufacturing Concentration
Core Course
ECE 689 VLSI Processing

Electives
ECE 586 Digital Integrated Circuits
ECE 680 Physical VLSI Design
ECE 745 ULSI Microelectronics

Ph.D. in Electrical and Computer Engineering
The Ph.D. in Electrical and Computer Engineering, offered by the Department of Electrical and Computer Engineering, is the only combined electrical engineering and computer engineering doctoral program in Virginia. The program prepares students for leadership positions in research and development in industrial, government, and academic settings. The program includes course requirements, a qualifying examination testing fundamental concepts and the ability to think creatively, a teaching requirement, a research competency examination and dissertation proposal defense, dissertation research, and a dissertation defense. Students may choose to emphasize in such areas as communications, networking, computer engineering, control and robotics, signal processing, electronics, photonics, and electromagnetics. The general doctoral requirements of George Mason University apply to this program.

Admissions Requirements
All general George Mason University and specific School of Information Technology and Engineering admission requirements apply. Students typically admitted to the program hold M.S. degrees in electrical engineering, computer engineering, and other related areas. Students holding European (or equivalent) diploma degrees may also be considered for admission. The application material for each student is reviewed by the departmental doctoral committee, which makes a recommendation to the department chair.

Advisor/Dissertation Director
Each student, upon admission to the program, is assigned a faculty member as advisor. Upon passing the qualifying examination, the advisor is replaced by (or becomes) the dissertation director. All decisions concerning the student's course requirements and selections have to be approved by the Ph.D. advisor with the consent of the chair of the ECE Department.

A dissertation committee is formed within a year after the student has passed the qualifying examination. The committee is headed by the dissertation director, and has two more faculty members from the ECE Department and one from outside the department. One more member, from outside the university, may be added to the dissertation committee if justified by the subject of the dissertation. The composition of the dissertation committee must be approved by the chair of the ECE Department.

Course Requirements
The total credit required after the B.S. degree is 72 hours, of which 24 hours typically is thesis research. Students entering with M.S. degrees may use up to 24 credits of course work from their M.S. programs, subject to approval. Students entering with European diploma degrees may use some course credit, subject to individual consideration, but not more than 24 hours.

Of the required 48 credits of course work, at most 12 credits may be at the 500 level and at least 12 credits have to be at the 700 level or higher. For courses taken elsewhere, the equivalent levels are to be determined by the Ph.D. advisor, subject to the approval of the chair of the ECE Department. Individualized reading courses at any level cannot account for more than 6 credits.

Each student is required to take one graduate course (6 credits) at the 600 level outside the department in a subject considered foundational for his/her area of specialization. Typical examples would be advanced mathematics or statistics courses for those wishing to pursue an emphasis in signal processing or control, physics courses for those desiring an emphasis in

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electronics, and computer science courses for those pursuing the computer engineering emphasis. Since such courses are usually not taken for M.S. degrees, this requirement can rarely be satisfied with a course taken previously.

Each student is required to take two courses (6 credits) within the department but outside his/her area of emphasis. This requirement may be satisfied with courses taken during previous studies, subject to approval.

The 24 hours of dissertation research (ECE 998 and ECE 999) must include at least 12 hours of ECE 999. The dissertation proposal must be approved by the dissertation committee before the student may enroll in ECE 999.

Qualifying Examination
The department offers a doctoral qualifying examination twice each year. The exam is to test primarily the student's familiarity with fundamental concepts and the ability to think creatively.

Students have to take the qualifying examination within the first semester after they have completed 24 credit hours past the B.S.. The qualifier consists of a written, in-class examination and an oral interview, the latter administered by the doctoral committee. Only students passing the written part proceed to the interview. The written exam is offered in at least six course subjects (see tentative course list below). The student has to select three of the course subjects, of which one has to be outside his/her area of emphasis. The exam may be repeated once. A student failing the exam twice is removed from the program.

Tentative list of qualifying exam subjects/courses:
- CS 571 Operating Systems
- ECE 511 Microprocessors
- ECE 521 Modern Systems Theory
- ECE 528 Random Processes in Electrical and Computer Engineering
- ECE 535 Digital Signal Processing
- ECE 542 Computer Network Architecture and Protocols
- ECE 545 Introduction to VHDL
- ECE 546 Parallel Computer Architectures
- ECE 548 Sequential Machine Theory
- ECE 565 Introduction to Optical Electronics
- ECE 584 Semiconductor Device Fundamentals
- ECE 586 Digital Integrated Circuits

Teaching Requirement
To acquire lecturing and teaching experience, each doctoral student is required to participate in the department's teaching activity. This typically takes the form of working as a recitation instructor. The minimum requirement is one full semester of such activity in one course, or equivalent arrangements approved by the doctoral coordinator.

Research Competency Examination and Dissertation Proposal
Upon completing all course work requirements, the student takes an oral research competency examination to demonstrate his or her knowledge and preparation for dissertation research. The exam covers the knowledge derived from higher level courses taken, familiarity with the relevant technical literature, and preliminary thoughts about the proposed research. The exam is administered by the student's dissertation committee.

The student prepares a written dissertation proposal outlining the contents of the dissertation and the research activities leading up to it. The dissertation proposal is submitted to the dissertation committee for approval. The proposal is orally presented by the student, preferably as part of the research competency examination.

Dissertation Research and Defense
The student conducts dissertation research under the guidance of the dissertation director, with regular consultation with other members of the dissertation committee. During this period, the student has to present research results at least once in the form of a departmental seminar. The dissertation must represent an achievement in research; it must be a significant contribution to its field and should be deemed publishable in refereed journals or at highly selective conferences. Upon completion of the dissertation, a public defense is administered by the dissertation committee. This may be preceded by a pre-defense in the presence of the committee members only, at the discretion of the committee. A copy of the dissertation must be placed in the university library four weeks prior to the public defense.

Following a successful public defense, and the completion of the final form of the dissertation, the dissertation committee recommends the candidate for the degree of doctor of philosophy.

Information and Software Engineering

Web: isce.gmu.edu
Phone: (703) 993-1640

Faculty
Professors: Gomaa, Jajodia (chair), Korschberg, Motro, Sandhu, Sibley
Associate professors: Ammann, Barbara, Baum, Brodsky, Parisi-Presicce, Offutt, Wang
Assistant professors: Wijesekera, Wu
Instructor: Bechtold
Adjunct professors: Dinh, Lee, Matthews, Mills, Obenland, Nidiffer

Course Work
The Department of Information and Software Engineering (ISE) offers courses designated INFS and SWE in the "Course Descriptions" chapter of this catalog.

Although there is no undergraduate degree program in information systems, courses are offered as electives in other programs. Students also may elect an information systems engineering emphasis in the systems engineering degree program. We also offer a B.S. in Computer Science/Accelerated M.S. in Information Systems program and a B.S. in Computer Science/Accelerated M.S. in Software Engineering program. See below for the descriptions.

GRADUATE PROGRAMS

Information Systems, M.S.
The M.S. in Information Systems focuses on the underlying principles and practical issues associated with building computer-based information systems for modern organizations.
Information is the lifeblood of every enterprise, both private and public, and the M.S. program addresses the theoretical and pragmatic aspects of specifying, designing, implementing, and deploying information systems. The program prepares students for research and professional practice in the above areas.

The M.S. program is unique in two respects: 1) it provides a balance between the theoretical and practical aspects of information systems, and 2) it accepts students with baccalaureate degrees in such disciplines as business, arts and sciences, computer science, and engineering.

The M.S. student studies the core topics of computer organization, programming languages, operating systems, operations research and management, database management, computer communication networks and distributed applications, systems analysis and design, and information systems policy and administration.

Through elective courses, the student acquires knowledge and skills in the areas of secure information systems; software engineering; information systems engineering; data engineering; knowledge engineering; information retrieval; decision support systems; user interface design; artificial intelligence; network management; and object-oriented analysis, design, and programming.

An M.S. graduate may pursue a career in areas such as database administration, management and engineering, database application programming, systems analysis and design, information engineering, knowledge engineering, information security engineering, electronic commerce, network design and administration, systems integration, and the management of information systems.

The program is offered by the faculty of the Information and Software Engineering Department. All classes are scheduled in the late afternoon and early evening to accommodate employed students.

**Foundation Requirements**

The M.S. program prepares students for research and practice in information systems. The program emphasizes a balance of theoretical and practical skills. To ensure that students have an adequate background in mathematical methods, computer technology, and business knowledge, the program requires the following five foundation courses, or their equivalents:

1. An introductory programming course such as INFS 310
2. INFS 501 Discrete and Logical Structures for Information Systems
3. INFS 515 Computer Organization
4. INFS 590 Program Design and Data Structures
5. A course in one of the three following areas: accounting, management, or marketing

When a prospective student applies to the M.S. program, he or she is asked to fill out a departmental self-evaluation form, indicating whether previously taken courses may satisfy these foundation requirements. Upon acceptance, the student is advised of the necessary foundation courses to be satisfactorily completed to meet this requirement. Foundation courses do not earn credit toward the M.S. degree; however, they must be successfully completed with a grade of B or better before enrolling in the core curriculum.

Students may take courses through the Commonwealth Graduate Engineering Program. Appropriate courses may be transferred, with advisor approval, into this George Mason degree program.

**Admission Requirements**

Each applicant for the M.S. program must meet the following requirements:

1. Hold a baccalaureate degree from an accredited institution.
2. Have earned a GPA of 3.00 or better in the last 60 credits.
3. Show proof of a satisfactory score on the Graduate Management Admission Test (GMAT) or the Graduate Record Exam (GRE), if required. The applicable test should have been taken within five years of applying for admission. Effective spring 2001, the Information and Software Engineering Department has established the following policy with regard to the GMAT or the GRE. The GMAT or GRE is required of each applicant unless the applicant (1) has an undergraduate degree in science or engineering from a U.S. university and graduated with a GPA of 3.00 or better in the last 60 hours; or (2) has a graduate degree in science or engineering from a U.S. university.
4. Submit the appropriate application forms with three letters of recommendation from persons directly knowledgeable of the applicant's professional and academic competence; a one-page goals statement; and a work resume.
5. Submit a departmental self-evaluation form that is essential for evaluating foundation requirements by the department faculty. This form may be obtained from the department office.

**Advising**

Before the beginning of each semester, the Information and Software Engineering Department holds an orientation meeting each January and August to advise newly admitted and continuing students. Members of the faculty are present to answer questions and to offer advice concerning programs of study. Detailed information is posted on the ISE home page: ise.gmu.edu.

The department also provides an advising function to students, as outlined in the Student Advising form available from the department. Each student is assigned a faculty advisor with whom the student may confer on matters related to degree requirements. A plan of study form for the M.S. degree should be completed and submitted by the student soon after admission to the program. The plan serves as a planning guide for the student.

**Degree Requirements**

Completion of the M.S. program requires a minimum of 30 approved graduate credits (10 courses). To provide a common background in the fundamentals of information systems, the following four courses are required of all students:

- INFS 601 Operating Systems Theory and Practice
- INFS 612 Principles and Practices of Communication Networks
- INFS 614 Database Management
- INFS 622 Information Systems Analysis and Design

Students must also take one of the following two courses:

- INFS 790 Information Systems Policy and Administration
- INFS 798 Research Project

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The research project is intended for research-oriented students who have discussed a project with a graduate faculty member who has agreed to supervise the project.

**Electives**

In order for students to pursue their individual interests, they may elect five courses. A list of pre-approved qualified electives is available from the department office. However, a student may choose other electives from offerings within IT&E with the consent of his or her faculty advisor. A thesis option is available; a student may elect to complete a thesis for up to 6 elective credits.

Students may earn certificates in software engineering by replacing the INFS 622 core course with SWE 620, and by taking as electives SWE 619 Software Construction and SWE 621 Software Design, followed by two of the following as the remaining two electives:

- SWE 623 Formal Methods and Models in Software Engineering
- SWE 625 Software Project Management
- SWE 630 Software Engineering Economics
- SWE 631/CS 631 Object-Oriented Design Patterns
- SWE 632 User Interface Design and Development
- SWE 637 Software Testing and Quality Assurance
- SWE 641/SYST 621 Systems Architecture for Large-Scale Systems
- SWE 642 Software Engineering for the World Wide Web
- CS 706 Concurrent Software Systems
- CS 707 Distributed Software Systems
- SWE 720 Advanced Software Requirements
- SWE 721 Reusable Software Architectures
- CS 735 Concurrency
- SWE 763 Software Engineering Experimentation

**Certificate in Electronic Commerce**

The graduate certificate program in electronic commerce is intended for persons who are interested in the use of the Internet and associated World Wide Web technology by governments, individuals, and industry. The impact of electronic commerce is already starting to be felt as its use crosses international boundaries and affects the management and administration of business, changes legal and cultural contexts, and has taxation and treaty effects. Thus the problems engendered extend across technological and policy borders, and the study of the implementation and use of electronic commerce bristles with issues that are not typically covered in traditional programs.

**Admission Requirements**

Applicants to the electronic commerce certificate program must have earned a GPA of 3.000 or better in the last 60 credits. Additionally, applicants must possess the equivalent knowledge of the following three foundation courses:

- INFS 501 Discrete and Logical Structures for Information Systems
- INFS 515 Computer Organization
- INFS 590 Program Design and Data Structures

In addition, applicants must possess the equivalent knowledge of operating systems theory and practice (INFS 601), communication networks (INFS 612), and database management (INFS 614).

Applicants must complete a self-evaluation form, which can be obtained from the Information and Software Engineering Department. This form provides summary information concerning background and preparation for the program. Additionally, applicants are required to submit a brief (one to two-page) statement of educational and work experience in the computing field.

Students not enrolled in a graduate degree program at George Mason University should apply for the electronic commerce certificate program through the Graduate Admissions Processing Center of IT&E. Students enrolled in a graduate degree program at George Mason should apply to the Information and Software Engineering Department for admission into the certificate program. Admission to the certificate program does not guarantee acceptance into any M.S. program.

**Certificate Requirements**

Certificate candidates must complete five courses (subject to satisfying equivalents of INFS 601, 612, and 614), with an average grade of B or better, for a total of 15 credits of graduate study. To obtain the certificate a student must complete the following:

1. Take one of the following combinations for 9 credits:
   a. INFS 640 Introduction to Electronic Commerce, INFS 641 Group Project in Electronic Commerce, and INFS 740 Individual Project in Electronic Commerce
   or
   b. INFS 640 Introduction to Electronic Commerce, and 6 credits of INFS 641 Group Project in Electronic Commerce

2. Take two additional courses for 6 credits from one of the following combinations:
   a. INFS 762 Information Systems Security and either INFS 766 Internet Security Protocols or INFS 767 Secure Electronic Commerce
   or
   b. HSCI 678 Introduction to the U.S. Health System* and either HSCI 720 Health Databases and Data Integration or HSCI 722 Electronic Commerce and Online Marketing for Health Services

*With permission of the instructor, this course may be waived for a person with experience in health care systems management.

Application forms may be obtained by contacting the Department of Information and Software Engineering, Room 330, Science and Technology II, (703) 993-1640.

**Certificate in Information Engineering**

The graduate certificate program in information engineering has been designed for persons who are involved in the specification, design, implementation, and management of data- and knowledge-intensive information systems. The INFE certificate program prepares students for research, development, and professional practice in information engineering by providing a hands-on set of courses designed to provide theoretical knowledge and practical experience with methods and tools associated with the areas of database management systems, data modeling, knowledge acquisition, data/knowledge representation, and information and software engineering.
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Admission Requirements
Applicants to the INFE certificate program must have earned a GPA of 3.00 or better in the last 60 credits. Additionally, applicants must complete a self-assessment form, which can be obtained from the Information and Software Engineering Department. This form provides summary information concerning background and preparation for the program.

Each applicant must possess knowledge equivalent to that provided by the following courses:

- INFS 501 Discrete and Logical Structures for Information Systems
- INFS 515 Computer Organization
- INFS 590 Program Design and Data Structures

Students not enrolled in a graduate degree program at George Mason University should apply for the information engineering certificate program through the Graduate Admissions Processing Center of IT&E. Students enrolled in a graduate degree program at George Mason should apply to the Information and Software Engineering Department for admission into the certificate program. Admission into the certificate program does not guarantee acceptance into any M.S. program.

Certificate Requirements
Certificate candidates must complete five courses with an average grade of B or better, for a total of 15 graduate credits. To obtain the certificate, a student must complete the following:

1. INFS 612 Principles and Practices of Communication Networks
2. INFS 614 Database Management
3. SWE 620 Software Requirements Analysis and Specification
4. SWE 621 Software Design
5. One of the following:
   - SWE 625 Software Project Management
   - INFS 770 Methods for Information Systems Engineering

*Note:* Students enrolled in the M.S. in Information Systems program may substitute SWE 620 for INFS 622 to obtain the certificate in information engineering. Credit is not given for taking both INFS 622 and SWE 620; only 3 credits are awarded.

Applicants may obtain more information by contacting the Information and Software Engineering Department, Science and Technology II, Room 330, (703) 993-1640.

Certificate in Information Systems Security
The graduate certificate program in information systems security is intended for persons who are interested in science and methods for ensuring secrecy, integrity, availability, and legitimate use of information systems. The certificate in information systems security may be pursued concurrently with any of the graduate programs in IT&E.

Certificate Requirements
Certificate candidates must complete the following requirements to obtain the certificate.

1. INFS 601, 612, and 614, or their equivalents, with grades of B or better. This requirement can be waived if equivalent graduate courses have been previously completed.
2. INFS 762 Information Systems Security
3. Three additional courses from the following:
   - INFS 765 Database and Distributed Systems Security
   - INFS 766 Internet Security Protocols
   - INFS 767 Secure Electronic Commerce
   - IT 862 Computer Security Models and Architectures (restricted to Ph.D. students)
   - ECE 646 Cryptography and Computer Network Security

Items 2 and 3 must be completed with an average grade of B or better.

Students in the M.S. in Computer Science program can substitute CS 697 Independent Reading and Research in the information security area for one of the courses in item 3. Prior approval of the specific independent study course should be obtained.

Applicants may obtain more information by contacting the Information and Software Engineering Department, Science and Technology II, Room 330, (703) 993-1640.

Certificate in Software Engineering
The graduate certificate program in software engineering provides knowledge, tools, and techniques to those who are working in, or planning to work in, the field of software engineering, but who do not want to complete all the requirements for a master's degree in software engineering. The certificate in software engineering may also be pursued concurrently with any of the graduate degree programs in IT&E.

Admission Requirements
Applicants to the software engineering certificate program must have earned a GPA of 3.00 or better in the last 60 credits. Additionally, applicants must complete a self-assessment form, which can be obtained from the Information and Software Engineering Department. This form provides summary information concerning background and preparation for the program.

Each applicant must possess knowledge equivalent to the following undergraduate courses: structured programming in a modern programming language, data structures, discrete mathematics, and machine organization. The level of
knowledge may also be achieved by taking the following foundation courses from George Mason:

INFS 501 Discrete and Logical Structures for Information Systems
INFS 515 Computer Organization
INFS 590 Program Design and Data Structures

In addition, it is desirable, but not necessary, for applicants to have at least one year of appropriate work experience in building and/or modifying software systems.

Applicants are required to submit a brief (one-to-two-page) statement of educational and work experience in the computing field that includes a statement of career goals in software engineering.

Students not enrolled in a graduate degree program at George Mason should apply for the certificate program through the Graduate Admissions Processing Center of IT&E. Students enrolled in a graduate degree program at George Mason should apply to the Information and Software Engineering Department for admission into the certificate program. Admission into the certificate program does not guarantee acceptance into any M.S. program.

Certificate Requirements
Certificate candidates must complete five courses, with an average grade of B or better, for a total of 15 graduate credits. To obtain the certificate, a student must complete the following:

1. SWE 619 Software Construction,
   SWE 620 Software Requirements Analysis and Specification, and
   SWE 621 Software Design

2. Two additional courses (subject to satisfying prerequisites) from the following:
   SWE 623 Formal Methods and Models in Software Engineering
   SWE 625 Software Project Management
   SWE 630 Software Engineering Economics
   SWE 631/CS 631 Object-Oriented Design Patterns
   SWE 632 User Interface Design and Development
   SWE 637 Software Testing and Quality Assurance
   SWE 641/SYST 621 Systems Architecture for Large-Scale Systems
   SWE 642 Software Engineering for the World Wide Web
   CS 706 Concurrent Software Systems
   CS 707 Distributed Software Systems
   SWE 720 Advanced Software Requirements
   SWE 721 Reusable Software Architectures
   CS 735 Concurrency
   SWE 763 Software Engineering Experimentation

Software Engineering, M.S.
The M.S. in Software Engineering provides specialized knowledge and experience in developing and modifying large, complex software systems. It emphasizes technical and management aspects of the software engineering process. Software engineering is an established discipline based on computer analysis, design, construction, testing, maintenance, economics, and management issues of software engineering. A pragmatic approach to problem solving is the hallmark of a software engineer. Software engineers are concerned with the theoretical and practical aspects of technology, cost, and social impact of software systems that are both effective and efficient.

Software engineers are in demand in every segment of society affected by computing technology. Typical employers include Internet-based companies, businesses that build and sell computers, software companies, research and development laboratories, aerospace contractors, banks, insurance companies, and manufacturing organizations. The master's program is concerned with both technical and managerial issues, but primary emphasis is placed on the technical aspects of building and modifying software systems.

The contents of the M.S. in Software Engineering program are revised on a regular basis to stay abreast of the latest developments in information technology. Recent additions to the program include software construction with the object-oriented Java programming language, requirements analysis with use cases and the Unified Modeling Language (UML), object-oriented software design with the UML, graphical user interface design, software engineering for the world wide web, software project management using the spiral life cycle model and the Capability Maturity Model (CMM), software architecture, design patterns, system testing and testing of object-oriented components, and formal methods using the Object Constraint Language (OCL).

Foundation Requirements
Students entering the M.S. program must have course work or equivalent knowledge in the following areas: a modern, block-structured programming language such as Java, Ada, C, or Pascal; data structures and algorithms; machine organization (e.g., as given in computer system architecture or assembly language courses); and topics in discrete mathematics, including sets, relations, functions, trees, graphs, and inductive proofs. The level of knowledge required in these areas is equivalent to that taught in undergraduate courses in the indicated topics, and also may be achieved by taking the following foundation courses from George Mason:

INFS 501 Discrete and Logical Structures for Information Systems
INFS 515 Computer Organization
INFS 590 Program Design and Data Structures

In addition, it is desirable, though not required, that entering students have at least one year of work experience in building and/or modifying software systems.

When a prospective student applies to the M.S. program, he or she is asked to fill out a departmental self-evaluation form, indicating whether previously taken courses may satisfy these foundation requirements. Upon acceptance, the student is advised of the necessary foundation courses to be satisfactorily completed to meet this requirement. Foundation courses do not earn credit toward the M.S. degree; however, they must be successfully completed with a grade of B or better before enrolling in the core curriculum.

Students may take courses through the Commonwealth Graduate Engineering Program. Appropriate courses may be transferred, with advisor approval, to this George Mason degree program.
Admission Requirements

In addition to the general admission requirements of the university, each applicant to the M.S. program must meet the following minimum entrance requirements:

1. Hold a baccalaureate degree in an appropriate discipline from an accredited institution.
2. Have earned a GPA of 3.00 or better in the last 60 credits of undergraduate study.
3. Provide a brief (one- to two-page) statement of educational and work experience in the computing field that includes a statement of career goals in software engineering.
4. Submit a departmental self-evaluation form, which can be obtained from the department. This form provides summary information concerning background and preparation for the program.
5. Show proof of a satisfactory score on the GRE, if required. The test should have been taken within five years of applying for admission. Effective spring 2001, the Information and Software Engineering Department has established the following policy with regard to the GRE. The test is required of each applicant unless the applicant (1) has an undergraduate degree in science or engineering from a U.S. university and graduated with a GPA of 3.00 or better in the last 60 hours; or (2) has a graduate degree in science or engineering from a U.S. university.
6. Submit the appropriate application form with three letters of recommendation from persons directly knowledgeable of the applicant’s professional and academic competence.

Acceptance into the M.S. program is based on an overall assessment of the applicant’s ability to complete the program of study satisfactorily. Well-qualified students with minor deficiencies may be admitted to the program in provisional status, with specified course work to be completed within a specified time.

Advising

Before the beginning of each semester, the Information and Software Engineering Department holds an orientation meeting each January and August to advise incoming and continuing students. Members of the faculty are present to answer questions and to offer advice concerning programs of study. Detailed information is posted on the ISE home page: ise.gmu.edu.

The department also provides an advising function to students, as outlined in the Student Advising Form available from the department. Each student is assigned a faculty advisor with whom the student confers on matters related to degree requirements. A plan of study form for the M.S. degree should be completed and submitted by the student soon after admission to the program. The plan serves as a planning guide for the student.

Degree Requirements

The M.S. in Software Engineering requires a minimum of 30 graduate credits. The following six core courses (18 credits) are required:

- SWE 619 Software Construction
- SWE 620 Software Requirements Analysis and Specification
- SWE 621 Software Design
- SWE 623 Formal Methods and Models in Software Engineering
- SWE 625 Software Project Management
- SWE 626 Software Project Laboratory

In addition, students may choose between the professional option, consisting of four electives, or the research option, consisting of two electives and a 6-credit thesis, which is primarily intended for students planning to pursue a Ph.D. with an emphasis in software engineering.

Electives

Electives provide students the opportunity to gain in-depth knowledge in a selected area, to gain breadth of knowledge, or by careful selection, to complete some of the core course requirements for the Ph.D. program. A listing of approved qualified electives is available from the department office. However, students may choose other electives from offerings within IT&E with the consent of their faculty advisors.

B.S. in Computer Science/Accelerated M.S. in Information Systems

The B.S. in Computer Science/Accelerated M.S. in Information Systems is for those interested in immediately continuing their undergraduate studies in computer science with graduate studies in information systems.

Admission Requirements

Students in the B.S. in Computer Science program can apply for admission in Computer Science/Accelerated M.S. in Information Systems program if they have earned 90 undergraduate credits with an overall GPA of at least 3.00. Criteria for admissions to the B.S. in Computer Science/Accelerated M.S. in Information Systems program are identical to the criteria for admission to the M.S. in Information Systems program.

Degree Requirements

1. Students must complete 144 credit hours that satisfy both the requirements for the B.S. in Computer Science program and those for the M.S. in Information Systems program, with 6 credit hours overlap.
2. Students will register for 6 credit hours of 500-level computer science core courses in place of the corresponding 400-level computer science courses, as part of the undergraduate degree requirements. That is, students will have to register for two of the following courses, CS 540, CS 571, CS 580, and CS 583, in place of the corresponding 400-level courses.
3. Students will complete all M.S. in Information Systems core courses and will apply the two courses from item 2 towards the M.S. in Information Systems elective requirements. Note: Students who complete CS 571 in item 2 will be waived from INF 601.

Degrees Conferral

Students in the B.S. in Computer Science/Accelerated M.S. in Information Systems program may apply to have the B.S. in Computer Science degree conferred during the semester in which they expect to complete the B.S. in Computer Science requirements. At the completion of the M.S. in Information Systems requirements, a master's degree will be granted.

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Software Engineering

Students in the B.S. in Computer Science program may apply to have the corresponding

Degree Requirements

1. Students have to complete 144 credit hours that satisfy both the requirements for the B.S. in Computer Science program and those for the M.S. in Software Engineering program, with 6 credit hours overlap.

2. Students will register for 6 credit hours of 500-level computer science core courses in place of the corresponding 400-level computer science courses, as part of the undergraduate degree requirements. That is, students will have to register for two of the following courses, CS 540, CS 571, CS 580, CS 583, in place of the corresponding 400-level courses.

3. Students will complete all M.S. in Software Engineering core courses and will apply two courses from item 2 towards the M.S. in Software Engineering elective requirements.

Degrees Conferral

Students in the B.S. in Computer Science/Accelerated M.S. in Software Engineering program may apply to have the B.S. in Computer Science degree conferred during the semester in which they expect to complete the B.S. in Computer Science requirements. At the completion of the M.S. in Software Engineering requirements, a master's degree will be granted.

Ph.D. Study in Information and Software Engineering

Doctoral study in information systems and software engineering is available through the Ph.D. in Information Technology program, which offers advanced courses in these disciplines. The doctoral program allows the student to take a broad range of courses and research options. The program is described in the information technology section immediately following. Students can specialize in various areas, including information systems, software engineering, and computer science. Students can also pursue the Ph.D. in Computer Science jointly offered by the Computer Science, and Information and Software Engineering Departments.

Interdisciplinary Programs

Information Technology, B.S.

The B.S. in Information Technology degree program emphasizes the interdisciplinary nature of IT through the design of a set of IT concentration-related courses that address the broader issues of IT in addition to presenting the capability of the technology itself. Because of its heavy reliance on courses offered by departments across the School of Information Technology and Engineering, the B.S. in Information Technology program is managed by the IT&E Dean's Office. Additionally, the interdisciplinary nature of the program requires that faculty from across IT&E, as well as across the university, serve as academic advisors and mentors for students.

The objectives of the B.S. in Information Technology program are to provide students with the following:

1. The fundamental knowledge regarding concepts, tools, methods and methodologies of IT, including the opportunity to learn appropriate conceptual and computational tools essential for a successful career.

2. A solid foundation in a chosen interest area while enabling them to achieve depth of knowledge of IT associated with this chosen interest area.

3. Skills for effective written and oral communication with both technical and nontechnical people in the information technology field and in the chosen area of interest, as well as skills and strategies for facilitating group projects and activities.

4. Working knowledge of leading-edge technologies and advanced systems through computer laboratory courses as well as direct interaction with industry through internships and cooperative education experience.

5. Preparation for graduate studies in fields such as information systems, telecommunications, and related information technology areas.

6. An appreciation for the global impact of information technology on society, and an understanding of the ethical and social responsibilities of IT professionals.

The B.S. in Information Technology degree program aims to meet these existing and emerging needs of the information technology industry by educating new IT workers in current principles and practices in information technology and their applications. The B.S. in Information Technology graduate is one who is versed in the technical aspects of IT, but whose role in the modern enterprise will focus on the use and management of IT resources rather than on the development of leading-edge intellectual property. Graduates fill jobs that focus on the application of IT in an increasing number of emerging subdisciplines, including web development, computer graphics, information systems, telecommunications, network administration, and information security.

Admission Requirements

A student who meets the university's general eligibility requirements may apply to the B.S. in Information Technology program. Admission is based on the appropriateness of the student's academic objectives and the likelihood of the student benefiting from the program. There are no additional admission criteria to the IT program above those required by other programs at George Mason University, but preference is given to students who have four years of high school mathematics that include pre-calculus.

The IT program can be successfully completed in eight full-time semesters with an average of 15 credit hours each semester as shown in the sample schedule below. Since many of these students are likely to be employed full-time, it is expected that most of the students will pursue the degree on
a part-time basis. The 120-credit hour degree requirement consists of George Mason University general education requirements, IT core and major related courses, and courses required for the chosen IT concentration area. At least 30 semester hours toward the B.S. in Information Technology degree must be earned at George Mason University, and at least 45-credit hours of the degree requirements must be level 300 or above. The B.S. in Information Technology degree program will be administered from George Mason University’s Prince William Campus.

Degree Requirements

Students pursuing the B.S. in Information Technology major must complete requirements for at least one of the following two IT concentration areas: computer graphics and web development; and information security and network administration. The computer graphics and web development concentration requirements are selected from prescribed lists of database, web development, and computer graphics courses. The information security and network administration concentration requirements are selected from prescribed lists of information security, network administration, and telecommunications courses. Prescribed lists for both concentrations are available in the IT&E Student Services Office.

Students following the computer graphics and web development concentration have the following collection of marketable knowledge and skills:

- Computer graphics, data visualization, and data presentation.
- Web site-driven database design, implementation, and maintenance, with the concepts, syntax, and applications of the Java programming language.
- Mainstream Internet technologies, including web page programming, web site design, graphic design, good web interface design, Java scripting using Active Server Pages, and web/relational database integration and Internet security issues.
- Design, implementation, maintenance, and administration of database-driven web site technology.
- Relational database management systems and two or more scripting languages and their uses.
- Database management, network protocols and architectures, operating systems, web-based information systems, information systems analysis and design, and intelligent decision support systems.

Students completing the computer graphics and web development concentration find employment in industry and government as database programmers, network administrators, web programmers, web site administrators, and e-business application programmers.

Students following the information security and network administration concentration have the following collection of marketable knowledge and skills:

- Support, design, planning, and implementation of computer networks.
- Configuration, administration, design, planning, and deployment of secure networks.
- Strong conceptual skills in modern telecommunications systems, both at the hardware and software levels.
- Business aspects of the telecommunications industry.

- Database management, network protocols and architectures, operating systems, web-based information systems, and information systems analysis and design.

Companies and organizations in private and public sectors of our economy have networked systems, often with visibility on the Internet. Students completing the information security and network administration concentration find positions in the IT departments of large and small organizations, vendors of security products and services, and consulting companies. The graduate will be able to bridge the gap between engineering project teams, management, and clients. This leads to positions in areas such as marketing of telecommunications products and services, project planning and product design, participation in engineering project teams, and customer support. Because of the acute shortage of skilled professionals in this area, there is likelihood of scholarship opportunities for undergraduate students and strong demand on graduation. Advanced degrees in telecommunications, business, and other disciplines are also available to the graduate.

IT Foundation, Core, and Concentration Requirements

In addition to university general education [GE] requirements, including humanities and social sciences as well as mathematics and basic sciences requirements, the B.S. in Information Technology program requires IT foundation, core, and concentration courses as described below. Each concentration includes a six-hour capstone design project. It is expected that the student will complete the capstone design project over a period of two consecutive semesters.

1. All B.S. in Information Technology majors must complete the following foundation courses:
   - IT 101 Introduction to Information Technology (3 credits)
   - IT 103 [GE] Introduction to Computing (3 credits)
   - IT 108 Programming Fundamentals (3 credits)
   - IT 212 How Computers Work (3 credits)
   - IT 250/STAT 250 Introductory Statistics I (3 credits)

2. All B.S. in Information Technology majors must complete the following core courses:
   - IT 213 Multimedia and Computer Graphics (3 credits)
   - IT 214 Database Fundamentals (3 credits)
   - IT 221 Introduction to Information Security Technologies
   - IT 341 Network and Operating System Essentials (3 credits)
   - IT 443 IT Resources Planning (3 credits)
   - CS 305 Law and Ethics for the Computing Professional (3 credits)
   - MSOM 302 Managing Information (3 credits)
   - MSOM 303 Marketing in a Digital World (3 credits)
   - IT/TCOM 300 Introduction to Telecommunications (3 credits)

3. All B.S. in Information Technology majors must complete a two-semester sequence of approved capstone design courses:
   - IT 492 Synthesis I (3 credits)
   - IT 493 Synthesis II (3 credits)
   - a 1 credit IT seminar.

4. All B.S. in Information Technology majors must complete a total of at least 15 semester hours of IT concentration courses from the three categories of courses listed under the student’s selected IT concentration area. The student must select at least one of these five courses from each of the three categories of courses listed under the
selected concentration in the advising materials available from the IT&E Student Services Office.

Sample Schedule

<table>
<thead>
<tr>
<th>Semester</th>
<th>Courses</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>First Semester</strong></td>
<td>IT 101 Introduction to Information Technology                         3</td>
</tr>
<tr>
<td></td>
<td>IT 103 Introduction to Computing                                        3</td>
</tr>
<tr>
<td></td>
<td>ENGL 101 Composition                                                    3</td>
</tr>
<tr>
<td></td>
<td>HIST 100 History of Western Civilization                                3</td>
</tr>
<tr>
<td></td>
<td>MATH 108 Introductory Calculus with Business Applications               3</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td>15</td>
</tr>
<tr>
<td><strong>Second Semester</strong></td>
<td>IT 108 Programming Fundamentals                                          3</td>
</tr>
<tr>
<td></td>
<td>IT 250/STAT 250 Introductory Statistics                                 3</td>
</tr>
<tr>
<td></td>
<td>Natural science with lab                                               4</td>
</tr>
<tr>
<td></td>
<td>COMM 100 Oral Communication                                             3</td>
</tr>
<tr>
<td></td>
<td>Literature                                                             3</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td>16</td>
</tr>
<tr>
<td><strong>Third Semester</strong></td>
<td>IT 212 How Computers Work                                              3</td>
</tr>
<tr>
<td></td>
<td>IT 214 Database Fundamentals                                            3</td>
</tr>
<tr>
<td></td>
<td>MATH 125 Discrete Mathematics I                                         3</td>
</tr>
<tr>
<td></td>
<td>Natural science with lab                                               4</td>
</tr>
<tr>
<td></td>
<td>Social/behavioral science elective                                      3</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td>15</td>
</tr>
<tr>
<td><strong>Fourth Semester</strong></td>
<td>IT 215 Multimedia and Computer Graphics                                 3</td>
</tr>
<tr>
<td></td>
<td>IT 221 Introduction to Information Security Technologies                3</td>
</tr>
<tr>
<td></td>
<td>HIST 120 U.S. History general education                                 3</td>
</tr>
<tr>
<td></td>
<td>Science with lab                                                       3</td>
</tr>
<tr>
<td></td>
<td>Fine arts elective                                                     3</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td>16</td>
</tr>
<tr>
<td><strong>Fifth Semester</strong></td>
<td>MSOM 302 Managing Information                                           3</td>
</tr>
<tr>
<td></td>
<td>MATH 111 Linear Mathematical Modeling                                   3</td>
</tr>
<tr>
<td></td>
<td>TCOM 300 Introduction to Telecommunications                              3</td>
</tr>
<tr>
<td></td>
<td>ENGL 302 Advanced Composition                                          3</td>
</tr>
<tr>
<td></td>
<td>Elective                                                               3</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td>15</td>
</tr>
<tr>
<td><strong>Sixth Semester</strong></td>
<td>CS 305 Law and Ethics for Computing Professionals                       3</td>
</tr>
<tr>
<td></td>
<td>MSOM 303 Marketing in a Digital World                                   3</td>
</tr>
<tr>
<td></td>
<td>IT networking core course                                              3</td>
</tr>
<tr>
<td></td>
<td>IT concentration related requirement                                     3</td>
</tr>
<tr>
<td></td>
<td>Elective                                                               3</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td>15</td>
</tr>
<tr>
<td><strong>Seventh Semester</strong></td>
<td>IT resources planning requirement                                       3</td>
</tr>
<tr>
<td></td>
<td>IT global understanding requirement                                      3</td>
</tr>
<tr>
<td></td>
<td>IT seminar                                                             1</td>
</tr>
<tr>
<td></td>
<td>IT 492 Synthesis I                                                     3</td>
</tr>
<tr>
<td></td>
<td>IT concentration related requirement                                    3</td>
</tr>
<tr>
<td></td>
<td>IT concentration related requirement                                    3</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td>16</td>
</tr>
<tr>
<td><strong>Eighth Semester</strong></td>
<td>IT 493 Synthesis II                                                     3</td>
</tr>
<tr>
<td></td>
<td>IT concentration related requirement                                     3</td>
</tr>
<tr>
<td></td>
<td>Elective                                                               3</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
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</tr>
</tbody>
</table>

**E-commerce, M.S.**

Web: ite.gmu.edu/msecomm/
Phone: (703) 993-1673

The M.S. in E-commerce degree is managed by the School of Information Technology and Engineering and is a joint degree with the School of Management, School of Public Policy, School of Law, College of Arts and Sciences, and the College of Nursing and Health Science. The program is designed to prepare graduates with the depth and breadth they need to take advantage of electronic commerce opportunities in commercial and enterprise management opportunities in the new economy. They will be able to understand management, public policy, and information technology aspects, and effectively integrate these in developing electronic commerce solutions in a wide variety of specialized applications from electronic government, to electronic banking, to telehealth. More importantly, they will respond to the demand for professionals to work in a wide variety of capacities in digital age organizations in Northern Virginia and elsewhere. This program is composed of a few new courses, with the designation EC in the "Course Descriptions" chapter of this catalog, as well as existing courses as indicated in the "Degree Requirements" section that follows.

**Format**

The degree program requires 36 credits be completed. All students complete an e-commerce core, the *breadth requirement*, comprising six courses from four interdisciplinary foundation disciplines totaling 18 credits. Following completion of these core courses, students take specialized application courses, for a total of 15 credits, in one of four chosen fields of concentration: information technology, business and economics, public policy and law, and health care and services industry. Students from all concentrations will deepen their theoretical and practical knowledge through courses in the concentration, the *depth requirement*, building upon a common core of knowledge.

One of the unique features of the degree program is an electronic commerce capstone project course (3 credits), taken by all students at the completion of all their coursework. The capstone project is an interdisciplinary course that reinforces and integrates material covered in core and concentration courses. It allows students to pursue a mixed team-based, practical project related to e-commerce in an identified area of opportunity. This capstone project serves to give students an integrative experience in response to digital age challenges and opportunities. It also allows them to work with other students from a diverse set of backgrounds.

**Admission Requirements**

Applications to the program must be submitted to the Graduate Admissions Office of the School of Information Technology and Engineering. Applicants must 1) fulfill all admission requirements for graduate study at George Mason University, 2) hold a baccalaureate degree with a satisfactory GPA from an accredited college or university, 3) demonstrate

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programming experience in at least one block-structured programming language (e.g., Java, C, C++, Visual Basic, Pascal) or in a scripting language (e.g., Javascript) used in web design. This experience can be obtained either through courses and/or work experience. Course descriptions and syllabi, as well as copies of transcripts and grades obtained, must be provided. If only work experience is available, a statement describing the work experience in programming must be submitted. This statement should include: name of organization, type of programs the applicant was responsible for developing, years of experience in each job, and programming languages used.

Applicants must submit transcripts of all postsecondary education; a self-assessment form (normally included in the application package or available online); a brief (one-to-two-page) statement of educational and work experience; three letters of recommendation; and official reports of either the GRE, the Graduate Management Admission Test (GMAT), or the Law School Admissions Test (LSAT). TOEFL scores are required from non-native English speakers who did not use English as the official language in their college education.

Degree Requirements
In addition to meeting the general requirements that apply to all master’s degrees at the university, completion of this program requires the following:

1. Eighteen credits comprising the following 3-credit core courses:
   - EC 511 E-commerce Basic IT Infrastructure
   - EC 512 E-commerce Software Services
   - EC 521/MBA 603 Managerial Economics and Decisions of the Firm
   - EC 522/MBA 613 Financial Reporting and Decision Making
   - EC 531 Law and Public Policy in E-commerce
   - EC 541 Integrative Case Studies in Electronic Commerce

2. Fifteen credits in one of the four concentrations: information technology, business and economics, public policy and law, and health care and services industry. The courses that can be used to fulfill these requirements are described below.

3. Three credits in EC 600 Group Project in Electronic Commerce.

Information Technology Concentration
Students who select this concentration must take 15 credits, which must include the following three 3-credit courses: 1) CS 650 Database Engineering or INFS 614 Database Management, 2) CS 656 Computer Communications and Networking or ECE 542 Computer Network Architectures and Protocols, and 3) INFS 762 Information Systems Security. In addition to these three courses, students must take at least one course from List A following and at most one course from Lists B, C, or D, to complete the five courses required for this concentration.

Business and Economics Concentration
Students must take MBA 623 Marketing Management and select four additional courses from the following:

- MBA 725 Leadership
- MBA 712 Project and Cost Management
- MBA 731 Business Systems Development
- MBA 732 Knowledge Management
- MBA 733 Business Data Communications

MBA 734 Electronic Commerce
MBA 735 Systems Thinking and Business Simulation
MBA 736 Managing Digital Business

Public Policy and Law Concentration
Students must take 15 credits by choosing, in consultation with their advisor, a coherent set of courses from List C below.

Health Care and Services Industry Concentration
Students must take 15 credits (12 required and 3 elective credits). The elective course is selected, in consultation with the advisor, from List D below. The required courses are: 1) HSCI 707 Health Care Management Policy, Law, and Ethics; 2) HSCI 709 Health/Medical Informatics for Health System Managers; 3) HSCI 720 Health Databases and Data Integration; and 4) HSCI 722 Electronic Commerce and Online Marketing of Health Services.

HSCI 678 Introduction to the U.S. Health System (3 credits) is required, in addition to the 15-credit application courses, if students do not have recent relevant working experience in the U.S. health system. Determination is made at the time of program admission.

List of Courses Used in the Concentrations
A description of these courses can be found in the “Course Descriptions” chapter of this catalog. Students must satisfy the prerequisites for these courses or obtain permission from the instructor.

List A (Information Technology): CS 571, 671, 672, 673, 707, 750/INFT 750, CS 755, ECE 646, 741; INFS 601, 623, 740, 755, 760, 765, 766, 767, IT 809; OR 635; SWE 619/CS 619, SWE 620/CS 620, SWE 621/CS 621, SWE 632/CS 632, SWE 642; SYST 781/INFS 781/STAT 781. CS 571 and INFS 601 are mutually exclusive. Only one of them can be used for the M.S. in E-commerce program.


List D (Health Care and Services Industry): HSCI 678, 714, 703, 704, 705, 706, 708, 712, 715.

Enterprise Engineering and Policy, M.S.
E-mail: spp@gmu.edu
Phone: (703) 993-8099

The Enterprise Engineering and Policy (EEP) M.S. degree program provides a technology degree for those interested in designing, integrating, and managing technology-enabled private and public organizations using modern enterprise solutions. The program is focused on teaching students how to design, integrate, manage, and optimize the extended enterprise, which includes customers, suppliers, and other organizational claimants. It emphasizes the impact that enterprise integration is having on the way organizations manage their business processes. This includes the implementation and tuning of enterprise resource planning systems, business-to-business extensions (including customer- and supplier-facing solutions), and other standard software solutions.

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The EEP program is designed to provide students with significant experience in working with enterprise solutions in a problem-solving environment. This program is focused not on software development or engineering, but rather on integrating and implementing commercial software solutions in public and private organizations. It is focused on the engineering implementation consulting aspects of standard replicable software from major enterprise vendors, that is, enterprise consulting at the applications level.

Understanding the distinction between enterprise engineering and proprietary system development is critical. Enterprise engineering focuses on the configuration and integration of commercial software for replicable business processes. Proprietary design and development focuses on building new nonreplicable systems to meet particular needs.

The School of Information Technology and Engineering (IT&E) and Public Policy (SPP) jointly administer the EEP Program.

Admission Requirements
Courses are open to students who hold a baccalaureate degree from an accredited college or university, and who hold a B.S. or B.A. degree in any engineering, math, science, computer science, business (with a quantitative background), economics, or other analytic-related discipline. The following is required: a background in managerial accounting; proficiency in a procedural or object-oriented programming language; database familiarity (at least Access); and college-level mathematics through linear algebra, multivariate calculus, and statistics. Depending on their prior background, some applicants may be required to complete 3 to 6 credit hours of preliminary course work before enrolling in any of the core courses or specialty courses in the program. A minimum 3.000 undergraduate GPA is required.

Complete applications for both fall and spring semesters are reviewed on a rolling basis, with late applications considered on a space-available basis. To enter the program as a degree candidate, a student must meet the following minimum requirements:

1. Graduate application with application fee (no fee waivers).
2. A two-to-three page written statement of the student’s goals and interest in the program.
3. A current resume.
4. A bachelor’s degree from an accredited institution with a preferred GPA of 3.000 or better (on a 4.0 scale) in the last 60 semester hours of baccalaureate study. Submit two official transcripts of all university work completed. International students are also required to submit an evaluation and/or translation of all foreign-earned degrees.
5. GRE, GMAT, or MAT scores are optional.
6. TOEFL scores (for international applicants) – with a minimum score of 575 (paper-based) or 230 (computer-based). Students may also be required to be tested by the English Language Institute.
7. Two letters of recommendation. At least one recommendation should be from an individual who is qualified to attest to the candidate’s academic potential.

Students with academic deficiencies may be accepted conditionally pending removal of the deficiencies. Courses taken to remove admission deficiencies extend the minimum requirements for the degree. Students whose undergraduate training was in the quantitative social sciences or quantitatively oriented business administration may be allowed to complete a portion of the mathematics prerequisite by taking SYST 500.

All decisions related to the student’s course of study must be approved by his or her advisor, with consent of the director of the EEP program.

Degree Requirements
The program consists of 33 graduate credits.

Required Core Courses .................................................. 15
EEP 601/PUBP 771/SYST 691 Introduction to Enterprise Engineering: Engineering and Policy .......................... 3
EEP 602/PUBP772/SYST 692 Decision Support for Enterprise Integration .................................................. 3
INF5 614 Database Management ....................................... 3
ITRN 772 International Telecommunications ................... 3
or ECE 540 Modern Telecommunications ..................... 3
SYST 530 Systems Management and Evaluation ................ 3
or SYST 512 Systems Engineering for Design and Development ............................... 3

Concentration Modules .................................................. 12
The student selects four courses in one of the following three concentration areas, for at least 12 credit hours:
1. E-Business
2. Supply Chain Integration and Management
3. Business Intelligence

Project ................................................................. 6
All students are required to complete a 6-credit project course. This course will require that a student work with a corporation on an enterprise project. The master’s project reflects significant independent effort. The work is conducted under the guidance of a faculty advisor, and the final written and oral project defense are approved by a three-member faculty committee and submitted to the EEP director.

Total Credits .......................................................... 33

Engineer Degree in Information Technology
The Engineer Degree in Information Technology allows a student to combine the advanced course work of the Ph.D. degree in Information Technology with an applied project. It is suitable for students seeking specialized training who do not wish to complete an extended research project.

Admission Requirements
Admission requirements for the Engineer degree are the same as for the Ph.D. in Information Technology.

Plan of Study
The Engineer program is made up of specialized course work followed by completion of an applied project summarized in a project report.

Under the guidance of the supervisory committee, the student prepares a tentative plan of study. The plan lists the intended courses and their expected timing. The plan should also contain a tentative subject for the applied project.
Specialized Course Work
Students must include in the plan of study a well-defined advanced concentration area. Successful completion of this requirement should enable the student to do applied research in a significant contemporary area in information technology.

The supervisory committee and the associate dean for graduate studies and research of the School of Information Technology and Engineering must approve a plan of study. These approvals must occur before a student completes the courses in the area of concentration. There is no guarantee that a course taken before this approval will be accepted.

Students must take 30 credit hours of graduate-level course work. A GPA of 3.500 is required in these credit hours. Students may waive up to 6 credit hours of course work by passing two of the qualifying examinations from any of the Ph.D. programs offered by the School of Information Technology and Engineering (i.e., 3 credit hours per qualifying examination).

The plan of study may include at most 3 credit hours of directed reading course work. At least 12 of the credit hours must be in courses numbered 700 or higher, and these 12 credit hours cannot include directed-reading, project, or thesis courses.

Courses that cannot be included in any plan of study are any INFS 500-level courses; IT 500 and 599; OR 540; STAT 510, 512, and 530; and SYST 500. The associate dean must approve exceptions to any of these rules in advance.

Supervisory Committee
Upon admission to the program, a student is assigned a temporary advisor. The student is responsible for working with the temporary advisor until the student selects a project director and a supervisory committee. It is recommended that a student form a supervisory committee as soon as feasible.

The supervisory committee includes the project director plus at least two additional members. The committee must contain at least two graduate faculty members from IT&E. It is strongly recommended that the committee include at least one person from outside the university who is knowledgeable in the subject area of the project. The supervisory committee supervises the project proposal presentation and the project defense.

Project Proposal Presentation
Near the end of the course work each student in the Engineer program prepares a written project proposal, which is presented to the supervisory committee. The student may enroll in IT 996 Engineer Project Proposal to complete this effort. During the term the student expects to present the project proposal to the committee, the student should enroll in IT 991 Engineer Project Presentations. After successfully completing this requirement, the student is formally admitted as a candidate for the Engineer degree. The application for candidacy is submitted to the Office of the Dean on a standard form.

Project and Final Defense
With concurrence of the supervisory committee, the student proceeds with the project research, during which time the student must continuously enroll in IT 997 Engineer Project. The student must complete a minimum of 12 credits from among IT 991, 996, and 997, with a minimum of 6 credits of IT 997. When the central portions of the project work have been completed to the point that the student is able to describe the contributions of the project effort, a candidate submits the written project report to the supervisory committee. Once the committee believes the student is ready, a final public oral defense may be scheduled; the application for the defense must be submitted to the associate dean at least one month in advance of the defense in order to have an announcement posted for at least two weeks.

Following a satisfactory evaluation of the oral defense of the project by the supervisory committee, the student must submit, with supervision from the project director, a final project that represents a definitive contribution to applied knowledge in information technology. This document must meet format guidelines specified by the Guide for Preparing Graduate Theses, Dissertations, and Projects.

If the candidate successfully defends the project, the supervisory committee recommends that the final form of the project be completed, and that the faculty of IT&E and the graduate faculty of George Mason University accept the candidate for the Engineer degree.

Information Technology, Ph.D.
The general doctoral requirements of George Mason University apply to this program.

When the term information technology (IT) and engineering is used at George Mason University to describe the school and its activities, it is intended to mean information technology and the branches of engineering most closely associated with information use and management. These aspects of technology are emphasized in this geographic region, and the relevance of the IT doctoral program has grown with the increasing dependence of the nation's commerce on the effective use of information. Our focus on the science and technology of information processing complements and enhances the more traditional approaches to engineering that are more strongly based on the physical and material sciences.

Course work
The information technology doctoral program offers courses designated IT in the "Course Descriptions" section of this catalog.

Admission Requirements
Doctoral students in information technology are selected on the basis of scholarship and potential from among applicants with appropriate degrees from institutions of high standing. Generally, a master's degree in an information technology-related area, such as engineering, computer science, operations research, statistics, mathematics, physical sciences, economics, and psychology, is required for admission to the program.

In addition, well-qualified students without an appropriate master's degree may apply directly to the Ph.D. program. Such students will have to complete the equivalent of an appropriate George Mason University master's degree as part of their program of study. In some cases it may be possible to obtain transfer credit for graduate course work taken elsewhere, subject to meeting the requirements for transfer credit imposed by the university. (The description here assumes that a student has already received an appropriate master's degree.)
An undergraduate GPA of B (3.000 on a 4.000 scale) and a graduate GPA of 3.500 on a 4.000 scale are basic requirements for applicants to the program. The admission process involves submitting the application for admission, undergraduate and graduate transcripts from previous colleges and universities attended, GRE test results when available, three letters of reference, a resume and a short statement of career goals and aspirations, and a self-assessment of past background. Translations of international credentials must be provided if they are not in English; in some cases, applicants will be required to have documents evaluated by an external agency. All of an applicant's background is examined before an admission decision is made.

To ensure a common ground of fundamentals, students should have a background in topics such as calculus, differential equations, linear algebra, discrete structures, probability, and statistics. In addition, students entering the doctoral program in information technology must have a sound working knowledge in computing as demonstrated by examples of programs or applications developed and tested in at least one high-level programming language environment. Because much of the course work within this program requires computational proficiency, experience with a variety of languages and computer hardware is useful, as is an understanding of computer architecture. Highly qualified students who do not present evidence of appropriate course work for the program may be admitted and then required to take appropriate articulation courses.

### Plan of Study

The Ph.D. in Information Technology program is made up of a breadth requirement (assessed via the qualifying examinations) and specialized course work (assessed via the comprehensive examination), followed by preparation of a dissertation. Generally, a student will have obtained a master's degree in a field appropriate to information technology, and this master's program typically prepares a student for the qualifying examinations.

Under the guidance of the doctoral supervisory committee, the student prepares a tentative plan of study. The plan lists the intended courses and their expected timing. The plan should also contain the intended dates of the qualifying and comprehensive examinations, and a tentative subject of the dissertation research.

### Qualifying Examinations

To satisfy the breadth requirement of the Ph.D. degree, each student must pass a set of qualifying examinations designed to test a student's fundamental knowledge. These examinations correspond to the individual master's programs in the School of Information Technology and Engineering. For each such program, at least two written exams will be offered, with each exam being based on a reading list that corresponds roughly to one 3-credit course (a student need not take the corresponding course). These exams are offered twice a year in specified locations on campus, typically near the beginning of the fall and spring semesters. Each exam is allocated 2 hours and 45 minutes. The examinations are graded on a pass/fail basis.

Each student must take a set of four exams from three different degree programs within two years of enrolling in the program, unless fewer than 24 credit hours of course work have been completed in that time. Otherwise, the exams must be taken no later than the first opportunity following the completion of 24 credit hours. (If a student enters the program without a master's degree, these time limits are measured from the date when the student completes the equivalent of an appropriate George Mason University master's degree.)

A student has two chances to pass the qualifying exams:
- A student who passes all four exams in the first attempt passes the qualifying exam.
- A student who passes three of the four exams in the first attempt must either retake and pass the failed exam within one year, or pass an exam in a new subject within one year.
- A student who passes less than three exams in the first attempt must retake and pass an entire set of 4 exams within one year.

After two unsuccessful attempts, a student is dismissed from the Ph.D. program.

### Advanced Emphasis Requirement

Students must include in the plan of study a well-defined advanced concentration area. Successful completion of this requirement should enable the student to do basic or applied research in a significant contemporary area in information technology.

The doctoral supervisory committee and the associate dean for graduate studies and research of IT&E must approve a plan of study. These approvals must occur before a student completes the courses in the area of concentration. There is no guarantee that courses taken before this approval will be accepted.

Students must take a set of 24 credit hours of graduate-level coursework that are independent of the qualifying exams taken by the student. (That is, if a student takes a qualifying exam related to OR 541, then OR 541 cannot be counted as 3 credit hours of specialty course work.) A GPA of 3.500 is required in these 24 credit hours. The plan of study may include at most 3 credit hours of directed reading course work. At least 12 of the 24 credit hours must be in courses numbered 700 or higher, and these 12 credit hours cannot include directed-reading, project, or thesis courses. The courses listed below cannot be included in the plan of study.

Courses that cannot be included in any plan of study are any INFS 500-level courses; IT 500 and 599; OR 540; STAT 510, 512, and 530; and SYST 500. Exceptions to any of these rules must be approved in advance by the associate dean.

Each Ph.D. student is allowed to designate an emphasis from among the titles of the M.S. degree programs offered by the School of Information Technology and Engineering.

### Doctoral Supervisory Committee

Upon admission to the program, a student is assigned a temporary advisor. The student is responsible for working with the temporary advisor until the student selects a dissertation director and an advisory committee. The student should select a director and advisory committee as soon after the student's admission as is feasible. This is especially important for students who have completed a considerable amount of graduate work elsewhere.

The doctoral supervisory committee includes the dissertation director plus a faculty member from the student's intended major who is selected by the student to become chair of the doctoral supervisory committee. The chair of the committee need not be the dissertation director, but should be
selected from a list of approved chairs established by the associate dean. The dissertation director must be a member of the George Mason graduate faculty. Other committee members are selected to form a committee of at least four people from the George Mason graduate faculty. At least three of these faculty members must be from IT &E and at least two of the departments of IT &E must be represented on this committee. In addition, industrial representatives and faculty members from departments outside of the school are highly desirable but are not required on the committee. The doctoral supervisory committee administers the comprehensive examination, the dissertation proposal presentation, and the dissertation predefense and defense. Permission for the comprehensive examination and the dissertation defense are requested from the IT &E associate dean on the basis of a written request and plan that has been approved by the supervisory committee.

**Comprehensive Examination**

The comprehensive examination is taken after the student has satisfactorily completed all the course work requirements in the approved plan of study filed by the student. To initiate the exam process, the student meets with the supervisory committee to prepare a memorandum to be forwarded to the associate dean requesting the comprehensive examination and the appointment of an examination committee. The examination committee consists of the doctoral supervisory committee plus any outside examiners considered appropriate. The requesting memorandum lists all course taken by the student that form the plan of study for the Ph.D. The memorandum should also propose a date or dates for the comprehensive examination. This examination is based on all the course work taken by the student, and consists of an oral examination and a written examination of up to 8 hours in length, to be taken at a designated place on campus.

The examining committee determines the specific details of the exam.

The objective of the comprehensive examination is to allow the examining committee to assess the student's readiness to complete doctoral research in an area of concentration. The result of the comprehensive examination is a grade of pass or fail with recommendations for removing any deficiencies.

If a student fails the comprehensive exam, the student may request a re-examination within 60 days of receiving notice of the exam result. The request should be made in writing to the associate dean. The student may request a new exam in a different format, but the request must comply with the rules specified above. The examining committee will decide on the format of the new exam, but the decision may be appealed in writing to the associate dean. If the student fails the re-examination, or does not request a re-examination within 60 days, the student will be dismissed from the Ph.D. program.

**Dissertation Proposal Presentation**

Near the end of the course work, each doctoral student prepares a written dissertation proposal, which is presented to the doctoral supervisory committee. The student may enroll in IT 998 Doctoral Dissertation Proposal to complete this effort. During the term the student expects to present the dissertation proposal to the committee, the student should enroll in IT 990 Dissertation Topic Presentations. After successfully completing this requirement, the student is normally admitted as a candidate for the Ph.D. degree. The application for candidacy is submitted to the associate dean on a standard form.

**Dissertation and Final Defense**

With concurrence of the advisory committee, the student proceeds with the doctoral research, during which time the student must be continuously enrolled in IT 999 Doctoral Dissertation. The student must complete a minimum of 24 credits from among IT 990, 998, and 999, with a minimum of 12 credits of IT 999. When the central portions of the research have been completed to the point that the student is able to describe the original contributions of the dissertation effort, a candidate submits the written dissertation to the supervisory committee and schedules an oral predefense to the committee. The predefense is to be held no sooner than one month after the members of the committee have copies of the dissertation. Once the committee believes the student is ready, a final public oral defense may be scheduled no sooner than one month after the conclusion of the predefense in order to have an announcement posted for at least two weeks.

The entire dissertation committee must be present at the defense, unless an exception is approved by the associate dean in advance of the defense.

Following a satisfactory evaluation of the oral defense of dissertation by the supervisory committee, the student must prepare, with supervision from the dissertation director, a final publishable dissertation that represents a definitive contribution to the knowledge of information technology. This document must meet format guidelines specified by the *Guide for Preparing Graduate Theses, Dissertations, and Projects*.

If the candidate successfully defends the dissertation, the dissertation defense committee recommends that the final form of the dissertation be completed, and that the faculty of IT &E and the graduate faculty of George Mason University accept the candidate for the Ph.D. degree.

If the student fails to successfully defend the dissertation, the student may request a second defense, following the same procedures as for the initial defense. There is no time limit for this request, other than the general time limits for the doctoral degree. An additional predefense is not required, but the student is strongly advised to consult with the committee before scheduling a second defense. If the student fails in the second attempt to defend the dissertation, the student will be dismissed from the Ph.D. program.

**Telecommunications, M.S.**

The M.S. in Telecommunications degree is an innovative, interdisciplinary program that provides a blend of cutting-edge, engineering-oriented courses in such areas as wireless and fiber communications systems, networks, computers, and Internet protocols, combined with courses on telecommunications policy, law, business, international aspects, and other fields. The interdisciplinary program is designed for students who wish to enter the field of telecommunications or who are working in the field and want to advance their knowledge of telecommunications. It concentrates on the practical applications of telecommunications rather than on the theoretical approach and provides a focus on the engineering and information technology aspects of telecom-
communications in combination with the interdisciplinary knowledge offered by some of the courses in the M.A. in Telecommunications program. More than 25 new engineering and information technology courses have been designed specially for the M.S. in Telecommunications program.

A novelty of the program is its modular structure, involving five specialty modules corresponding to areas of concentration. The program offers a mix of 3-credit, full-semester courses for students with 1.5-credit, half-semester courses. This structure allows students to identify more clearly various specialities within telecommunications technology. Students enjoy considerable flexibility because they are able to design their master's programs to fit their technical preferences. A major share of the course material comes from the Electrical and Computer Engineering (ECE) Department and the Systems Engineering and Operations Research (SEOR) Department. Courses offered by the ECE Department are focused on network technologies, such as fiber optics, ATM, and Internet protocols; on network applications, such as networked multicomputer systems, client-server architectures, and network management; and on wireless communications, such as digital communications, satellite communications, mobile communications, PCS, and GPS. In addition to the many new telecommunications courses developed for this program, the ECE Department already offers a number of other graduate courses in communications as part of the graduate electrical and computer engineering program. Those courses may also be taken for credit under the M.S. in Telecommunications program, provided the student has the prerequisite background. Courses related to systems engineering, project management, capacity modeling, and business of telecommunications (e.g., the design and optimization of large, complex communication networks) will be offered by the SEOR Department. Both SEOR fields, systems engineering and operations research, play significant roles in all aspects of the design, operation, and business of telecommunications, and this knowledge is important for students of telecommunications.

The blend of in-depth knowledge of specific elements of telecommunications technology combined with a knowledge of broader issues in telecommunications is increasingly necessary for people who intend to work in a management or decision-making position within the telecommunications industry, telecommunications-related businesses, or government institutions dealing with telecommunications. The M.S. in Telecommunications provides just such a blend.

Course Work
The M.S. in Telecommunications program offers courses designated TCOM in the "Course Descriptions" chapter of this catalog and some of the other disciplines' courses listed below.

Format
The program consists of engineering and technology core courses (TCOM 500, 501, 502, 521); an interdisciplinary group of core courses common with the M.A. in Telecommunications (PUBP 726, LAW 181, and TELE 750); and five specialty modules (areas of concentration).

To earn a master of science degree in telecommunications, students must complete 30 credit hours of course work through a combination of core courses and specialty modules. The core in the M.S. in Telecommunications consists of 15 credits, with the remaining 15 credits being earned in the specialty modules. The specialty modules are sub-areas of telecommunications that provide the necessary depth in the selected areas of concentration. Students are normally expected to take courses from at least two specialty modules. Up to 6 credits from the core program may be carried forward into the specialty modules, thus permitting up to 6 credits of electives to be taken either inside or outside of the prime specialty module(s) chosen by the student. TCOM 501/502 may be carried forward into specialty module 1, 2, or 3 while TCOM 521 may be carried forward into specialty module 4 or 5. Double counting is not permitted, but the courses carried forward into a given module may permit that module's credit hour requirement to be satisfied, thus allowing elective courses to be taken outside of that module. Normally a minimum of 6 credit hours is needed to satisfy one specialty module. Credit for each specialty module can be obtained by taking an appropriate combination of full-semester courses (3 credits) and half-semester courses (1.5 credits). In many instances, a pair of coordinated, half-semester courses (e.g., TCOM 503/513 on fiber optic communications/fiber optic networks and TCOM 507/508 on introduction to satellite communications/advanced satellite communications) exist that permit a student to take either a half-semester course to get an introduction to the field, or a full-semester course for a more complete knowledge of that topic.

Admission Requirements
Courses are open to students who hold B.S. and B.A. degrees from accredited colleges and universities in engineering, math, science, computer science, business (with a quantitative background), economics, and other analytical disciplines, and to students who have equivalent work experience indicating analytical aptitude. Depending on their backgrounds, some applicants may be required to complete 3 to 6 credits of preliminary course work before they are allowed to enroll in any of the core courses or specialty courses in the program. A minimum undergraduate GPA of 3.00 is normally required.

Students may be admitted to the M.S. program, or they may be admitted for nondegree study within the M.S. in Telecommunications program, which allows them to take individual courses. Students in the nondegree program have the option of transferring into the regular program, provided their GPA within the M.S. in Telecommunications program is 3.00 or above. Up to 12 credits earned in nondegree study may be transferred into the regular program.

Degree Requirements
Each student must complete a minimum of 30 graduate credits, with a GPA of 3.00 or better. Students must earn a B (3.00) or above in core courses TCOM 500, 501, 502 and 521. Up to 6 credit hours of a combination of C, C+, or B-grades may be carried within the program from the remaining core courses or from the specialty module courses, provided the overall GPA is 3.00 or better.

The plan of study includes the following:
1. Fifteen credits from the following 18 credit hours of core courses:

   Mandatory courses:
   TCOM 500 Modern Telecommunications (3 credits)
   TCOM 501 Data Communications and Local Area Networks (1.5 credits)

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TCOM 502 Wide Area Networks and Internet (1.5 credits)
TCOM 521 Systems Engineering for Telecommunications Management (3 credits)

Elective courses—6 credit hours selected from the following 9 credit hours:
PUBP 726 Technology Policy and International Strategies (3 credits)
LAW 181 Telecommunications Law and Regulation (3 credits)
TELE 750 Coordinating Seminar (3 credits)

2. A minimum of 15 credits of courses listed below under specialty modules. Students will normally take 15 credits from at least two of the five specialty modules, or, alternatively, they may elect to take all 15 credits from the systems engineering of telecommunications module (module 5). If a student elects to carry forward a core course (TCOM 501/502 and/or TCOM 521) into an appropriate specialty module, he or she will have the option of taking an elective course or taking that module in another module to bring the total number of credits in the specialty module to 15.

A specialty module (group of courses in an area of concentration) can be completed by a combination of full-semester courses and half-semester courses listed under the module, or considered applicable to that module, for a total of at least 6 credits in that module. Some specialty module courses may be in more than one module (e.g. TCOM 509 Internet Protocols, which is both in module 1, network technologies, and module 2, network applications). Half-semester, 1.5-credit hour courses may only be counted in one module, even if they apply to more than one module. Full-semester, 3-credit hour courses may be counted in one module, or split between two modules (e.g. TCOM 551 Digital Communication Systems, which is both in module 1 and 3, may be counted as 3 credit hours in module 1 or module 3, or it may be counted as 1.5 credit hours in both modules 1 and 3). Basic courses in each module have been specially designed for the telecommunications program. These courses do not require completion of prerequisites from other M.S. programs in IT&E. Other courses, which are marked with asterisks, are from other M.S. programs in IT&E and can represent viable options for students who have appropriate prerequisites in some technical areas. Although these courses assume certain prerequisites from their specific M.S. programs, advanced students who already know the prerequisite material can ask for the instructors' permission to enroll in those courses.

Some alternatives to completion of each specialty module by using appropriate combinations of courses not listed under a given module may be admissible subject to prior approval by the program director. In addition, independent study courses and independent reading and research courses may be taken within all five modules. These courses will permit students to make use of their work experiences to undertake nonclassroom courses for credit within the program.

A capstone project course, TCOM 699, is required under the systems engineering of telecommunications module (module 5) should the student elect to take all 15 credits in this specialty module. If a student is taking only 7.5 credits in modules 4 or 5, he or she has the option of taking TCOM 699, but the course is not required unless the student takes all 15 credits in module 5.

Specialty Modules
(Courses marked with asterisks are courses from other graduate programs in IT&E that can be taken for credit in this program if the student has the appropriate prerequisites.)

Module 1 Network Technologies
TCOM 503, 504, 509, 510, 513, 519, 548, 551, 556; ECE 513*, 542*, 565*, 642*, 643*; CS 571*, 656*, 756*

Module 2 Network Applications
TCOM 505, 509, 510, 513, 540, 541, 548, 555, 556; ECE 646*, CS 656*, 756*; INFS 612*, 640*, 762*

Module 3 Wireless Communications
TCOM 506, 507, 508, 516, 518, 551, 552; ECE 739*, 763*, 732*, 741*

Module 4 Modeling of Telecommunications Systems
TCOM 540, 541, 542, 545, 546, 547, 548, 699; OR 641*, 642*, 644*

Module 5 Systems Engineering of Telecommunications
(This module can be taken as one of two specialty modules, or as one 15-credit module. No more than two SYST courses can be taken within this module.)
TCOM 520, 546, 548, 699; SYST 510*, 513*, 520*, 542*; INFS 612*, 614*, 640*; ITRN 772*

B.S./Accelerated M.S. in Telecommunications Programs
The M.S. in Telecommunications degree may currently be taken as part of an accelerated B.S. in Systems Engineering/M.S. in Telecommunications. Other accelerated programs with other undergraduate degrees are currently being developed. The B.S. in Systems Engineering/Accelerated M.S. in Telecommunications degree is described below.

B.S. in Systems Engineering/Accelerated M.S. in Telecommunications
Students who are in the B.S. in Systems Engineering program may elect to enter an accelerated M.S. in Telecommunications program while they are undergraduate students. The B.S. in Systems Engineering/Accelerated M.S. in Telecommunications program is designed for qualified undergraduate students in the systems engineering program who would like to proceed directly into the M.S. in Telecommunications program, completing the two degrees with 144 credit hours. Students in the accelerated program must satisfy both the requirements for the B.S. in Systems Engineering undergraduate degree (a total of 120 credit hours) and the M.S. in Telecommunications graduate degree (a total of 30 credit hours), with 6 credit hours of overlap permitted between the two degrees. The M.S. in Telecommunications degree would therefore be on an accelerated track, 6 credits being taken while an undergraduate and 24 credits as a graduate student. The 6 credit hours of telecommunications courses taken while a systems engineering undergraduate must be selected from those given in the table at the end of this description.

Applicants for the accelerated program must be George Mason University undergraduate students who have preferably chosen to take the systems engineering of telecommunications elective sequence. Other students will be considered on their individual merit. Students may apply for the B.S. in Systems Engineering/Accelerated M.S. in Telecommunications program during a semester after which they will have

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completed 90 or more credit hours as an undergraduate. Students must have an overall GPA of at least 3.250 to apply for the program. Students who have not yet finished 90 credit hours may be accepted provisionally subject to satisfactory completion of 90 credit hours. Criteria for admission into the B.S. in Systems Engineering/Accelerated M.S. in Telecommunications program are identical to criteria for admission into the M.S. in Telecommunications program, with the exception that students do not need to have completed an undergraduate degree prior to admission into the accelerated program.

Students who have been accepted into the B.S. in Systems Engineering/Accelerated M.S. in Telecommunications program must maintain a minimum 3.250 GPA in the undergraduate segment of the accelerated program and a 3.000 GPA in the graduate segment of the accelerated program. That is, after a student has been accepted into the B.S. in Systems Engineering/Accelerated M.S. in Telecommunications program, the student must maintain a 3.250 average until they have satisfied all of the requirements for the B.S. in Systems Engineering undergraduate degree. They must then maintain a minimum 3.000 average in the graduate segment of the accelerated program. Should their GPA fall below 3.000 while a graduate student, they will be dropped from the accelerated program to the regular program and those graduate telecommunications courses taken and applied to their B.S. program will no longer be admissible for their M.S. in Telecommunications degree. If a student is dropped from the accelerated program and has taken and applied telecommunications core courses towards their B.S. degree, then the student does not need to repeat those courses for the regular M.S. in Telecommunications program if they obtained a grade B or above in those courses. However, they will need to take elective courses in their place to satisfy the 30-credit requirement for the regular M.S. in Telecommunications degree. In a similar manner, if a student is dropped from the accelerated program and has taken and applied noncore telecommunications courses towards their B.S. degree, then the student does not need to repeat those courses for the regular M.S. in Telecommunications program if they obtained a C grade or above for those courses. Elective courses will be required to replace telecommunications courses already taken and dropped from the program. NOTE: up to 6 credit hours of a combination of C, C+, or B- grades may be carried in portions of the regular telecommunications program. A minimum GPA of 3.000 is required to graduate with an M.S. in Telecommunications degree.

Students must complete all requirements for the B.S. in Systems Engineering degree. Students in the B.S. in Systems Engineering/Accelerated M.S. in Telecommunications program may apply to have the B.S. in Systems Engineering degree conferred during the semester in which they expect to complete their B.S. in Systems Engineering requirements. The M.S. in Telecommunications degree is granted upon completion of all requirements for the accelerated M.S. in Telecommunications degree.

The telecommunications courses that may be taken as a systems engineering undergraduate student as part of the B.S. in Systems Engineering/Accelerated M.S. in Telecommunications program are: TCOM 500, 501, 502, 503, 504, 505, 507, 508, 509, 510, 513, and 521.

Telecommunications Certificates
Three, 15-credit hour certificates may be taken within the M.S. in Telecommunications program. Students are allowed to take these certificates as stand-alone items or as part of their degree program. For the former, they will be required to enroll in a certificate program; for the latter, since they are already enrolled in a degree program, they need only apply for the appropriate certificate after they have satisfied its requirements. The courses within the certificates are drawn directly from the M.S. in Telecommunications program. If a student initially signs up for only a certificate program, it will be possible to transfer into the degree program later, with up to 12 credits transferring into the degree program. Students must therefore ensure they have transferred into the degree program prior to starting course work beyond 12 credit hours in the certificate program to ensure that all credits from the certificate program may transfer into the degree program. A student who transfers from a certificate program into the degree program may earn both certificate and degree on satisfactory completion of the respective requirements. Applicable courses may count for both the certificate and the degree program.

NOTE: Students must earn a B grade or above in each course applied to their certificate to allow that course to count for credit towards the certificate.

♦ Certificate in Network Technologies and Applications
The objective of the certificate is to provide a broad understanding of the technologies used in telecommunications networks and the various applications of telecommunications networks. To obtain the certificate, the student must complete the following, for a total of 15 credits:

1. Core Courses
   - TCOM 501 (1.5 credits) Data Communications and Local Area Networks
   - TCOM 502 (1.5 credits) Wide Area Networks and Internet
   - TCOM 504 (1.5 credits) Asynchronous Transfer Mode Networks
   - TCOM 509 (1.5 credits) Internet Protocols
   - TCOM 505 (1.5 credits) Networked Multicomputer Systems
   - TCOM 510 (1.5 credits) Client-Server Architectures and Applications

2. Elective Courses
   - Students may take any additional 6 credits of courses from specialty modules 1 and 2.

♦ Certificate in Wireless Communications
The objective of the certificate is to provide a broad understanding of the technologies, applications, and systems used in all forms of wireless communications. To obtain the certificate, the student must complete the following, for a total of 15 credits:

1. Core Courses
   - TCOM 507 (1.5 credits) Introduction to Satellite Communications
   - TCOM 508 (1.5 credits) Advanced Satellite Communications
   - TCOM 551 (3 credits) Digital Communications Systems
   - TCOM 552 (3 credits) Introduction to Mobile Communications Systems

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2. Elective Courses
Students may take any additional 6 credits of courses from specialty modules 1, 2, and 3.

Certificate in Telecommunications Systems Modeling
The objective of the certificate is to provide a broad understanding of the end-to-end systems engineering approach to telecommunications projects. To obtain the certificate, the student must complete the following, for a total of 15 credits:

1. Core Courses
(9 credits from 12 credits shown below)
TCOM 521 (3 credits) Systems Engineering for Telecommunications Management
TCOM 540 (1.5 credits) Telecommunications Network Optimization: Routing, Flow Management, and Capacity Modeling
TCOM 541 (1.5 credits) Network Design and Pricing
TCOM 545 (3 credits) Reliability and Maintainability of Networks
TCOM 546 (3 credits) Financial Models of Telecommunications Systems

2. Elective Courses
Student may take any additional 6 credits of courses from specialty modules 4 and 5.

What is systems engineering?
Systems engineers determine the most effective ways for an organization to use all of a given system's components: people, machines, materials, information, and energy. They plan, design, implement, and manage integrated systems, working to ensure performance, safety, reliability, and maintainability. They also work to ensure that systems are delivered on time at reasonable cost. Examples of systems are a computer network, an automobile, an intelligent robot, a stereo, the Metro, and George Mason University. Whereas other engineering disciplines concentrate on individual aspects of a system (electronics, ergonomics, software, etc.), systems engineers focus on the system as a whole. Systems engineering, perhaps more than any other engineering discipline, is involved with the human and organizational aspects of developing the desired system. Systems engineering is the "people-oriented" engineering profession.

What is operations research?
Operations research is the professional field that deals with the use of scientific methods in management decision making, often focusing on problems of how best to allocate limited resources. Operations researchers do for organizations what physicists do for the physical world: they try to find order in apparent chaos by identifying the structure in complex situations and understanding how the components of organizations interact. The goal is to explain and predict the effects of actions taken on these systems. Much of this work is done by developing and manipulating mathematical and computer models of organizational systems composed of people, machines, information, and procedures. The overall purpose is to provide a rational basis for decision making.

The operations research faculty at George Mason University is principally involved in the theoretical and empirical study of managerial and operational processes and the use of mathematical and computer models to optimize these systems. Models are needed for a variety of decision-making purposes in business, industry, scientific research, and government to describe different environments and to relate alternative courses of action to performance. Thus, the courses in operations research focus on quantitative modeling and the analysis of complex systems. Courses stress the use of contemporary computer hardware and software in modeling and analysis. The Bureau of Labor Statistics predicts that the field of operations research will be one of the fastest growing professions of the next decade.

Why one department?
On the basis of the above descriptions of the fields of systems engineering and operations research, one can see that there is much overlap between these two disciplines. The department encourages students of either discipline to elect courses in the other.

For a more detailed description of the programs, faculty, and department, please visit the department web page, www.gmu.edu/departments/seor.

Course Work
The department offers all courses designated SYST and OR in the "Course Descriptions" chapter of this catalog.
UNDERGRADUATE PROGRAM

The mission of the undergraduate program in systems engineering is to equip students with the ability to participate productively in the many professional activities associated with the engineering of a trustworthy system that satisfies client needs. The term system is interpreted broadly, examples being information systems, telecommunication systems, defense systems, health delivery systems, transportation systems, manufacturing systems, and corporate processes.

Specifically, the objectives of the program are to provide an academic environment that facilitates and motivates learning the knowledge, principles, practices, and perspectives that will enable graduates to do the following:

• Apply fundamental concepts of mathematics, science, information technology, and engineering. This core curriculum is designed to develop the skills and understanding that form the basis for systems engineering now and in the future.
• Participate meaningfully in the development of systems using systems engineering methods, models, and tools.
• Achieve depth of knowledge in a technical area by completing a sequence of technical electives that constitute an emphasis.
• Work effectively as a leader and as a member of multidisciplinary and cross-functional teams and behave in a professional, ethical, and responsible manner. This includes establishing a foundation for lifelong learning in the area of systems engineering and in related areas.
• Communicate effectively with peers and others both orally and in writing.

Systems Engineering, B.S.

The program leading to the B.S. in Systems Engineering prepares students for a professional career in systems engineering. Our educational program reflects the systems engineer's unique perspective, which considers all aspects of a system throughout its lifetime. The systems engineering program at George Mason is interdisciplinary, drawing from engineering, computer science, operations research, psychology, and economics. The core systems engineering courses tie these diverse threads to provide a global understanding of how individual engineering disciplines fit into the development of complex, large-scale systems. Students gain depth in a technical area by selecting a sequence of technical electives that constitute an emphasis (software-intensive systems, telecommunications systems, environmental and infrastructure systems, and system modeling and performance). Students construct their own emphases with the help of their advisor. A year-long senior design project provides hands-on experience in applying various systems engineering methods and tools.

The bachelor's program in systems engineering at George Mason University is accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology, 111 Market Place, Suite 1050, Baltimore, Md., 21202-4012; telephone (410) 347-7700. The requirements for the degree may be satisfied on a part-time or co-op basis. Cooperative education provides students with the opportunity to integrate paid, career-related work experience with classroom learning.

Writing-Intensive Requirement

The university's writing-intensive requirement for systems engineering majors is satisfied by the successful completion of SYST 489.

Synthesis Requirement

The university's synthesis requirement for systems engineering majors is satisfied by the successful completion of SYST 490 and 495.

Degree Requirements

In addition to the general and university general education requirements for the B.S. degree, students must meet specific requirements for this degree as described below.

In the first two years, students obtain a basic foundation in mathematics, the natural sciences, computing, writing, the humanities, and the social sciences. The systems engineering program builds on this foundation, teaching students theoretical knowledge, practical skills, and the ability to apply systems thinking to problems. Teamwork, collaborative learning, analytical skills, practical problem solving, and oral and written communication are strongly stressed in the systems engineering degree program.

Course requirements for the systems engineering major are as follows:

- Mathematics and statistics: MATH 113, 114, 203, 213, 214; STAT 344
- Natural sciences: PHYS 160, 260, 261; CHEM 251 or EVSC 205
- Computer science: CS 112, 211, 421
- Social sciences: COMM 100; ENGL 101, 302; ECON 103; approved courses in literature, history, global understanding, and synthesis to satisfy the university's general education requirement.

Engineering: ENGR 107

Systems engineering: SYST 101, 201, 202, 203, 301, 302, 335, 371, 417, 470, 489, 490, 495, and five technical electives at the 300 level or above. (Some exceptions are allowed for lower-level courses that are prerequisites to other technical electives.)

Sample Schedule

The following sample schedule shows the required and elective courses in the undergraduate systems engineering program. Students are strongly encouraged to follow this sample schedule to ensure that prerequisites are satisfied.

First Semester

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>COMM 100 Oral Communication</td>
<td>3</td>
</tr>
<tr>
<td>ECON 103 Contemporary Microeconomic Principles</td>
<td>3</td>
</tr>
<tr>
<td>ENGL 101 Composition</td>
<td>3</td>
</tr>
<tr>
<td>ENGR 107 Introduction to Engineering</td>
<td>2</td>
</tr>
<tr>
<td>MATH 113 Analytic Geometry and Calculus I</td>
<td>4</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>15</strong></td>
</tr>
</tbody>
</table>

Second Semester

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CS 112 Computer Science I</td>
<td>4</td>
</tr>
<tr>
<td>MATH 114 Analytic Geometry and Calculus II</td>
<td>4</td>
</tr>
<tr>
<td>PHYS 160 University Physics I</td>
<td>4</td>
</tr>
<tr>
<td>SYST 101 Understanding Systems Engineering</td>
<td>3</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>15</strong></td>
</tr>
</tbody>
</table>

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School of Information Technology and Engineering 203

Third Semester
CS 211 Computer Science II .................................. 3
MATH 213 Analytic Geometry and Calculus III .......... 3
PHYS 260 University Physics II ............................. 3
PHYS 261 University Physics II Lab ........................ 1
SYST 201 Discrete Dynamic Systems Modeling .......... 3
Literature general education course ........................ 3
TOTAL .................................................................. 16

Fourth Semester
CHEM 251 General Chemistry for Engineers or EVSC 205 Environmental Science I ... 4
MATH 203 Matrix Algebra ...................................... 3
MATH 214 Elementary Differential Equations .......... 3
SYST 202 Continuous Dynamic Systems Modeling .... 3
SYST 203 Systems Modeling Lab ............................. 1
TOTAL .................................................................. 14

Fifth Semester
STAT 344 Probability and Statistics ......................... 3
SYST 301 Systems Design .................................... 3
SYST 417 Optimization Methods in Systems Engineering 3
HIST 100 History of Western Civilization .............. 3
Technical elective ............................................. 3
TOTAL .................................................................. 15

Sixth Semester
ENGL 302 Advanced Composition (for natural sciences) .... 3
SYST 302 Systems Methods .................................... 3
SYST 335/OR 335 Discrete Systems Modeling and Simulation 3
SYST 371 Systems Engineering Management .......... 3
Technical elective ............................................. 3
TOTAL .................................................................. 15

Seventh Semester
SYST 470 Human Factors Engineering ...................... 3
SYST 489 Senior Seminar ..................................... 3
SYST 490 Senior Design Project I ........................... 3
HIST 120 U.S. History general education .............. 3
Technical elective ............................................. 3
TOTAL .................................................................. 15

Eighth Semester
CS 421 Introduction to Software Engineering ............ 3
SYST 495 Senior Design Project II .......................... 3
Technical elective ............................................. 3
Technical elective ............................................. 3
Global understanding approved elective course ........ 3
TOTAL .................................................................. 15

All systems engineering students are assigned faculty advisors. With the help and approval of the advisor, each student is required to complete a plan of study. This plan of study, contained in the detailed pamphlet available from the systems engineering office, constitutes a learning plan for the degree program. The advisor must approve changes to the plan of study. All students in systems engineering are required to see their advisors at least once each semester to plan for the following semester's registration.

The systems engineering program requires 15 credits of technical electives. Sequences of electives that constitute an emphasis may be selected from courses in systems engineering, computer science, electrical and computer engineering, information systems, operations research, and applied statistics. Technical electives are normally chosen from 300- and 400-level IT&EE courses; 100- and 200-level courses may only be included for special reasons (e.g., if they are prerequisites for the other 300- and 400-level technical electives or they are needed for the FE/EIT exam). Students may also take some graduate courses at the 500 level, but this requires that the student satisfy a GPA requirement of 3.0 and obtain permission from his or her advisor. Students taking a 500-level course must satisfy the same requirements and are graded in the same way as other graduate students.

Examples of elective sequences are systems engineering of software-intensive systems, systems engineering of telecommunications systems, systems engineering of environmental and infrastructure systems, and systems modeling and performance. These are described as follows. The student's advisor must approve all elective sequences.

Systems Engineering of Software-Intensive Systems
Students must take CS 310 and 12 credits from the following courses:
MATH 125 Discrete Mathematics I (required as prerequisite for CS 330)
CS 330 Formal Methods and Models
CS 332 Object-Oriented Specification and Implementation
CS 450 Database Concepts
CS 480 Intro to Artificial Intelligence
CS 483 Data Structures and Analysis of Algorithms
ECE 301 Digital Electronics
INF 311 Database Management
INF 312 Computer Architecture and Operating Systems
SWE 432 Design and Implementation of Software for the Web
SYST 442 Decision Support Systems Design
SYST 451 Knowledge-Based Systems Design and Engineering

Systems Engineering of Telecommunications Systems
Students are required to take 15 credits from the following courses:
ECE 201 Introduction to Electrical Engineering
ECE 301 Digital Electronics
ECE 220 Signals and Systems I
ECE 460 Communication and Information Theory
ECE 462 Data and Computer Communications
ECE 463 Digital Communication Systems
INF 312 Computer Architectures and Operating Systems
SYST 410 Modern Telecommunications
SYST 421/ECE 421
SYST 422 Data Communication and Networks
SYST 430 Integration of Hardware and Software

For students requiring meeting to enroll in graduate courses:
ECE 540/TCOM 500 Modern Telecommunications
ECE 542 Computer Network Architectures and Protocols
TCOM 505/510 can be substituted for SYST 421

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Systems Engineering of Environmental and Infrastructure Systems

Students must take CEIE 301 Engineering and Economic Models in Civil Engineering, SYST 473 Decision and Risk Analysis, and 9 credits from the following:

- CEIE 360 Introduction to Transportation Engineering
- CEIE 410 Geographical Information Systems in Engineering
- CEIE 450 Environmental Engineering Systems
- CEIE 455 Introduction to Environmental Engineering
- CEIE 460 Public Transportation Systems
- CEIE 461 Traffic Engineering
- CEIE 462 Urban Transportation Planning
- CEIE 499 Special Topics in Civil and Infrastructure Engineering: Water Resource Systems Analysis
- CEIE 530 Water Resource Systems Analysis can be substituted for CEIE 499 for those students meeting requirements to enroll in graduate courses

Systems Modeling and Performance

Students must take CEIE 301 Engineering and Economic Models in Civil Engineering, SYST 473 Decision and Risk Analysis, and 9 credits from the following:

- INFS 311 Database Management
- OR 441/MATH 441 Deterministic Operations Research
- OR 442/MATH 442 Stochastic Operations Research
- OR 481/MATH 446 Numerical Methods in Engineering
- SYST 420 Network Analysis
- SYST 442 Decision Support Systems Design
- STAT 354 Probability and Statistics for Engineers and Scientists II
- STAT 455 Experimental Design
- STAT 463 Introduction to Exploratory Data Analysis
- STAT 474 Introduction to Survey Sampling

For those meeting requirements to enroll in graduate courses:
- SYST 510 Systems Definition and Cost Modeling
- SYST 542 Decision Support Systems Engineering

In addition to receiving a B.S. degree, a student may wish to select a sequence that contributes toward a minor or certificate program as described below.

Certificate in Operations Research and Engineering

The operations research program offers a certificate program to students enrolled in the computer science, decision sciences, mathematics, and systems engineering undergraduate degree programs. The certificate augments the standard curricula with material on the computational aspects of operations research. Because the demand for people trained in this area is great, this program expands the career options available to students.

Students must take STAT 344 Probability and Statistics for Engineers and Scientists I; STAT 362 Introduction to Computer Statistical Packages; OR 335 Discrete Systems Simulation Modeling; OR 441 Deterministic Operations Research; OR 442 Stochastic Operations Research; and either MATH 313 Introduction to Applied Mathematics or SYST 500 Quantitative Foundations for Systems Engineering.

They must also choose two courses from the following:

- OR 481 Numerical Methods in Engineering
- OR 498 Independent Study in Operations Research
- OR 499 Special Topics in Operations Research
- STAT 354 Statistical Methods for Engineers and Scientists

Students electing the certificate in operations research must apply to the Systems Engineering and Operations Research Department.

Interdisciplinary Minor Programs

By taking appropriate sequences of technical electives and in some cases a few courses in addition to the 120 credit hours required for graduation, students in the systems engineering program can obtain a minor in one of a variety of interdisciplinary minor programs. Available minors include data analysis and computer science. Students should see their advisors and the departments offering the minors for specific requirements.

B.S./Accelerated M.S. in Systems Engineering

Qualified undergraduate students may apply for a five-year B.S./Accelerated M.S. program leading to a bachelor of science in an engineering discipline and an M.S. degree in systems engineering. The B.S./Accelerated M.S. program can be completed in 144 credits.

Applicants to the B.S./Accelerated M.S. program must be George Mason undergraduate students with majors in IT&E. Students may apply for the B.S./Accelerated M.S. program after they have completed at least 90 credits. Students must have an overall GPA of at least 3.00 to apply for the program. Students who have not yet finished 90 credits may be accepted provisionally subject to satisfactory completion of 90 credits. Criteria for admission into the B.S./Accelerated M.S. program are identical to criteria for admission into the M.S. program, with the exception that students do not need to have completed an undergraduate degree before admission into the program.

Students must complete all requirements for the B.S. in their chosen majors. Students in the B.S./Accelerated M.S. program may apply to have the B.S. degree from the appropriate IT&E program conferred during the semester during which they expect to complete their B.S. requirements. The M.S. degree is granted upon completion of the remaining courses.

Up to two courses (6 credits) of master's-level courses taken as part of the undergraduate degree may be applied to the graduate degree. These two courses may be chosen from the list of graduate courses in the following table. For B.S. candidates, these graduate courses replace the corresponding undergraduate courses listed in the table. The undergraduate version of these courses may not be applied toward the M.S. degree. Systems engineering majors in the B.S./Accelerated M.S. program are required to take SYST 530 in place of SYST 471.

<table>
<thead>
<tr>
<th>Graduate course</th>
<th>Undergraduate course</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>SYST 520</td>
<td>SYST 301</td>
<td>SYST 301 or SYST 520 is required for the B.S. program. Systems engineering majors receiving B or better in SYST 301 may replace SYST 520 in the graduate program with an advisor-approved elective.</td>
</tr>
<tr>
<td>SYST 521</td>
<td>SYST 420</td>
<td>Credit may not be received for both courses.</td>
</tr>
<tr>
<td>SYST 530</td>
<td>SYST 471</td>
<td>Credit may not be received for both courses.</td>
</tr>
<tr>
<td>SYST 542</td>
<td>SYST 442</td>
<td>Credit may not be received for both courses.</td>
</tr>
<tr>
<td>SYST 555</td>
<td>SYST 455</td>
<td>Credit may not be received for both courses.</td>
</tr>
<tr>
<td>SYST 573</td>
<td>SYST 473</td>
<td>Credit may not be received for both courses.</td>
</tr>
</tbody>
</table>

http://catalog.gmu.edu
Any other 500-level SYST course may be applied to both the undergraduate and graduate degrees with the approval of the advisor.

**B.S./Accelerated M.S. Program in Operations Research**

Qualified undergraduate students may apply for a five-year B.S./Accelerated M.S. program leading to a bachelor of science in an engineering discipline and an M.S. degree in operations research. The B.S./Accelerated M.S. program can be completed in 144 credits.

Applicants to the B.S./Accelerated M.S. program must be George Mason undergraduate students with majors in IT&E. Students may apply for the B.S./Accelerated M.S. program after they have completed at least 90 credits. Students must have an overall GPA of at least 3.000 to apply for the program. Students who have not yet finished 90 credits may be accepted provisionally subject to satisfactory completion of 90 credits. Criteria for admission into the B.S./Accelerated M.S. program are identical to criteria for admission into the M.S. program, with the exception that students do not need to have completed an undergraduate degree before admission into the program.

Students must complete all requirements for the B.S. in their chosen majors. Students in the B.S./Accelerated M.S. program may apply to have the B.S. degree from the appropriate IT&E program conferred during the semester during which they expect to complete their B.S. requirements. The M.S. degree is granted upon completion of the remaining courses.

Up to two courses (6 credits) of master's-level courses taken as part of the undergraduate degree may be applied to the graduate degree. For B.S. candidates, these graduate courses replace the corresponding undergraduate courses. The undergraduate version of these courses may not be applied toward the M.S. degree. Systems engineering majors in the B.S./Accelerated M.S. program in Operations Research are required to take OR 541 and 542 in place of OR 441 and 442.

**Graduate Programs**

**Operations Research, M.S.**

The graduate program leading to an M.S. in Operations Research prepares students for research and professional practice associated with the formulation and analysis of mathematical models for decision making, and their computer implementation. Major components of the program include optimization, queuing and network modeling, computer simulation and modeling, applied and computational probability, and application of these components to realistic and relevant operational analysis problems. Students are expected to become proficient in these areas, as well as in supporting areas of information technology necessary to implement operations research methods.

To achieve this objective, the program includes core courses and electives selected by the student with the aid of a faculty advisor. To obtain the master of science degree, students complete an approved plan of study that contains a minimum of 30 graduate credits.

Students may take courses through the Commonwealth Graduate Engineering Program.

Appropriate courses may be transferred, with advisor approval, into this George Mason degree program.

**Admission Requirements**

To be admitted to the program, a candidate must meet the following requirements:

1. Fulfill all admission requirements for graduate study.
2. Hold a baccalaureate degree and have taken the following courses or their equivalents: MATH 113, 114, and 213, including calculus of several variables; STAT 344 Applied Probability for Engineers and Scientists; STAT 354 Statistical Methods for Engineers and Scientists; and MATH 203 Matrix Algebra or MATH 322 Linear Algebra.
3. Have knowledge of at least one scientific computer programming language.
4. Have three letters of recommendation submitted by former professors or supervisors.

The department offers SYST 500 as an intensive review of undergraduate engineering mathematics, including matrix algebra, transforms, differential equations, probability, and statistics. Upon acceptance, each student will be required to take a foundation qualification test a week or two before school starts unless waived by the department chair or graduate coordinator. Students who fail the test will be required to take SYST 500. A sample test is available from the department.

Students with deficiencies in preparation may be accepted conditionally pending removal of the deficiencies. Courses taken to remove admission deficiencies (including SYST 500) extend the minimum requirements for the degree. Students whose undergraduate training was in the quantitative social sciences or quantitatively oriented business administration may be allowed to complete a portion of the mathematics prerequisite by taking SYST 500.

**Degree Requirements**

The program consists of 30 credits, divided as shown below. The core curriculum includes the following five courses (15 credits):

- OR 541 Operations Research: Deterministic Models
- OR 542 Operations Research: Stochastic Models
- OR 635 Discrete Event Simulation
- STAT 544 Applied Probability
- (Students who have performed well in their undergraduate calculus-based probability class may instead take OR 645 Stochastic Processes.)
- OR 680 Project Course in Operations Research, Systems Engineering, and Computational Modeling

Also, at least three 600-level or higher methodology courses must be taken, including at least one course in each of deterministic and stochastic operations research.

Up to two additional elective courses may be chosen with the written concurrence of the student's advisor. These courses should be taken in an area appropriate to the student's interests, such as statistics, business administration, computer science, information systems, systems engineering, electrical and computer engineering, economics, mathematics, and public administration. At least one of these electives must be taken from IT&E's course offerings.

With the permission of his or her advisor, a qualified student may elect to write a thesis in place of 3 credits of course work from the methodological or applications area.
Students enrolled in the M.S. in Operations Research may construct concentration areas by choosing electives from among special groupings. The four concentrations currently available are: optimization, stochastic modeling, decision analysis, and military operations research.

Students whose primary interest is in optimization may complete a concentration by choosing three courses from OR 640, 641, 642, 643, 644, 682, 741, and 750. The remaining two courses are chosen with the written concurrence of the advisor, should be tailored to the student’s interest, and must include at least one stochastic operations research course. These may be chosen from the department’s offerings, from appropriate offerings in other departments within IT&E, and from appropriate courses in other university departments. A sample of possible courses outside the Systems Engineering and Operations Research Department is available from the department office.

Students concentrating in stochastic modeling must complete one 600-level statistics course (numbered 634 or above), and two courses from OR 647, 648, 671, 677, and 681. The remaining two courses are chosen with the written concurrence of the student’s advisor and must include at least one in deterministic operations research.

Students concentrating in decision analysis must complete OR 671 and 681 and SYST/STAT 664. The remaining two electives are chosen with the written concurrence of the student’s advisor and must include one deterministic operations research course, and one course from the following: SYST 510, 542, and 595; STAT 652; CS 580 and 681.

Finally, students concentrating in military operations research must complete OR 651 and 652 and SYST 683. The remaining two courses are chosen with the written concurrence of the student’s advisor and must include one deterministic operations research course and one course from the following: OR courses with numbers greater than 635; STAT 634, 656, 658; and SYST 542, 611, and 680, 684 and 685.

Particularly important to students planning a Ph.D. program in information technology are the core courses that satisfy the breadth requirement.

**Systems Engineering, M.S.**

The graduate program leading to the M.S. in Systems Engineering prepares students for a professional career in systems design, development, and management, associated with problem formulation, issue analysis, and evaluation of alternative courses of action. The program emphasizes both analytical and practical aspects of engineering complex systems. Students are expected to demonstrate proficiency in several quantitative modeling disciplines. Students are also expected to master issues relevant to practical aspects of systems design, engineering, and management. The program prepares students for careers in research and development and for pursuing advanced graduate study leading to the Ph.D. in Information Technology.

Each student is assigned a faculty advisor with whom he or she must work to complete an approved plan of study. This plan of study must include three core courses, two methods courses, three to four electives in a concentration, and a thesis or systems engineering project. The plan of study must include 30 graduate credits. Either a thesis (6 credits) or research project (3 credits) is required for the degree. Matriculation requirements for candidates needing additional work in mathematics or engineering also may be included in the plan of study.

**Foundation and Admission Requirements**

Each applicant for the M.S. program should meet the following entrance requirements:

1. Have a baccalaureate degree from an accredited institution in engineering, mathematics, computer science, physical sciences, economics, or a related field.
2. Have completed courses in calculus (MATH 113, 114, and 213), matrix algebra (MATH 203), applied probability and statistics (STAT 344), and a scientific programming language (CS 112).
3. Provide evidence of satisfactory educational achievement in at least one of the following forms: an acceptable GPA as an undergraduate, a satisfactory score on the GRE, or an acceptable GPA in graduate courses.
4. Have achieved a satisfactory score on the TOEFL examination for non-native English speakers.

Students who enter the program must have a working background in engineering mathematics and computer systems. A student lacking these foundations may apply for admission to the program, but will be required to take one or more foundation courses. The department offers SYST 500 as an intensive review of undergraduate engineering mathematics, including matrix algebra, transforms, differential equations, probability, and statistics.

Students who have not completed a basic engineering undergraduate mathematics sequence will be required to complete courses in engineering calculus and matrix algebra prior to taking SYST 500. Upon acceptance, each student will be required to take a foundation qualification test a week or two before school starts unless waived by the department chair or graduate coordinator. Students who fail the test will be required to take SYST 500 or other foundation courses. A sample test is available from the department.

A familiarity with analytical modeling software such as spreadsheets or math packages is also expected. Students should acquaint themselves with these software packages before beginning classes.

**Project or Thesis**

Each student must complete a project (3 credits) or thesis (6 credits) under the direction of a systems engineering faculty member.

Under the project option, the student completes 3 credits of SYST 798 or OR 680. For SYST 798, a project objective is selected with the approval of the faculty project advisor. A project report is submitted at the end of the semester and must be approved by the faculty project advisor. Although a student may register for more than 3 credits of project work, only 3 credits will be applied toward the degree.

Under the thesis option, the student completes 6 credits of SYST 799. The master’s thesis should reflect a significant independent research effort. The work is conducted under the guidance of a faculty thesis advisor, and the final written thesis and oral defense are approved by a three-member faculty committee and submitted to IT&E. The thesis work is expected to be completed while taking 6 credits of SYST 799. Although a student may register for more than 6 credits, only 6 credits may be applied toward the degree.
Core Courses
Students must complete the following three core courses (9 credits):
- SYST 510 Systems Definition and Cost Modeling
- SYST 520 System Design and Integration
- SYST 530 System Management and Evaluation

Emphasis Courses
Students must complete two basic methods courses and a set of elective courses that together constitute a clearly defined emphasis within systems engineering. Students pursuing the thesis option complete three electives in an emphasis; students pursuing the project option complete four electives in an emphasis.

Students may create their own emphases with the approval of their advisors, or they may choose one of the following five emphases: systems engineering methods, systems management, systems engineering of computer-based systems, telecommunications, and advanced transportation systems. Approved basic methods courses and electives for the major emphases are as follows.

Systems Engineering Methods
Systems engineers must address a broad range of issues relevant to the design, implementation, analysis, and management of systems. The systems engineering methods emphasis provides the student with methodological tools that can be applied to the systems engineering process. Areas of focus include decision support systems, distributed intelligent systems, knowledge-based planning systems, network systems, probabilistic reasoning systems, sensor fusion systems, and/or optimization methods. The graduate program in systems engineering recognizes the importance of balancing an education in quantitative models and engineering tools with a proper understanding of the systems perspective.

Basic methods courses: Students must complete SYST 611 System Methodology and Modeling and one of the following:
- SYST 521 Network Analysis
- SYST 563 Research Methods in Systems Engineering and Information Technology
- SYST 573 Decision and Risk Analysis
- SYST 595/ECE 595 Discrete Event Systems
- SYST 621 Systems Architecture for Large-Scale Systems
- ECE 521 Modern Systems Theory
- ECE 528 Introduction to Random Processes in Electrical and Computer Engineering
- OR 541 Operations Research: Deterministic Models
- OR 542 Operations Research: Stochastic Models

Elective courses: Courses designated as basic methods courses may also be used as elective courses once the requirement of two basic methods courses has been met. The set of elective courses must constitute a well-defined focus and must be approved by the student's advisor.
- SYST 542 Decision Support Systems Engineering
- SYST 555 Introduction to Intelligent Systems Engineering
- SYST 664/STAT 664 Bayesian Inference and Decision Analysis
- SYST 671/OR 671 Judgment and Choice Processing and Decision Making
- CS 580 Introduction to Artificial Intelligence
- CS 681 Designing Expert Systems

CS 688 Neural Network Principles (or ECE 549 Theory and Applications of Artificial Neural Networks)
CS 782 Machine Learning
CS 785 Knowledge Acquisition and Problem Solving
OR 641 Linear Programming
OR 642 Integer Programming
OR 643 Network Modeling
OR 644 Nonlinear Programming

Systems Management
The defining reality of the 20th century is evolution into a society of organizations and the emergence of management as a discipline. The technical disciplines of systems engineering are necessary but not sufficient for the development of successful systems. The management aspect of systems engineering involves tracking and controlling system development through the major phases of the system life cycle; identifying and resolving problems to minimize impacts on cost, schedule, and performance, and iteratively improving both product and process. The emphasis in systems management focuses on the theory and practice of systems management and prepares students for careers in managing the development of complex systems.

Basic methods courses: Students must complete SYST 573 Decision and Risk Analysis and one of the following:
- SYST 563 Research Methods in Systems Engineering and Information Technology
- SYST 573 Decision and Risk Analysis
- SYST 621 Systems Architecture for Large-Scale Systems
- OR 541 Operations Research: Deterministic Models
- OR 542 Operations Research: Stochastic Models

Elective courses: The set of elective courses must constitute a well-defined focus. Basic methods courses beyond the two required methods courses may also be counted as elective courses. Approved electives include the following:
- SYST 512 Systems Engineering for Design and Development
- SYST 513 Total Systems Engineering, Reengineering, and Enterprise Integration
- SYST 542 Decision Support Systems Engineering
- SYST 571 Systems Engineering Management
- SYST 572 Introduction to Systems Integration Engineering
- SYST 664/STAT 664 Bayesian Inference and Decision Analysis
- SYST 671/OR 671 Judgment and Choice Processing and Decision Making
- SYST 677/OR 677/STAT 677 Statistical Process Control
- CEIE 610 Construction Systems and Management
- SWE 625 Software Project Management

Command, Control, Communications, and Intelligence (C4I)
Command, Control, Communications, and Intelligence (C4I) systems are pervasive throughout the civilian and military world, allowing responsible authorities such as commanders or chief executive officers to control resources such as personnel, equipment, and money. Civilian government examples include the air traffic control systems, the drug enforcement C4I systems, law enforcement agency systems, and various emergency preparedness systems. Military systems include national-level crisis management systems, the global command and control system, the NATO command and control systems, and various tactical C4I systems of the military services. Private industry examples include the
corporate management systems of large national and multi-
national firms.

These systems include the equipment, people, and proce-
dures necessary to accomplish the mission. The equipment
may include a variety of sensors, communications systems,
and information processing and decision-support systems.
This area stresses the multidisciplinary approach necessary
to understand the field.

The specialization in C²I focuses on the theory and practice
of C²I and prepares students for careers in research, design,
and development of C²I systems, or in the use and manage-
ment of C²I systems. The courses offered emphasize the
analytical and behavioral aspects of engineering complex
C²I systems.

**Basic Methods Courses:** Students must complete SYST 611
System Methodology and Modeling and one of the following:
ECE 528 Introduction to Random Processes in
Electrical and Computer Engineering
OR 542 Operations Research: Stochastic Models

**Elective Courses:** A set of approved elective courses is given
below. The set of elective courses must constitute a well-
defined concentration area. Examples of concentration areas
include C²I architectures, C²I software, communications, deci-
sion support, modeling and simulation, or sensing and fusion.

Students in the C²I specialization area must complete the
following course: SYST 680/ECE 670/OR 683 Principles
of C²I, and may select their remaining elective(s) from the
following list of courses:

- SYST 542 Decision Support Systems Engineering
- SYST 573 Decision and Risk Analysis
- SYST 595/ECE 595 Discrete Event Systems
- SYST 621 Systems Architecture for Large-Scale Systems
- SYST 683 Modeling, Simulation, and Gaming
- SYST 684 Sensor Data Fusion
- SYST 685 Estimation and Tracking: Principles and Techniques
- SYST 760 Special Topics in C²I Systems Engineering
- ECE 542 Computer Network Architectures and Protocols
- ECE 630 Statistical Communication Theory
- ECE 731 Digital Communications
- ECE 737 Spread Spectrum Communications
- ECE 739 Satellite Communications
- ECE 642 Design and Analysis of Computer Communication
  Networks
- ECE 734/IT 830 Detection and Estimation Theory
- OR 647 Queuing Theory
- OR 651 Military Operations Research I: Cost Analysis
- OR 652 Military Operations Research Modeling II: Effectiveness Analysis

**Telecommunications (TCOM)**

The telecommunications emphasis provides detailed knowl-
edge and experience in designing and optimizing large, com-
plex communications networks. It addresses engineering
analysis topics such as reliability and expansion, critical
business and policy issues facing both the industry and cor-
porations, management of emerging technologies, and the
impacts of security and economic commerce.

**Basic methods courses:** Students must complete OR 542
Stochastic Models in Operations Research and one of the
following:

- OR 541 Operations Research: Deterministic Models
- SYST 573 (OR 681) Decision and Risk Analysis
- TCOM 540/541 Telecommunications Network Optimization/Network Design and Pricing
- TCOM 545 Reliability and Maintainability of Networks
- TCOM 546 Financial Models of Telecommunications Systems

**Elective courses:** Students must complete TCOM 500 Modern
Telecommunications and must also take a set of elective
courses that constitute a well-defined focus. Basic methods
courses beyond the two required methods courses may also be
counted as elective courses. Students must take three of
the following (two, if he or she selects the thesis option):

- OR 635 Discrete System Simulation
- OR 647 Queuing Theory
- SYST 513 Total Systems Engineering, Reengineering,
  and Enterprise Integration
- SYST 572 Introduction to Systems Integration Engineering
- TCOM 501 Data Communications and Local Area Networks
- TCOM 502 Wide Area Networks and the Internet
Certificate in Systems Engineering for Computer, Information, and Software-Intensive Systems

A certificate in systems engineering for computer, information, and software-intensive systems is available to any student who holds a bachelor's degree in an engineering or a scientific discipline, or who has graduate status in such a program. To be eligible for a certificate, students must complete SYST 510, 512, 513, 530, and one of these elective courses: ECE 542, CS 656; INF5 612, SYST 542, 595 and 621; SWE 620; and INF5 622. The following is a suggested program of study for obtaining the certificate while studying for the M.S. in Systems Engineering (required courses for the certificate are indicated in italics):

Core courses: SYST 510, 520, 530

Methods courses: two courses approved for the master's degree emphasis

Elective courses: two courses approved for the master's degree emphasis

Project: SYST 798 or OR 680

Certificate in Military Operations Research

The certificate program in military operations research provides knowledge, tools, and techniques to those who are working, or planning to work, in the field of military operations research. It is appropriate for students who cannot complete all the requirements for a master's degree in operations research, but who want a concentrated study of military modeling. Admissions requirements to this program are identical to those for the master's degree in operations research. Certificate candidates must complete six courses, with an average grade of B or better, for a total of 18 graduate credits. To obtain the certificate, a student needs to complete the following: OR 541, 542, 635, 651, 652, and SYST 683. If the candidate has already had 3 credits of deterministic operations research, then he or she can receive the certificate with 15 graduate credits. If the candidate has already taken a course equivalent to OR 542, then he or she should substitute OR 681.

Certificate in Computational Modeling

The certificate program in computational modeling provides knowledge, tools, and techniques to those who are working, or planning to work, in the field of computational modeling. Courses taken for this certificate program can count toward a master's in operations research or statistics, or a Ph.D. in Computational Sciences and Informatics. One must be concurrently enrolled in the program for courses to count toward both the certificate and the other degree. For admission into the certificate program, the applicants must meet either the minimum entrance requirements for the M.S. in Operations Research, the M.S. in Statistical Science, or the entrance requirements for the Ph.D. in Computational Sciences and Informatics. Certificate candidates must complete the following courses: CSI 700/OR 682; OR 541 and 635; and STAT 634. In addition, candidates must choose any two of the following electives: CSI 744, 773; OR 542, 680; and SYST 683. If the candidate has already taken the equivalent of any of the required courses, then he or she may (with the permission of the department chair) complete the certificate program taking only 15 credits of course work.

Certificate in Command, Control, Communications, and Intelligence (C3I)

A certificate program in C3I is available to students who hold bachelor's degrees in engineering and scientific disciplines, or who are currently in graduate status in such programs. To be eligible for a certificate, students must complete SYST 680; ECE 528 or OR 542; and three electives from the group listed above. The following is a suggested program of study for obtaining the certificate while studying for the M.S. in Systems Engineering degree (certificate required courses indicated in italics).

Core courses: SYST 510, 520, 530

Methods courses: SYST 611, ECE 528 or OR 542

Elective courses: SYST 680; three C3I approved elective courses

Project: SYST 798 or OR 680

Advanced Transportation Systems (ATS)

Transportation is one of the most important and increasingly complex infrastructure networks of our modern society. This emphasis looks at transportation operations, monitoring, and control from a systems engineering perspective. It uses both analytical and complex simulations to give the student an awareness of how future transportation systems will evolve.

Basic methods courses: Students must complete OR 542 Operations Research: Stochastic Models and one of the following:

SYST 697/PUBP 777 Critical Information Technology Infrastructures
OR 541 Operations Research: Deterministic Models
SYST 563 Research Methods in Systems Engineering and Information Technology
SYST 573 Decision and Risk Analysis
SYST 621 Systems Architecture for Large-Scale Systems
INF5 612 Principles and Practices of Communication Networks
TCOM 500/ECE 540 Modern Telecommunications

Elective courses: The set of elective courses must constitute a well-defined focus. Basic methods courses beyond the required methods courses may also be counted as elective courses. The set includes the following:

CEIE 560 Public Transportation Systems
CEIE 660 Urban Transportation Planning
SYST 512 Systems Engineering for Design and Development
SYST 513 Total Systems Engineering, Reengineering, and Enterprise Integration
SYST 571 Systems Engineering Management
SYST 595/ECE 595 Discrete Event Systems
SYST 684 Sensor Data Fusion
OR 635 Discrete System Simulation
OR 647 Queuing Theory
PSYCH 530 Cognitive Engineering: Cognitive Science Applied to Human Factors

Certificate in Systems Engineering for Computer, Information, and Software-Intensive Systems

A certificate in systems engineering for computer, information, and software-intensive systems is available to any student who holds a bachelor's degree in an engineering or a scientific discipline, or who has graduate status in such a program. To be eligible for a certificate, students must complete SYST 510, 512, 513, 530, and one of these elective courses: ECE 542, CS 656; INF5 612, SYST 542, 595 and 621; SWE 620; and INF5 622. The following is a suggested program of study for obtaining the certificate while studying for the M.S. in Systems Engineering (required courses for the certificate are indicated in italics):

Core courses: SYST 510, 520, 530

Methods courses: two courses approved for the master's degree emphasis

Elective courses: two courses approved for the master's degree emphasis

Project: SYST 798 or OR 680

Certificate in Military Operations Research

The certificate program in military operations research provides knowledge, tools, and techniques to those who are working, or planning to work, in the field of military operations research. It is appropriate for students who cannot complete all the requirements for a master's degree in operations research, but who want a concentrated study of military modeling. Admissions requirements to this program are identical to those for the master's degree in operations research. Certificate candidates must complete six courses, with an average grade of B or better, for a total of 18 graduate credits. To obtain the certificate, a student needs to complete the following: OR 541, 542, 635, 651, 652, and SYST 683. If the candidate has already had 3 credits of deterministic operations research, then he or she can receive the certificate with 15 graduate credits. If the candidate has already taken a course equivalent to OR 542, then he or she should substitute OR 681.

Certificate in Computational Modeling

The certificate program in computational modeling provides knowledge, tools, and techniques to those who are working, or planning to work, in the field of computational modeling. Courses taken for this certificate program can count toward a master's in operations research or statistics, or a Ph.D. in Computational Sciences and Informatics. One must be concurrently enrolled in the program for courses to count toward both the certificate and the other degree. For admission into the certificate program, the applicants must meet either the minimum entrance requirements for the M.S. in Operations Research, the M.S. in Statistical Science, or the entrance requirements for the Ph.D. in Computational Sciences and Informatics. Certificate candidates must complete the following courses: CSI 700/OR 682; OR 541 and 635; and STAT 634. In addition, candidates must choose any two of the following electives: CSI 744, 773; OR 542, 680; and SYST 683. If the candidate has already taken the equivalent of any of the required courses, then he or she may (with the permission of the department chair) complete the certificate program taking only 15 credits of course work.

Certificate in Command, Control, Communications, and Intelligence (C3I)

A certificate program in C3I is available to students who hold bachelor's degrees in engineering and scientific disciplines, or who are currently in graduate status in such programs. To be eligible for a certificate, students must complete SYST 680; ECE 528 or OR 542; and three electives from the group listed above. The following is a suggested program of study for obtaining the certificate while studying for the M.S. in Systems Engineering degree (certificate required courses indicated in italics).

Core courses: SYST 510, 520, 530

Methods courses: SYST 611, ECE 528 or OR 542

Elective courses: SYST 680; three C3I approved elective courses

Project: SYST 798 or OR 680
Ph.D. Study in Systems Engineering and Operations Research

Doctoral study in both systems engineering and in operations research is available through the Ph.D. in Information Technology program, which offers advanced courses in this discipline. The doctoral program allows the student to take a broad range of courses and research options.

Virginia Commonwealth Graduate Engineering Program

Graduate programs in engineering and information technology are offered under the auspices of a commonwealth network in Virginia. This network includes George Mason University, Virginia Polytechnic Institute and State University (VPI&SU), Old Dominion University (ODU), the University of Virginia (UVA), and Virginia Commonwealth University (VCU), and employs a mix of direct classroom instruction from George Mason and live interactive televised lectures from other universities. Afternoon and evening instruction is provided at the George Mason Fairfax Campus, and the UVA/VPI&SU Northern Virginia Center.

Master's degree programs are offered by UVA, VPI&SU, ODU, and George Mason. The degree programs from UVA include the Master of Materials Engineering, Master of Engineering in Chemical Engineering, Mechanical and Aerospace Engineering (Manufacturing Systems Engineering), Electrical Engineering, Systems Engineering, and Civil Engineering (Structural Focus). VPI&SU offers the following degree programs: Master of Engineering Administration; Master of Science or Master of Engineering in Electrical Engineering, Civil Engineering (Environmental), and Systems Engineering; and a Master in Mechanical Engineering. ODU offers the Master of Engineering Management. George Mason offers the master of science in programs described in this chapter. Also offered by George Mason are the Ph.D. in Computer Science, the Ph.D. in Electrical and Computer Engineering, and the Ph.D. in Information Technology, as well as a variety of certificate programs.

For further information, see the web site ite.gmu.edu/courses_programs/commonwealth.htm.
School of Management

Web: www.som.gmu.edu
Phone: (703) 993-1807

Administration
The School of Management (SOM) is located in Enterprise Hall.

Richard J. Klimoski, (Interim) Dean
David J. Harr, Senior Associate Dean
James W. Harvey, Associate Dean, Undergraduate Programs
Andres Fortino, Director of M.B.A. and M.S. Technology Management Programs
Sarah Nutter, Director of Executive M.B.A. Program
Archie Tinelli, Director of Executive and Professional Education
Gretchen Hendricks, Director of Career Services
George Wray, Manager, Information Technology
Victor Reston, Managing Director of Operations

Faculty
Accounting
Buchanan, Harr, Heller, Hylton, Lacy, Leary, Lobingier, Meeks, Moraglio, Nutter, Parsons, Wilkie

Decision Sciences and Management
Information Systems
Auffret, Chen, Das, Dutta, Fortino, Good, Haddad, Hsu, Hughes, Jukic, Mazumdar, Meixell, Shaw, Singer, Thomas

Finance
Andersen, Brown-Hruska, Christophe, Crockett, Ferri, Hallows, Hanweck, Hysom, Johnston

Management
Beckman, Coffinberger, Cramton, Demory, Eland, Kravitz, Kovach, Lee, Morse, O’Brien, Pruett, Samuels, Schmidt, Wasserman, Wolf

Marketing
Entrikin, Harvey, Martin, McCronan, Meamber, Philpot, Poisant, Reston, Stanbury

Course Work
The School of Management offers all course work designated ACCT, BULE, DESC, EMBA, FNAN, MBA, MGMT, MIS, MKTG, MSOM, SOM and TECM in the “Course Descriptions” chapter of this catalog.
UNDERGRADUATE PROGRAMS

Because all organizations face constant change, driven largely by information technology, new organizations and new business models are continually evolving. In the School of Management, faculty and students are intellectually curious about what information technology, new business models, and paradigm shifts mean to present and future organizations.

Success in business requires a broad portfolio of skills as well as a desire for lifelong learning. When studying business, focusing on just one discipline is not enough. Today’s workforce must be able to perform successfully in an environment of change and ambiguity. The School of Management prepares students to be successful in the fast-paced world of business. The School of Management degree programs are accredited by the Association to Advance Collegiate Schools of Business (AACSB International).

Bachelor of Science Degree
Office of the Associate Dean for Undergraduate Programs
Web: som.gmu.edu
Phone: (703) 993-1880

The programs in management education offered by the university culminate in a B.S. degree with a major from one of five areas: accounting, decision sciences and management information systems, finance, management, or marketing. A minimum of 120 credits of course work is required, of which at least 45 credits must be at the 300 or 400 level. Students should consult the Baccalaureate Degree Requirements section in the “Academic Policies” chapter for information concerning literacy, general education, residence, and other academic requirements.

In addition, students should carefully examine prerequisites for courses offered by the School of Management. Students who enroll in courses without having fulfilled the prerequisites may be dropped from such courses.

Degree Requirements

All degree applicants must complete at least 24 credits in the degree program following acceptance to the School of Management. The 24 credits must include 18 to 21 credits required for the specific major and SOM 498 Capstone Course: Advanced Business Models. A minimum of 30 credits of the School of Management core and major courses must be completed at George Mason University. While a student may apply 12 credits of D grades toward graduation, no D grades may be applied to the School of Management core and major requirements.

Students pursuing a Bachelor of Science degree in the School of Management complete the university-wide general education program plus one additional credit of natural science (for a total of 8 credits). The natural science requirement must be fulfilled by completion of two 4-credit laboratory sciences. Additionally, all degree applicants must complete the following School of Management degree requirements:

Economics .................................................. 9
ECON 103* ................................................. 3
ECON 104* ................................................. 3
ECON 300-400 ........................................... 3
(MKTG majors must take ECON 306)

School of Management Core * .................................. 35
ACCT 203 ................................................. 3
ACCT 301 ................................................. 3
BULE 302 ................................................. 3
DESC 210 .................................................. 4
DESC 301 .................................................. 3
FNAN 301 .................................................. 3
MGMT 301 .................................................. 3
MIS 102 ..................................................... 1
MIS 301 ..................................................... 3
MKTG 301 .................................................. 3
SOM 301 .................................................... 3
SOM 498 .................................................... 3

Major* ........................................................ 18

General Electives ............................................. 17

These credits may not include pure activity courses in any department such as those listed under the catalog designations of dance, individual sports, physical education, team sports, and recreational activities, music, theater, and art. Contact the Office of Student Services at (703) 993-1880 for more specific information. A minimum of 9 credits must come from courses outside School of Management or the Department of Economics.

Total Credits

University General Education and School of Management ........................................... 120

* Completion with a grade of C or better is required for graduation.

Acceptance into the School of Management

The following requirements apply to all students admitted to George Mason University commencing with the 2001-02 University Catalog.

A student interested in pursuing a major in accounting, decision sciences and management information systems, finance, management, or marketing must apply for acceptance to the School of Management during the semester in which the student will complete the acceptance requirements. A student who has not received acceptance into the School of Management will have a degree status classified as “BPRE,” until the application is approved.

Acceptance into the School of Management is competitive, based on completion of the following:

• At least 48 credit hours with a minimum of 9 credit hours at George Mason University.
• A cumulative GPA of 2.500 or higher at the end of the semester of application, for all courses attempted and from all schools and universities attended.
• Successful completion of the following courses with a grade of “C” (2.0) or better:
  • ACCT 203 (Prerequisite: C or better in ECON 103)
  • DESC 210 (Prerequisite: C or better in MATH 108)
  • SOM 301 (Prerequisite: C or better in ACCT 203, DESC 210 and ENGL 302)
• A minimum semester GPA of 2.000 at the end of the semester of application.
• An average GPA of 2.500 in all attempts at upper-level School of Management core courses (ACCT 301, BULE 302, DESC 301, FNAN 301, MGMT 301, MIS 301, MKTG 301, and SOM 498)

http://catalog.gmu.edu
Students interested in applying to the School of Management should contact the Office of Student Services Office at (703) 993-1880.

Please Note: Effective with the fall 2001 catalog, the acceptance criteria were changed to the above requirements. Students who entered George Mason University prior to fall 2001 should consult the catalog of their year of entry to the university for application requirements. Any student who wishes to change to a major in the School of Management must consult a School of Management academic advisor for degree requirements.

Applications for acceptance to the School of Management must be submitted by November 1 for the following spring semester; by April 1 for the following Summer Term and July 1 for the following fall semester. Students should file the application at the beginning of the semester in which they anticipate completing the requirements set forth above. Students with any questions about the School of Management application process should contact the Office of Student Services at (703) 993-1880.

Academic Advising

Academic planning for undergraduate students is available in the School of Management Office of Student Services, Enterprise Hall, Room 008. Students are encouraged to consult with an assigned advisor on a regular basis. Call (703) 993-1880 to make an appointment.

■ Accounting, B.S.

Degree Requirements

The B.S. in Accounting (ACCT) prepares students for professional careers in the private and public sectors of the economy. Students discover and evaluate fundamental value propositions for various types of organizations and transactions, and learn how to convert data from these organizations and transactions into information that is useful for decision-making purposes. Students also learn how to design and test information systems that provide reliable and relevant information for planning and control purposes. Further, students learn how to identify value-creating opportunities and choose between competing operating, investing, financing, and disclosure alternatives to maximize firm or organizational value.

The program emphasizes, but is not limited to, the accounting profession and its role in business and government, including professional responsibilities and ethics. The program stresses conceptual understanding, technical competency, analytic abilities, communication skills, and computer literacy. The degree is separately accredited by the Association to Advance Collegiate Schools of Business (AACSB International).

In addition to the general requirements for the B.S. degree, students must complete all required credits in upper-level accounting courses, with grades of C or better in each course. Students majoring in accounting must complete 18 credits composed of:

- ACCT 311
- ACCT 321
- ACCT 351
- ACCT 361
- ACCT 421
- ACCT 461

Advising materials are available in the School of Management Office of Student Services to provide guidance regarding recommended electives. Students who anticipate taking the CPA, CMA, CIA or other professional examination should consult applicable regulations and discuss their programs with their assigned advisors. State regulations may dictate course selections.

■ Decision Sciences and Management Information Systems, B.S.

Degree Requirements

The B.S. in Decision Sciences and Management Information Systems (DMIS) prepares students for a range of career options that involve the application of information technology and quantitative methods to business problems. Their knowledge of business functions as well as information technology makes them capable in assessing information requirements and in leveraging technology to design and improve business processes. The content of the DMIS major is at the intersection of technology, process, and people.

In addition to the general degree requirements for the major, students who major in DMIS must complete 18 credits of upper-level DMIS courses with grades of C or better in each course. Of these, 9 credits are taken up by the required courses for the major as listed below. Students have considerable flexibility in their choice of electives and may choose from two tracks of study, one in management information systems, which prepares students for their career in information technology industries, and the other in management of business operations, which develops expertise in areas such as quality, project, and supply chain management and business process analysis. Students are strongly urged to discuss their choice of electives and programs of study with their advisor. It is also strongly recommended that students planning to major in DMIS take a high level programming language course (e.g. C++ or Java) prior to starting their major area courses.

Required courses for the major:

- MIS 310
- MIS 320
- MIS 330

Choose three electives from the following:

- DESC320, DESC352, DESC435, DESC452, DESC456, DESC493, DESC499, MIS411, MIS412, MIS430, MIS435, MIS440, MIS450, MIS491, MIS499

■ Finance, B.S.

Degree Requirements

The B.S. in Finance (FNAN) prepares students for professional careers in finance by providing a solid foundation in financial principles necessary to make operating decisions for an organization. In addition to the general degree requirements for the major, students who want to major in finance must complete 18 credits in upper-level finance courses with a grade of C or better in each course.

Choose three required courses from the following:

- FNAN 302
- FNAN 311
- FNAN 321
- FNAN 401

http://catalog.gmu.edu
### Management, B.S.

**Degree Requirements**

The B.S. in Management prepares students for management and leadership positions in the public and private sectors. In addition to the general degree requirements for the B.S., students must complete 18 credits in upper-level management courses with a grade of C or better in each course.

**Students are required to take the following:**
- MGMT 312 Principles of Management
- MGMT 321 Human Resource Management
- MGMT 323 Teams and Leadership

**Beyond these three required courses, students must choose three courses from the following:**
- MGMT 331 Labor Relations
- MGMT 411 Organizational Theory and Development
- MGMT 412 Diversity in Organizations
- MGMT 421 Advanced HR
- MGMT 431 Employee Relations
- MGMT 451 New Venture Creation
- MGMT 471 Competitive Strategy
- MGMT 493 Management of Technology

**Students specializing in human resources/personnel should take:**
- MGMT 331, MGMT 421, and MGMT 431.

### Marketing, B.S.

**Degree Requirements**

The B.S. in Marketing prepares students for a broad range of global and domestic career options in market and consumer research, brand management, advertising, customer relationship management, new market and business development, and marketing strategy. Marketing opportunities are increasing in the new economy as firms, government agencies, and nonprofits adopt a market orientation.

A major in marketing provides students with a solid background in marketing concepts and practices, with emphasis on market analysis and planning, research, consumer behavior, and advertising management. Because marketing draws on a variety of disciplines for its foundation and is practiced globally, marketing majors are encouraged to take electives in related fields such as psychology, sociology, economics, public policy, international studies, computer science, and foreign languages.

In addition to the required core courses for the B.S. degree, students must complete 18 credits of upper-level marketing courses with a grade of C or better in each course.

**Students are required to take the following:**
- MKTG 312 Consumer Behavior
- MKTG 313 Advertising Management
- MKTG 351 Marketing Research Techniques and Applications
- MKTG 471 Marketing Management

The remaining six credits must be chosen from a variety of upper-level electives in marketing. Marketing majors are advised to work closely with their academic advisors to ensure that electives taken in related fields provide the opportunity to gain proficiency in specific marketing-related areas.

### Minor in Business

The minor in business (BUS) provides an introduction to the business skills needed for success in the rapidly changing and evolving world of business. Because it is designed for non-business students who wish to learn business essentials to enhance their own area of expertise, the minor provides broad exposure to business concepts and theories. The minor presents and integrates the major functional areas in business to solve management problems through the use of information technology. Strong written and oral communication skills are expected of students. Prior to beginning the minor in business, students must have completed 38 credit hours. The School of Management also recommends taking ECON 103 to fulfill the Social and Behavioral Science General Education Requirement and MATH 108 for the Quantitative Reasoning General Education Requirement. The minor in business consists of the following six courses. Students must complete five of the six courses for a total of 15 credit hours. **Students must achieve a grade of 2.0 or better in each course that is applied toward the minor.**

**Required courses for a minor in Management are:**
- MSOM 300 Managing Financial Resources
- MSOM 301 Managing People and Organizations
- MSOM 302 Managing Information
- MSOM 303 Marketing in the Global Economy
- MSOM 304 Starting and Managing the Enterprise
- MSOM 305 Managing International Business

**These courses may not be taken for credit by School of Management majors.**

### Graduate Programs

**Web:** som.gmu.edu

Graduate Admissions
4400 University Drive, MS 5A2
Fairfax, VA 22030-4444
Phone: (703) 993-2140
Fax: (703) 993-1778

The School of Management offers the Master of Business Administration (M.B.A.), the Executive M.B.A, and the Master of Science in Technology Management. The graduate programs are accredited by the Association to Advance Collegiate Schools of Business (AACSB International).

### Business Administration, M.B.A.

**Director, Master in Business Administration Program**
(703) 993-2136
masonmba@som.gmu.edu

The Master of Business Administration (M.B.A.) program provides a high-level professional education in business administration. The curriculum integrates functional areas
with an emphasis on group work, information technology, and the global business environment.

Admission Requirements
All students registering for graduate courses offered by the School of Management must have graduate standing. Nondegree student status is not available.

Admission to the M.B.A. program is highly competitive. No previous course work in business administration is required, but a four-year undergraduate degree and a college-level calculus course must be successfully completed before matriculation. Applicants are evaluated primarily on undergraduate record and GMAT performance. A minimum of two years of professional work experience before entering the program is required. Preference is also based on strength of professional background and leadership potential. These criteria are applied with a reasonable amount of flexibility to ensure that individuals with unusual academic and professional qualifications are considered. Applications for admission to the M.B.A. program must be submitted by November 1 for the following spring semester, and by April 1 for the following fall semester.

The M.B.A. program is a part-time evening program. Student cohorts are admitted in fall and spring semesters to commence course work. The curriculum effectively integrates functional areas with the use of information technology, oral and written communication, and teamwork. The M.B.A. program requires 48 credits: 30 credits of core courses and 18 credits of elective courses. Students complete the degree program in two and one-half years by taking six credits each semester for eight consecutive semesters (including Summer Terms). Due to the cohort structure, students must commit to attending classes two times per week. Each year a cohort of qualified students is selected from those who want to accelerate their studies and complete their degree in 23 months. They take three courses per semester, which is considered full time graduate work.

Core Courses, 30 Credits
The core courses are offered during the first five semesters, with students taking six credits each fall, spring, and summer. Each course sets the foundation for the next and builds on knowledge gained in previous courses. All M.B.A. students must complete the following required core courses:

- MBA 603 Managerial Economics and Decisions of the Firm .......... 3
- MBA 612 Managing Costs and Evaluating Performance ............. 1.5
- MBA 613 Financial Reporting and Decision Making ................. 3
- MBA 623 Marketing Management ..................................... 3
- MBA 633 Statistics for Business Decision Making ................... 3
- MBA 638 Managing Operations and Technology for the Digital Enterprise .......... 3
- MBA 643 Managerial Finance ........................................... 3
- MBA 653 Organizational Behavior and Human Resources Management .......... 3
- MBA 673 Legal Environment for Management .......................... 1.5
- MBA 678 Strategy and Organizational Leadership ....................... 3
- MBA 798 Global Business Perspectives ................................ 3

Technology Competency Requirement
Before taking any MBA electives, students are required to take and pass at least the first module of Tek Xam. Tek Xam is a nationwide standard for technical literacy assessment (see www.tekexam.com). Administered by the university on a periodic basis, Tek Xam is a unique test measuring technology and problem-solving skills within the technology environment. It is an Internet-based, vendor-neutral test delivered online in a proctored computer lab.

Elective Courses, 18 Credits
After completing the core courses, students can choose from several market-driven elective courses offered by the School of Management.

Concentrations
M.B.A. students may use electives to complete courses leading to a concentration in financial management, enterprise management, market and business development, or information systems management.

Financial Management
Required courses:
- MBA 701 Business Analysis and Valuation
- MBA 702 Corporate Financial Policy
- MBA 703 Financial Markets

Two courses from the following:
- MBA 704 Risk Management and Financial Innovation
- MBA 705 Venture Capital and Private Finance
- MBA 706 Investment Analysis
- MBA 707 Accounting Systems
- MBA 708 Global Tax Strategies
- MBA 717 International Finance

Note: One elective must be taken outside this concentration.

Enterprise Management
Required courses:
- MBA 701 Business Analysis and Valuation
- MBA 705 Venture Capital and Private Finance
- MBA 711 Entrepreneurship

Two courses from the following:
- MBA 708 Global Tax Strategies
- MBA 713 Human Resource Management
- MBA 712 Project and Cost Management
- MBA 721 Marketing Decision Systems
- MBA 725 Leadership
- MBA 736 Managing Digital Business

Note: One elective must be taken outside this concentration.

Market and Business Development
Required courses:
- MBA 721 Marketing Decision Systems
- MBA 722 Consumer Behavior
- MBA 723 Supply Chain Management

Two courses from the following:
- MBA 711 Entrepreneurship
- MBA 724 Marketing Communications
- MBA 725 Leadership
- MBA 732 Knowledge Management
- MBA 734 Electronic Commerce

Note: One elective must be taken outside this concentration.
Information Systems Management

Required courses:
MBA 731 Business Systems Development
MBA 732 Knowledge Management
MBA 733 Business Data Communications

Two courses from the following:
MBA 734 Electronic Commerce
MBA 735 Systems Thinking and Business Simulation
MBA 736 Managing Digital Business
MBA 737 Corporate Information Systems Policy
MBA 707 Accounting Systems
MBA 711 Entrepreneurship

Note: One elective must be taken outside this concentration.
Electives may be chosen from courses offered by other graduate programs in the university, with approval from the School of Management.

◆ CIO Certification
(703) 993-2140

Requirements for the George Mason University
CIO Certificate for MBA students
The certificate consists of seven courses. This sequence is intended for holders of an MBA or EMBA degree from George Mason University or any other Association to Advance Collegiate Schools of Business (AACSB International) accredited school of business or management.

1. Required courses:
   MBA 731 Business Systems Development (or equivalent)
   MBA 732 Knowledge Management (or equivalent)
   MBA 799 Corporate Information Systems Policy

2. Two additional courses from the following:
   MBA 733 Business Data Communications (or equivalent)
   MBA 735 Systems Thinking and Business Simulation
   MBA 736 Managing Digital Business
   MBA 734 Electronic Commerce

3. Two additional courses from the following:
   MBA 712 Project and Cost Management (or equivalent)
   MBA 725 Leadership (or equivalent)
   MBA 713 Human Resource Management (or equivalent)

If a student has taken any of these courses in their MBA program as an upper level elective, they may submit evidence of having taken the course and will be given credit for up to one course in the seven courses required for the certificate. They will be waived from having to repeat a course they have taken and must choose from the remaining electives for a minimum total of five courses, which is a George Mason requirement for a graduate credit-bearing certificate.

◆ Executive M.B.A.
Web: som.gmu.edu
Phone: (703) 993-1832
E-mail: emba@som.gmu.edu

The Executive Master of Business Administration program is a 21-month general management program leading to the M.B.A. degree. The program provides managers and executives with state-of-the-art education in contemporary management. Emphasis is placed on leadership and strategic management of business resources, technology, and operations.

The class schedule of alternating Fridays and Saturdays, two domestic residencies, and one international residency is designed to allow participants to continue their careers while they study and master a broad range of functional and leadership skills.

The curriculum incorporates three distinctive elements: a focus on services as the dominant context, competencies needed to transition to executive rank, and an understanding of the transformational impact of technology.

Participants
The Executive M.B.A. is designed for those with significant business and professional experience. Participants must have the support of their organizations (i.e., given the time to attend class). Financial sponsorship is desired but not required.

Sponsoring organizations include but are not limited to SAIC, Oracle Corporation, EDS, ExxonMobil Corporation, Defense Intelligence Agency, PriceWaterhouseCoopers LLP, L-3 Communications, Allstate Insurance, Atlantic Research Corporation, AT&T, Verizon, Fannie Mae, Freddie Mac, General Motors, Landmark Systems Corporation, Paxton Van Lines, TASC, the U.S. government, the World Bank, and Xerox Corporation.

Methods of Instruction
Study groups are an essential part of the Executive M.B.A. experience and are arranged by the director of the program. The groups usually meet independently, once a week to discuss course work and prepare class presentations. Between classes and study group sessions, group members continue to work collaboratively through a groupware platform provided by the program.

The faculty encourages classroom discussions in which opinions are shared and experiences reviewed for the benefit of the whole class. The program is designed to combine the theoretical with the practical, making each person’s contribution to the discussion essential.

Residency Weeks
Live-in sessions complete the Executive M.B.A. experience. The international residency is scheduled at the end of the first year. It is a two-week program in Europe, designed to help the participants integrate the managerial disciplines learned during the year. The European program includes one week of study in residence at Oxford University where a certificate is earned, and one week in continental Europe where participants visit firms, research centers, and governmental institutions. The domestic residencies vary in length and are designed to provide students with business seminars, site visits, and lectures that leverage our location in the Northern Virginia and greater Washington D.C. area.

◆ Technology Management, M.S.
Web: www.som.gmu.edu
Phone: (703) 993-1792
E-mail: technan@som.gmu.edu

The Technology Management program is designed for experienced managers and professionals in the information technology industry who are seeking to advance their careers in management. This 18-month executive program meets on Saturdays, and awards an M.S. in Technology Management.
Admission to the program is highly competitive. A minimum of three years professional work experience before entering the program is required. No previous course work in business is necessary. A bachelor's degree with an acceptable GPA is required. For those with less than ten years work experience, demonstrable ability in graduate work or appropriate GMAT score is required. Applicants are evaluated on relevant work experience, letters of recommendation, executive support, their fit to the program, and on leadership potential. These criteria are applied with a reasonable flexibility to ensure that individuals with unique academic qualifications are given full consideration. Applications for admission to the program must be submitted by September 1 to join the yearly cohort that starts in January.

Methods of Instruction
Study groups are an essential part of the M.S. in Technology Management experience and are arranged by the director of the program. The groups usually meet independently, once a week, to discuss course work and prepare class presentations. Between classes and study group sessions, the group members continue to work collaboratively through the Web CT and Lotus Notes platforms, provided by the program.

The Technology Management program includes required international residency. Students travel abroad to explore the global information technology industry and participate in a week-long program that examines economic, sociopolitical, and cultural issues that affect the global marketplace.

Program Schedule
**Spring Semester—First Year**
- TECM 610 Communications and Leadership
- TECM 615 Decision Making Using Accounting and Financial Information
- TECM 620 Economics of Technology Management
- TECM 700 Business Engineering and Change Management

**Summer Session—First Year**
- TECM 635 Metrics and Statistics for Quality and Project Management
- TECM 702 Interpersonal Dynamics and Teamwork

**Fall Semester—First Year**
- TECM 704 Planning and Control of Projects
- TECM 720 Analysis of IT Industries
- TECM 735 Technology Management Capstone Project
- TECM 740 Management of the Client Relationship

**Spring Semester—Second Year**
- TECM 640 Management of Consulting and Technical Professionals
- TECM 703 Technology Assessment, Evaluation, and Investment
- TECM 745 Business Functions and Operations: Client Industries

**Summer Session—Second Year, One-Week International Residency**
- TECM 750 Global IT Management

**CIO University Partnership**
The School of Management is also a CIO (Chief Information Officer) University Academic Partner. Working in cooperation with the Federal CIO Council, SOM educates federal information technology (IT) managers to acquire the IT management competencies of a CIO mandated by the Clinger-Cohen Act. The Federal CIO Council created CIO University as a virtual university to develop and educate the top managers in government and those aspiring to those positions. The major emphasis of the CIO University is the use of IT to deliver agency business objectives and outcomes. Students and graduates of the technology management program are eligible to apply for CIO certification once they complete the degree and present themselves to the Federal CIO Council as candidates for certification.
The State Council of Higher Education for Virginia and the State Board of Nursing approved the baccalaureate nursing program in 1974. Since that time, the program has grown from a Department of Nursing to a School of Nursing and in 1993, the School of Nursing was reformulated as the College of Nursing and Health Science to provide the breadth needed to respond to dramatic and dynamic fundamental changes occurring in health care. The college’s community-based curriculum has become a national and international model serving to inform and guide curriculum change as decentralization trends move the focus of health care from the institutional to regional and local community-based care.

The mission of the college is to equip professionals to provide leadership, care, and services related to health promotion, wellness, disease prevention, and quality of life through the promotion of physical, social, and environmental health practices. Graduates practice in a variety of roles in settings that are complex, multicultural, and constantly changing. The college is a resource for health promotion to the university, as well as to the citizens of the Commonwealth of Virginia.

Administration
Rita M. Carty, Dean
Jeanne Sorrell, Associate Dean for Academic Programs and Research
Rosemarie C. Brenkus, Assistant Dean for Student Academic Affairs
Christena Langley, Assistant Dean for Undergraduate Programs
Ellen Dawson, Assistant Dean for Graduate Programs in Nursing
P. J. Maddox, Assistant Dean for Graduate Programs in Health Science

Faculty
Professors: Ailinger, Butler, Carty, Feeg, Johnson-Brown, Metcalf, Silva, Sorrell, Wakefield
Associate professors: Alemi, Baghi, Choi, Dawson, Douglas, Ferguson, Fisher, Gaffney, Maddox, Moore, Noble, Redmond, Vail, Wu
Assistant professors: Atherton, Bernstein, Boland, Boyd, Brenkus, Carle, Conti, Davidson, Edwards, Kodahek, Langley, Normile, Pavloski, Roberts, Rudowski, Washington, Willis, Young,
Adjunct professor: Tornaboni
Adjunct associate professors: Bednash, DeLeon, Geolot, Johnson
Adjunct assistant professor: Barry
Instructors: Alsace, Blasser, Boyd, Durham, Gillette, Liss, Maradiegue, Merritt, Miklancie, Moss, Robertson, Stoehr, Urban, Venske
Lecturers: Burch, Brown
220 College of Nursing and Health Science

Student Health Services
The George Mason University Student Health Services is operated through a partnership between the College of Nursing and Health Science and University Life.

Course Work
The College of Nursing and Health Science offers all course work designated NURS and HSCI in the "Course Descriptions" chapter of this catalog.

ACADEMIC PROGRAMS

Undergraduate Degrees and Pathways
Bachelor of Science in Nursing (B.S.N.)
   Traditional
   Accelerated master's degree for traditional students
   LPN-B.S.N.
   RN-B.S.N.
   Second degree
   Bachelor of Science in Health Science
   Health Systems Management (traditional and accelerated pathways)
   Health Care Coordination (traditional and accelerated pathways)

Graduate Degrees and Pathways
Master of Science in Nursing (M.S.N.)
   Nurse Administration
   Advanced Clinical Nursing
   Nurse Practitioner
   RN-M.S.N.
   Master of Science in Health Science
   Health Systems Management
   Health Policy Analysis
   Electronic Commerce and Technologies in the Health Industry
   M.S.N./M.B.A.
   Nursing, Ph.D.

Certificates
   Nutrition (undergraduate)
   Gerontology (undergraduate and graduate)
   International Health (graduate)
   Nursing Administration (graduate)
   Nursing Education (graduate)
   Conflict Resolution for Health Professionals (graduate)
   Quality Improvement and Outcomes Management in Health Care Systems (graduate)

UNDERGRADUATE PROGRAMS
The undergraduate nursing program at George Mason University uses a community-based curriculum preparing students to deliver superior nursing care and provide leadership in nursing in the increasingly complex and challenging field of modern health care. Graduates are in demand as professional nurses in hospitals, long-term care facilities, community health agencies, and other health care agencies. The program emphasizes health promotion and disease prevention capitalizing on early detection of potential health problems, health maintenance in ambulatory services, and preparation for the managerial responsibilities of nursing.

The program is accredited by the Virginia State Board of Nursing, the National League for Nursing, and the Commission on Collegiate Nursing Education.

Attendance at the first meeting of all nursing courses (lecture, on-campus laboratory, and agency laboratory) is mandatory.

Nursing Professional Development
Continuing nursing education is a commitment of the College of Nursing and Health Science and the university. Activities are planned to meet the special needs of individuals and groups in the community. The College of Nursing and Health Science offers opportunities for credit and noncredit courses. Contract courses are offered in a variety of health care agencies in the Northern Virginia area. These credits can be applied to a program of study in nursing.

Comments and suggestions for programming from the health care community are welcomed. To obtain information about specific activities, call (703) 993-1910.

Nursing, B.S.N.
The B.S.N. degree prepares graduates to function as professional nurses in hospitals, long-term care facilities, and the community. The community-based program may be completed on a full- or part-time basis. Special accelerated pathways for registered nurses (RNs) and licensed practical nurses (LPNs) take into account the needs of the working RN and LPN. A twelve-month, full-time accelerated pathway for students with a baccalaureate degree outside of nursing also is offered. (The Med-U-Net scholarship students complete this program in a 15-month sequence.) Students interested in these pathways must contact the nursing program before admission. All pathways lead to completion of the objectives of the undergraduate program.

Clinical nursing begins at the junior level. Students must complete a prenursing curriculum and be admitted to junior standing or to one of the accelerated pathways.

Acceptance Into Junior Standing in Nursing
A student who is interested in pursuing a major in nursing must make an additional and separate application for junior standing through the College of Nursing and Health Science.

To be eligible to apply for junior standing, traditional prenursing students must complete the 39 credits of required general education, which apply to the degree, by the end of the spring semester. LPN students who desire to be full-time students must complete all prerequisite general education requirements by the end of the semester preceding entry into the nursing major.

Students must earn a C or better in psychology (6 credits); sociology or anthropology (3 credits); BIOL 124 and 125 (8 credits); and BIOL 246 and 306 (4 credits).

Admission to the nursing program is competitive. It is based on a minimum cumulative GPA of 3.000 in the prerequisite general education course work (wherever taken) required for the degree (excluding electives, U.S. history, western civilization, information technology, and English 302). The acceptable GPA may increase each year based on the number of spaces available in the nursing program.

Transfer students and those changing their majors to nursing are ranked downward from 4.000 on the basis of the

http://catalog.gmu.edu
number of junior spaces available in any given year. Students admitted as prenursing freshmen must have a minimum GPA of 3.000.

Students are accepted for junior standing each fall. The application deadline is April 1, and students are notified of their status in early June. LPN students desiring to be full-time students in the spring semester must submit an application by November 15. Part-time LPN students are admitted in the fall and spring semesters.

Permission to register for NURS 330, 331, 332, and 333 requires prior acceptance into junior standing in nursing. Full-time nursing requires carrying a heavy schedule; therefore, outside obligations should be limited to ensure success.

Degree Requirements
Candidates for the degree must present at least 120 credits. Specific requirements for the B.S.N. are as follows.

<table>
<thead>
<tr>
<th>Credits</th>
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<tbody>
<tr>
<td>Language arts, culture, and global understanding</td>
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<tr>
<td>ENGL 101 and 302 (three credits of humanities are a prerequisite to ENGL 302)</td>
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<tr>
<td>Communication</td>
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<tr>
<td>Ethics</td>
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<tr>
<td>Literature (at 200 level or above, does not include ENGL 101 and 302)</td>
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<tr>
<td>U.S. history</td>
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<tr>
<td>Western civilization</td>
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<tr>
<td>Global understanding</td>
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<td>Synthesis</td>
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<tr>
<th>Credits</th>
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<tbody>
<tr>
<td>Social and behavioral sciences</td>
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<tr>
<td>Sociology or anthropology</td>
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<tr>
<td>Psychology (PSYC 100 and 211)</td>
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<tr>
<td>(Any psychology for RNs and LPNs)</td>
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<tr>
<th>Credits</th>
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<tbody>
<tr>
<td>Natural sciences and mathematics</td>
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<tr>
<td>BIOL 124 and 125</td>
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<tr>
<td>Microbiology (BIOL 246 and 306)</td>
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<tr>
<td>Statistics (STAT 250)</td>
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<tr>
<td>Normal nutrition (HSCI 295)</td>
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<tr>
<td>Information technology</td>
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<tr>
<th>Credits</th>
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<tr>
<td>Nursing major</td>
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<table>
<thead>
<tr>
<th>Credits</th>
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<tbody>
<tr>
<td>Electives</td>
</tr>
<tr>
<td>(No more than three credits of nursing electives may be used to satisfy this requirement.)</td>
</tr>
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</table>

Total | 120 |

Students pursuing a B.S.N. must take BIOL 124 and 125. This will meet the natural science portion of the general education requirements. Nursing students are exempt from the general education requirement of a fine arts course. Nursing students must take an approved synthesis course (3 credits).

The university provides opportunity for credit by examination in several courses for students presenting evidence of previous education. Programs of study are based on student needs.

Writing-Intensive Requirement
The university requires all students to complete at least one course in their majors designated "writing intensive" at the 300 level or above. Students majoring in nursing fulfill this requirement by successfully completing NURS 465.

Academic Grade Standards
Progression

Nursing Academic Warning
A final nursing course grade of less than C prohibits further progress in the nursing major until that course is repeated and a satisfactory grade of C or better is earned.

The student is placed on "nursing academic warning" and must notify the assistant dean for undergraduate programs in writing, within two weeks of final exams, of his/her intent to repeat the course. Students should be aware that space may not be available in some clinical nursing courses that they may need to repeat. Although attempts will be made to place the student clinically, it must be understood that the student may have to sit out a semester or more until space becomes available.

A nursing course in which a grade of less than C is earned may be repeated once. A student who fails to earn a C or better in the repeated course is dismissed from the nursing program. Upon earning a grade of C or better in the repeated course, the student may resume progress in the sequence of required courses.

Earning a grade of less than C in a second nursing course results in dismissal from the nursing program.

A nursing major who has failed a course must repeat the course and earn a C or better to resume progression in classes with NURS/HSCI prefixes. Before the course is repeated, the student may not register for any other courses with a NURS or HSCI prefix.

Professional Conduct Policy
The College of Nursing and Health Science reserves the right to discipline (i.e., place on probation, suspend, or dismiss) a student from the program who does not demonstrate professional conduct. This includes, but is not limited to, verbal abuse and/or insubordination, as well as behavior that threatens the safety of a client, another student, a faculty member, or other health care provider when the behavior occurs within the context of the academic program. The student has the right to appeal. The process for implementation of this Professional Conduct Policy is documented in the College of Nursing and Health Science Student Handbook.

Readmission
Readmission to the nursing program for nonacademic and/or professional infractions is not automatic. A former student must apply in writing for readmission to the assistant dean for undergraduate programs by September 1 for the spring semester, by February 1 for the fall semester, or by November 1 for the summer term.

The letter requesting readmission should include the following:
1. A description of the circumstances surrounding the non-academic suspension
2. A description of interim activities
3. Steps taken to support success upon readmission
4. Reasons readmission is justified
5. Rationale to support expectation of success upon readmission

Students meeting the above criteria are considered for readmission on a space-available basis. Students have the right to appeal unfavorable decisions.

**Leave of Absence**
A leave of absence from the nursing program of up to two semesters may be requested in writing by a student in good standing. Readmission following the leave of absence is granted only on a space-available basis.

**Appeal Process**
Although the faculty members of the nursing program are generally the best judges of a student's professional performance, in some instances a student may feel that their judgment of readmission or dismissal is unfair. In such cases, the student should ask the assistant dean for undergraduate programs to reconsider the decision. If the student remains dissatisfied, the matter may be appealed to the dean. If the dean believes that the student may have a legitimate complaint, the dean will appoint a committee of three faculty members and a student peer to review the decision. After the committee thoroughly reviews the student's case, it will issue a written recommendation to the dean with a copy to the assistant dean.

**Undergraduate Honors Program**
The honors program within an undergraduate major in the College of Nursing and Health Science provides opportunities for highly motivated, self-directed students seeking enriched course work and research involvement. Highly qualified students in any of the nursing and health science programs are eligible to participate in specialized course work while working closely with an honors faculty advisor and graduate students to accomplish individualized projects.

Policies that apply to the honors program within the undergraduate nursing program are described below:

1. Course work: The undergraduate honors program includes a minimum of 6 credits or two to three semesters of honors course work. This course work is accomplished through one or more of the following options:
   a. Nursing courses designated as honors courses. This could be a designated section of an existing course or a special course developed for the honors program (i.e., Honors Colloquium).
   b. Independent study courses designated as honors courses.
   c. Add-on honors credits that are completed in conjunction with an existing required nursing course. One or 2 credits are given for additional work required of an honors student.

   All honors courses contain the word "honors" so they are easily identified in the University Catalog, Schedule of Classes, registration forms for specialized courses, and on student transcripts.

2. Criteria for admission to the undergraduate nursing honors program:
   a. George Mason students awarded general education honors and achieving a 3.00 GPA in the prerequisite course work for junior standing are accepted into the nursing honors program. All other interested traditional students apply during the first semester of junior-level nursing course work. Interested LPN and RN pathway students apply while taking NURS 334.
   b. Applicants to the undergraduate honors program must submit a GPA of 3.500 or better; short essay; and a letter of reference from a teacher familiar with their academic abilities; and a letter of reference from a colleague able to speak to the applicants leadership potential, and past and future community involvement.
   c. Final decisions on acceptance of students to the honors program in nursing are made by the College of Nursing and Health Science Honors Admissions Committee.

3. Students admitted to the nursing honors program do not constitute more than 10 percent of the graduating students receiving B.S.N. degrees each year.

**Student Learning Portfolio**
All students in the College of Nursing and Health Science initiate a learning portfolio in the first semester of the junior year. The purpose is to provide evidence of a student's ability to meet programmatic outcomes of provider of care; designer, manager, and coordinator of care; member of the profession; demonstrate development of professional values and behaviors through providing evidence of work completed throughout the nursing program; and develop a "Best Works" portfolio at the conclusion of the nursing program to evaluate program outcomes and to use for ongoing professional development. Each course requires elements of the portfolio and is integrated into the course syllabus.

**Required Computerized NCLEX Assessment**
All students are required to take a computerized version of a practice NCLEX-RN exam in the first semester of their senior year.

**Special Requirements**

**Fees and Expenses**
Fees and expenses specific to the nursing program are as follows: laboratory equipment kit, standardized testing fee, uniforms, stethoscope, name pin, books, course materials, transportation to and from agencies, CPR certification, fee for review of health forms, immunizations, and any other additional fees as mandated by clinical agencies (i.e., clinical background check).

A one-time lab fee of $90 for traditional and $80 for LPN students is required before beginning the first semester of nursing. A lab fee of $15 is required for RN students before they take NURS 425. A one-time health records review fee of $10 is required for all students before their first clinical rotations.

Nursing students are required to obtain a health examination and immunizations before registering for their first clinical course. Students must complete two of the three hepatitis B immunizations in accordance with current U.S. Public Health Service recommendations before entering the first clinical setting. The cost of the immunizations is the responsibility of the student. Student immunization records are monitored at the College of Nursing and Health Science.
Office of Student Academic Affairs, which charges a small fee for this service.

Clinical agencies sometimes require additional records and documentation, such as criminal background checks, before student participation. Any cost is the responsibility of the student.

Student assignments are based on the learning needs of the student without regard to the HIV or HBV status of the client. Failure to practice universal precautions and blood-borne pathogen safety results in dismissal from the nursing program.

No student or faculty member is discriminated against or denied admission to the nursing program for the sole reason that the student or faculty member has been exposed to, infected, or diagnosed with HIV or HBV.

In the event that a student has a clinical experience/practicum exposure to body fluids of a client, procedures and appropriate incident reports are to be completed according to institutional and nursing policies.

Information related to exposure or infection is confidential, and dissemination of such information is based on the need to know criteria that apply generally in health care situations. A complete and detailed HIV/HBV policy is available in the College of Nursing and Health Science Office of Student Academic Affairs.

All students are required to have an active George Mason University e-mail account.

Students are responsible for their own uniforms and transportation. Student liability insurance is provided by the university. Students are strongly advised to maintain health insurance coverage at all times. An accident and health insurance plan is available through the university. Each student is responsible for his or her health care, including emergency care. The nursing program assumes no financial responsibility for the health care of students.

All students must have CPR certification before entering the first clinical nursing course and maintain it through the remainder of the program. Either the American Red Cross Professional Rescuer or the American Heart Association Basic Life Support is required.

The drop period for nursing courses offered for fewer than 14 weeks is three weeks.

Because knowledge, skills, and behavior patterns in the major field of this program are so vital to the health and perhaps even the survival of individuals or groups being served, failure or borderline achievement cannot be tolerated. Therefore, the faculty of the nursing program has established, with approval of university faculty and administration, special major field quality standards that go beyond the general university quality standards printed elsewhere in this catalog.

**RN and LPN Licensure Requirement**

RN and LPN students are required to submit a copy of his/her license prior to entering the first nursing course.

**Health Science, B.S.**

The B.S. in health science prepares students to function as managers and clinicians in a variety of settings such as hospitals, clinics, community health, schools, home care, long-term care, employee health, managed care organizations, group medical practices, manufacturing, medical technology and supply organizations, the health insurance industry, and financial consultant services. Two pathways are available: health systems management and health care coordination.

The program may be completed on a full- or part-time basis, and special accelerated pathways for graduates of allied health technical programs take into account the needs of the adult learner. Interested students should contact the health science program before admission. All pathways lead to completion of the objectives of the undergraduate health science program. The major begins at the junior year. Students must complete a prehealth science curriculum before enrolling in major courses.

Students must check with their advisors to ensure that all general education requirements, global understanding (3 credits), and synthesis (3 credits) have been met prior to graduation.

**Program Requirements**

**Health Systems Management Traditional Pathway**

<table>
<thead>
<tr>
<th>Language arts and humanities</th>
<th>24</th>
</tr>
</thead>
<tbody>
<tr>
<td>English (ENGL 101 and 302)</td>
<td>6</td>
</tr>
<tr>
<td>Communication (COMM 101)</td>
<td>3</td>
</tr>
<tr>
<td>Philosophy (PHIL 309)</td>
<td>3</td>
</tr>
<tr>
<td>Literature</td>
<td>3</td>
</tr>
<tr>
<td>U.S. history</td>
<td>3</td>
</tr>
<tr>
<td>Western civilization</td>
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<tr>
<td>Fine arts</td>
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</tr>
<tr>
<td>Behavioral and social sciences</td>
<td>6</td>
</tr>
<tr>
<td>Sociology or anthropology</td>
<td>3</td>
</tr>
<tr>
<td>(SOCI 101 or ANTH 114)</td>
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<tr>
<td>Psychology (PSYC 100)</td>
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<tr>
<td>Natural science and mathematics</td>
<td>14</td>
</tr>
<tr>
<td>Biology (BIOL 103 and 104)</td>
<td>8</td>
</tr>
<tr>
<td>Statistics (STAT 250)</td>
<td>3</td>
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<tr>
<td>Information technology</td>
<td>3</td>
</tr>
<tr>
<td>Business and management</td>
<td>12</td>
</tr>
<tr>
<td>Economics (ECON 103)</td>
<td>3</td>
</tr>
<tr>
<td>Management (MGMT 302 and 312)</td>
<td>6</td>
</tr>
<tr>
<td>Government (GOVT 103)</td>
<td>3</td>
</tr>
<tr>
<td>Health science major</td>
<td>42</td>
</tr>
<tr>
<td>HSCI 302, 303, 332, 378, 402, 436, 440, 453, 465, 495</td>
<td></td>
</tr>
<tr>
<td>Electives (two must be in HSCI)</td>
<td>22</td>
</tr>
<tr>
<td>Total</td>
<td>120</td>
</tr>
</tbody>
</table>

**Health Care Coordination Traditional Pathway**

| Language arts and humanities | 30 |
| English (ENGL 101 and 302)   | 6  |
| Communication (COMM 101, 305, and 320) | 9  |
| Philosophy (PHIL 309)        | 3  |
| Literature                   | 3  |
| Fine arts                    | 3  |
| U.S. history                 | 3  |
| Western civilization         | 3  |
| Behavioral and social sciences | 12 |
| Sociology or anthropology    | 3  |
| (SOCI 101 or ANTH 114)       |    |
| Psychology (PSYC 100, 211, and 321) | 9 |

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**Natural sciences and mathematics** ...................... 14  
  Biology (BIOL 124 and 125) .......................... 8  
  Computer science (IT 103) ............................ 3  
  Statistics (STAT 250) .................................. 3  

**Business and management** .............................. 9  
  Economics (ECON 103) ................................. 3  
  Management (MGMT 302 and 312) ...................... 6  

**Health science major** ................................ 45  
  HSCI 250, 295, 332, 341, 344, 402, 436,  
  440, 453, 465, 497  

**Electives (two must be in HSCI)** ....................... 10  

Total ....................................................................... 120

Students pursuing the health care coordination pathway in the health science major must take BIOL 124 and 125. This will meet the natural science portion of the general education requirements.

### Health Systems Management Accelerated Pathway for Students with Associate’s Degrees in Allied Health

**Language arts and humanities** ......................... 24  
  English (ENGL 101 and 302) .......................... 6  
  Communication (COMM 101) ............................ 3  
  Philosophy (PHIL 309) .................................. 3  
  Literature .................................................... 3  
  U.S. history ............................................... 3  
  Western civilization ...................................... 3  
  Fine arts ..................................................... 3  

**Behavioral and social sciences** ......................... 6  
  Sociology or anthropology ............................. 3  
  (SOCI 101 or ANTH 114)  
  Psychology .................................................. 3  

**Natural sciences and mathematics** ..................... 14  
  Biology (BIOL 103 and 104) .......................... 8  
  Information technology .................................. 3  
  Statistics (STAT 250) .................................... 3  

**Business and management** .............................. 12  
  Economics (ECON 103) ................................. 3  
  Management (MGMT 302 and 312) ...................... 6  
  Government (GOVT 103) ................................. 3  

**Health science major** ................................ 64  
  HSCI 302, 303, 332, *334, 378, 402, 436,  
  440, 495  

Total ....................................................................... 120

*Upon completion of bridge course HSCI 334, students are awarded 15 advanced placement hours from the associate's degree program.

Students pursuing the health care coordination pathway in the health science major must take BIOL 124 and 125. This will meet the natural science portion of the general education requirements.

**Certificate in Gerontology**

The undergraduate certificate program in gerontology prepares students for work with older adults, as well as with professionals who are already working with the elderly. The program provides a background of basic knowledge in gerontology and permits the student to prepare in professional skill areas such as counseling, recreation, social work, nursing, and administration.

The certificate program is administered by the College of Nursing and Health Science. Three other academic units participate in the program: the Graduate School of Education, Department of Psychology, and Department of Sociology and Anthropology. A Gerontology Certificate Committee determines program policy and curriculum.

Academic advising and an application form are available through the College of Nursing and Health Science.

### Certificate Requirements

The certificate program in gerontology consists of 24 credits. Students receiving the certificate either must hold a baccalaureate degree or have earned one from George Mason University by the time they receive the certificate.

The 24 credits are divided as follows:

1. A minimum of 12 credits selected from HSCI 480; NURS 505, 570; PRLS 315, 415; PSYC 415; SOCI 441; and SOCW 483

2. Six credits in a practicum in gerontology: PSYC 548, 549  
   (Students must have completed at least 9 credits of core courses before enrolling in the practicum.)

3. Six credits of electives selected from HEAL 110, 323, 480; HSCI 332; PHED 415, 450, 499; PRLS 210, 310; PSYC 211, 325, 326, 415, 423; PUAD 502, SOCI 350, 390, 599; SOCW 300, 351, 352; reading and research in gerontology from any department

*HSCI* = Health Science Laboratory Course

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Certificate in Nutrition

The certificate in nutrition offers a variety of courses in nutrition for future and present health care professionals, researchers, and others who are commonly faced with community-related nutrition issues. The program is intended to help health care professionals and others who would like to increase their current knowledge in nutrition. This certificate is in no way an equivalent to the registered dietician license and does not provide a license to practice therapeutic nutrition.

Certificate Requirements:

Applicants are expected to have taken a beginning undergraduate level nutrition course such as HSCI 295 or equivalent. Applicants need not have a bachelor's degree in nursing. Application is made through the College of Nursing and Health Science. A requirement for the certificate is 15 credits of undergraduate/graduate course work.

Program of Study:

Required Courses: HSCI 420, HSCI 421, HSCI 422, HSCI 423, and one elective from the following: CHEM 102, CHEM 463, HSCI 150, HSCI 530, HSCI 578

GRADUATE PROGRAMS

Nursing, M.S.N.

The M.S.N. program is accredited by the Virginia State Board of Nursing and the National League for Nursing. The program prepares nurses for a variety of leadership roles in the health care delivery system. The adult or gerontological nurse practitioner in primary care and the family nurse practitioner tracks are part of a collaborative program with the George Washington University School of Medicine and Health Sciences. The adult or gerontological nurse practitioner and the family nurse practitioner tracks have been approved by the state boards of nursing and medicine in Virginia. The track in advanced clinical nursing prepares nurses to provide and manage care of individuals, families, and groups, including the chronically ill, the elderly, and others with self-care limitations. The track in nursing administration prepares nurses to function in management positions in hospitals, nursing homes, community health agencies, and other health-related facilities.

Admission Requirements

In addition to meeting the graduate admission requirements, an applicant to this program must have a cumulative GPA of 3.00 for the last 60 credits of undergraduate work, hold an active license as a registered nurse, and submit three letters of recommendation. Although the GRE is not formally required, applicants may be asked to submit GRE scores at the discretion of the school when it believes those scores will lead to a clearer presentation of the applicant's qualifications. Applicants must have successfully completed undergraduate statistics as well as a graduate bivariate statistics course.

Students applying to the tracks in advanced clinical nursing and the adult or gerontological nurse practitioner in primary care must have a health assessment course with a skills component within 18 months of the clinical practicum in the master's program.

In addition, applicants to the nursing administration track are required to have the equivalent of one year's experience in direct patient care as a registered nurse. It is recommended that students applying to the advanced clinical nursing and the adult or gerontological nurse practitioner in primary care tracks have the equivalent of one year's experience in direct patient care as a registered nurse.

Special Requirements

Graduate students are required to have annual health examinations and immunizations before enrolling in practicum courses. Students enrolled in the advanced clinical nursing, the adult or gerontological nurse practitioner in primary care, and the family nurse practitioner tracks must be in the process of completing a hepatitis B immunization series when they enroll for their first practicum course. Nursing administration students who have practicum placements in health care agencies also must be in the process of completing a hepatitis B immunization series when they enroll for their first practicum course. Student health and immunization records are monitored at the College of Nursing and Health Science Office of Student Academic Affairs, which charges a small fee for this service. All students are required to have an active e-mail account.

Degree Requirements

The master's program in nursing requires 37-48 graduate credits. Of these, a 13-credit core consists of course work in the theoretical foundations of nursing, applications in nursing research, a seminar in the ethics of health care, and a course on the organization of nursing and health care delivery systems. The nursing administration and advanced clinical nursing tracks require an additional 24 credits; the adult or gerontological nurse practitioner track requires an additional 29 credits; and the family nurse practitioner track requires an additional 35 credits. A graduate course in which a grade of C or below is earned may be repeated only once. Graduate students (both master's and doctoral students) may repeat no more than two courses in their total programs of study.

RN-M.S.N. Pathway

This pathway allows registered nurses who have completed 63 general education credits and have demonstrated substantial involvement in professional nursing within the past two years to earn the M.S.N. degree with a minimum of undergraduate course work. Three credits of the 63 credits are earned from a computer course. Students entering a major through this pathway must meet all the requirements for admission to that major.

Admission Requirements

In addition to fulfilling admission requirements for degree status in the university, applicants to this pathway must

- hold a current license to practice nursing;
- be graduates of an accredited nursing program;
- have earned a 3.000 GPA in 63 general education credits in an accredited institution; and
- demonstrate substantial involvement in professional nursing within the past two years as a registered nurse in clinical practice.
Program of Study

Bridge (established course)  
NURS 623 Clinical Concepts in Family Primary Care ................................. 3  
After completion of the bridge course, students choose one of the three tracks and meet all requirements of the graduate program.

Core Courses (required of all students)  
NURS 660 Seminar in the Ethics of Health Care .................. 3  
NURS 680 Theoretical Foundations  
Related to Nursing ........................................... 2  
NURS 685 Applications in Nursing Research .................. 3  
NURS 686 Projects in Nursing Research .................. 2  
NURS 688 Organization of Nursing and Health Care Delivery Systems ............... 3

Nursing Tracks (select one): Nurse Practitioner, Advanced Clinical Nursing, or Nursing Administration  
**Adult or Gerontological Nurse Practitioner in Primary Care**  
NURS 623 Clinical Concepts in Family Primary Care ......................................... 3  
NURS 746 Practicum in Adult Primary Care Nursing I ........................................... 6  
NURS 748 Practicum in Adult Primary Care Nursing II ........................................... 8

**Family Nurse Practitioner**  
NURS 623 Clinical Concepts in Family Primary Care ......................................... 3  
NURS 720 Practicum in Family Primary Care Nursing I ........................................... 4  
NURS 721 Practicum in Assessment and Management of the Developing Family ........... 8  
NURS 722 Practicum in Family Primary Care Nursing II ........................................... 8

Nursing Support Courses  
NURS 552/HCS 205 Advanced Physiology and Pathophysiology* ............................... 5  
NURS 554/HCS 207 Practicum in Advanced Health Assessment* .................. 1

**Related discipline support courses**  
**at George Washington University**  
HCS 206 Clinical Decision Making* .................. 2  
PHARM 207 Pharmacology* .................. 4  
• Co-listed with George Washington University School of Medicine and Health Sciences. All courses offered at George Washington University are charged at George Washington University tuition.

**Advanced Clinical Nursing**  
NURS 773 Advanced Clinical Nursing I ................................. 3  
NURS 775 Advanced Specialty Practice I ................................. 3  
NURS 776 Advanced Clinical Nursing II ................................. 3  
NURS 778 Advanced Specialty Practice II ................................. 3

Nursing elective in area of concentration  
(chronic care, gerontology, or oncology) ............... 3  
Related discipline support courses ....................... 6

**Nursing Administration**  
NURS 763 Administrative Theory in Nursing ....................... 3  
NURS 765 Practicum in Nursing Administration I ................................. 3  
NURS 766 Administrative Strategies in Nursing ....................... 3  
NURS 768 Practicum in Nursing Administration II ................................. 3

**Nursing Support Courses**  
NURS 654 Nursing Administration Financial Management ........................................... 3  
or HSCI 703 Financial Management of Health Systems ........................................... 3  
NURS support course ........................................... 3

**Related discipline support courses**  
Management/organizational theory ....................... 3  
Recommended courses include LRNG 601, PUAD 620, PSYC 632, or SOCI 602  
Related discipline support course ....................... 3

**M.S.N./M.B.A. Program**  
The M.S.N./M.B.A. program, offered jointly with the School of Management, prepares nurses for mid- and top-level administrative, leadership, and health policy roles in health and health-related organizations. A variety of health care and health-related settings are used for clinical practice experiences. The M.S.N./M.B.A. program requires 59.5 graduate credits, including graduate nursing, business, decision sciences, and elective courses.

Applicants to the M.S.N./M.B.A. program must have GMAT scores sent directly to George Mason University and must meet the admission requirements for graduate degree status in both the College of Nursing and Health Science and the School of Management.

**M.S.N. Courses**  
NURS 660 Seminar in the Ethics of Health Care ................................. 3  
NURS 680 Theoretical Foundations  
Related to Nursing ........................................... 2  
NURS 763 Administrative Theory in Nursing ....................... 3  
NURS 765 Practicum in Nursing Administration I ................................. 3  
NURS 766 Administrative Strategies in Nursing ....................... 3  
NURS 768 Practicum in Nursing Administration II ................................. 3  
NURS 790 Applications in Nursing Research ....................... 3  
NURS 791 Projects in Nursing Research ........................................... 2  
NURS 794 Organization of Nursing and Health Care Delivery Systems ................................. 3  
HSCI 703 Financial Management of Health Systems ........................................... 3

**M.B.A. Courses**  
MBA 603 Managerial Economics and Decisions of the Firm ................................. 3  
MBA 612 Managing Costs and Evaluating Performance ........................................... 1.5  
MBA 613 Financial Reporting and Decision Making ........................................... 3  
MBA 623 Marketing Management ........................................... 3

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MBA 633 Statistics for Business  
Decision Making ........................................... 3  
MBA 638 Managing Operations for  
Competitive Advantage .................................. 3  
MBA 643 Managerial Finance  
.............................. 3  
MBA 653 Organizational Behavior  
.............................. 3  
MBA 663 Introduction to Information  
Technology and Management  
.............................. 3  
MBA 673 Legal Environment for Management  
.............................. 3  
MBA 678 Strategy and Policy  
.............................. 3

■ Health Science, M.S.

The M.S. in health science provides students with the skills and tools to work in one of three capacities: 1) leaders and executive-level managers in evolving health systems; 2) health policy analysts; or 3) consultants and managers of electronic commerce and technology products and enterprises in the health system. The 39-credit curriculum was developed in response to the demand for advanced, health management and policy preparation for a variety of health care and allied health professionals.

The program of study is designed to prepare graduates with state of the art technical and humanistic skills to serve as leaders, managers, consultants, and health policy advisors in a variety of settings. Graduates are prepared to work in public and private health care systems, legislative arenas and public health agencies, health management and policy-related trade and consumer organizations, and health accreditation-regulatory organizations. The curriculum integrates concepts selected from a variety of disciplines with application in health management and policy endeavors; business management, economics, philosophy, organizational behavior, information technology, social psychology, public policy, law, and ethics as they uniquely apply to health management and health policy analysis.

The interdisciplinary curriculum is designed to prepare graduates with an understanding of the larger sociopolitical and economic context of which the health system is a part. It prepares working professionals with leadership knowledge, skills, and abilities that serve to improve efficiency and effectiveness of health systems by alignment of decisions and resource management that optimizes organizational and health-related public policy objectives/goals. Students examine issues and mechanisms of universal access as a social imperative, and the feasibility, need, and mechanisms of strengthening market factors. They create linkages and alignment between public and private sectors, and among voluntary, market, and regulatory forces in the context of a variety of public policy frameworks. From a community focus, students explore the design of seamless systems of care that provide health services on the life span continuum, and how to manage these systems and their impact on outcomes of care using ethical principles.

Admission Requirements/
Student Characteristics

Health care professionals with a baccalaureate degree and at least three years of leadership experience in the health field are eligible to apply. The curriculum is designed for experienced, working professionals with a track record of success in academic and work areas. An accelerated teaching/learning format consistent with executive-style programs is utilized. Class expectations are rigorous and require students to manage the learning of technically complex material at a fast pace. Students also are expected to possess basic computer skills (familiarity with Windows environments, e-mail, and Internet web browsers). An introductory noncredit course is available for those who do not have these skills.

Applicants to the program must submit transcripts from all previous college-level studies, references, a letter of interest specifying study goals, a curriculum vita, and a completed copy of the graduate admissions form. GMAT scores may be requested. Applicants are competitively selected. Admissions are made on a rolling basis for studies that commence in fall, spring, and summer.

Program Format and Curriculum Features

The program is scheduled to be convenient for working professionals. The usual schedule for students involves part-time study comprising two classes (6 credits) per semester. Classes are held primarily in evenings, with some Saturday day classes. Selected courses also are available via the Internet.

Courses in the health systems management curriculum offer content with the following unique features:

1. Content focuses on individual competencies in analytic decision making and how services are provided across institutions and levels of care through integrated systems. Services are analyzed according to the impact on individual health status and on enrolled populations, and how these groups affect utilization of health services. Business functions are taught in the context of integrated systems versus individual institutions (e.g., financial management examines how risk is incurred and distributed across multiple institutions).

2. Management skills are taught (breaking from traditional curriculum) from the contexts of leadership in learning organizations and as team leaders managing professionals across functional and clinical units. Business and clinical decisions are integrated with competencies in computer application in health care and clinical decision support systems, clinical case management, evaluation of clinical outcomes, and interorganizational relations.

3. The orientation of integrated managed care is based on the organization and delivery of community-based service networks. The curriculum prepares graduates to assess health risk, evaluate and understand consumer behavior, and structure/optimize community-based networks and fully integrated health systems.

4. The curriculum teaches applied public health policy skills that support the development and analysis of health policy and the management of political processes involving the health industry and health professionals in the United States. Health policy analysis concentration courses build on and integrate content from the courses in the degree program to prepare graduates for mid-level policy advisor or health policy analyst positions in government agencies, public policy and legislative arenas, and the health sector (i.e., formulate, analyze, interpret, and evaluate health policy).

Electronic commerce and technology concentration courses build on and integrate content from the courses in the degree program to prepare graduates for mid-level consultant or management positions in the health industry related to the development and management of electronic commerce and technology. This includes the development and management of products, services, and systems related to Telehealth and electronic commerce in health-related services, and information and data management in health care enterprises.
### Prerequisite for electronic commerce courses:
Prior to enrolling in INFS courses, students must demonstrate programming experience in at least one block-structured programming language (e.g., Java, C, C++, Visual Basic, Pascal) or in a scripting language (e.g., Javascript) used in web design. This experience can be obtained either through taking a basic program language course and/or work experience.

### Degree Requirements
Program of study for the M.S. degree in health science comprises 39 credits (three concentrations). Twenty-four credits form the common core of the degree, and another 15 form each of the three concentrations. Note: If students have not had recent relevant experience in the U.S. health system/industry, an additional three-credit core course is required, HSCI 678 Introduction to the U.S. Health System, bringing the number of credits required to 39.

<table>
<thead>
<tr>
<th>Course Description</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>HSCI 678 Introduction to the U.S. Health System</td>
<td>3</td>
</tr>
<tr>
<td>HSCI 701 Quantitative Decision Making</td>
<td>3</td>
</tr>
<tr>
<td>HSCI 707 Health Care Law and Ethics</td>
<td>3</td>
</tr>
<tr>
<td>HSCI 708 Operations Research/Quality Management of Health Services</td>
<td>3</td>
</tr>
<tr>
<td>HSCI 709 Health Informatics</td>
<td>3</td>
</tr>
<tr>
<td>HSCI 710 Health Policy and Management Practicum (Capstone)</td>
<td>3</td>
</tr>
<tr>
<td>HSCI 712 Health Services Research</td>
<td>3</td>
</tr>
<tr>
<td>HSCI 715 Health Economics</td>
<td>3</td>
</tr>
<tr>
<td>PUAD 620 Organizational Behavior</td>
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</table>

### Core Courses

<table>
<thead>
<tr>
<th>Course Description</th>
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<tbody>
<tr>
<td>HSCI 702 Managerial Accounting in Health Systems</td>
<td>3</td>
</tr>
<tr>
<td>HSCI 703 Financial Management of Health Systems</td>
<td>3</td>
</tr>
<tr>
<td>HSCI 704 Contemporary Issues in Health Policy and Management</td>
<td>3</td>
</tr>
<tr>
<td>HSCI 705 Strategic Management and Marketing in Health Care</td>
<td>3</td>
</tr>
<tr>
<td>HSCI 706 Integrated Health Systems</td>
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</table>

### Concentration in Health Systems Management (15 credits)

<table>
<thead>
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<th>Course Description</th>
<th>Credits</th>
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<tbody>
<tr>
<td>HSCI 542 Health Policy</td>
<td>3</td>
</tr>
<tr>
<td>HSCI 866 Health Care Public Policy</td>
<td>3</td>
</tr>
<tr>
<td>PUAD 640 Public Policy Process</td>
<td>3</td>
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### Electives (suggested) (6 credits)

<table>
<thead>
<tr>
<th>Course Description</th>
<th>Credits</th>
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<tbody>
<tr>
<td>ANTH 631 Refugees in Contemporary Society</td>
<td>3</td>
</tr>
<tr>
<td>CONF 703 Conceptions of Practice</td>
<td>3</td>
</tr>
<tr>
<td>CONF 709 War, Violence, and Conflict Resolution</td>
<td>3</td>
</tr>
<tr>
<td>CONF 731 Conflict in Organizations</td>
<td>3</td>
</tr>
<tr>
<td>CONF 745 Leadership Roles in Conflict and Conflict Resolution</td>
<td>3</td>
</tr>
<tr>
<td>HSCI/NURS 542 Health Policy</td>
<td>3</td>
</tr>
<tr>
<td>PHIL 510/NURS 660 Ethics in Health Care</td>
<td>3</td>
</tr>
</tbody>
</table>

### Total Credits Required: 39

Students must complete all courses with a 3.000 GPA to earn the certificate. If students already have taken the regular section of CONF 501, it can be applied toward the certificate.

### Certificate in Conflict Resolution for Health Professionals
This is a joint graduate certificate program offered through the College of Nursing and Health Science and the Institute for Conflict Analysis and Resolution. The certificate allows students to enrich their understanding of disputes that are specific to the health care arena through a series of courses with topics such as leadership, violence, health and conflict, organizational conflict, and the links between conflict resolution theory and practice.

<table>
<thead>
<tr>
<th>Course Description</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CONF 501 Introduction to Conflict Analysis and Resolution</td>
<td>9</td>
</tr>
<tr>
<td>CONF 713 Lab and Simulation I: Interpersonal and Intergroup Conflict</td>
<td>3</td>
</tr>
<tr>
<td>CONF 738/HSCI 635 Research Seminar in Health and Conflict (final course)</td>
<td>3</td>
</tr>
</tbody>
</table>

### Concentration in Health Policy Analysis

<table>
<thead>
<tr>
<th>Course Description</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>HSCI 542 Health Policy</td>
<td>3</td>
</tr>
<tr>
<td>HSCI 866 Health Care Public Policy</td>
<td>3</td>
</tr>
<tr>
<td>PUAD 640 Public Policy Process</td>
<td>3</td>
</tr>
</tbody>
</table>

### Concentration in Electronic Commerce and Technology in the Health Industry (15 credits)
Applicants to the electronic commerce certificate program must have earned a GPA of 3.00 or better in the last 60 credits. Additionally, applicants must possess the equivalent knowledge of operating systems theory and practice (INFS 601), database communications and distributed processing (INFS 612), and database management (INFS 614).

<table>
<thead>
<tr>
<th>Course Description</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>HSCI 720 Management of Health Information Systems</td>
<td>3</td>
</tr>
<tr>
<td>HSCI 722 Telehealth and Electronic Commerce in the Health Industry</td>
<td>3</td>
</tr>
<tr>
<td>INFS 640 Introduction to Electronic Commerce</td>
<td>3</td>
</tr>
<tr>
<td>INFS 767 Secure Electronic Commerce</td>
<td>3</td>
</tr>
<tr>
<td>INFS 762 Information Systems Security</td>
<td>3</td>
</tr>
</tbody>
</table>

### Certificate in Gerontology
The graduate certificate program in gerontology combines theoretical and applied course work in aging with the student's graduate curriculum in one of several departments. Because gerontology is by definition multidisciplinary, students in the program are required to take course work outside their major field. Two other academic units participate in the program: the Department of Psychology and the Department of Sociology and Anthropology. The program is administered by the College of Nursing and Health Science and super-
Certificate Requirements

Students applying to the certificate program must complete all courses with a 3.000 GPA to earn the certificate.

Certificate in Nursing Education

The graduate certificate program in nursing education combines foundation courses in education with courses in the principles and practices of nursing education. The program prepares students to function in nursing educational roles in both academic and nonacademic settings.

Certificate Requirements

Applicants to the graduate certificate program must hold a bachelor's degree in nursing. Application is made through the College of Nursing and Health Science.

Required courses

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>EDRS 531 Educational and Psychological Measurement</td>
<td>3</td>
</tr>
<tr>
<td>NURS 610 Curriculum Development</td>
<td>3</td>
</tr>
<tr>
<td>NURS 657 Perspectives in Nursing Education</td>
<td>3</td>
</tr>
<tr>
<td>NURS 658 Practicum and Seminar in Nursing Education</td>
<td>3-6</td>
</tr>
</tbody>
</table>

(Those who qualify for a three-credit practicum because of their educational experiences may choose the remaining three credits from courses designated by the graduate nursing program.)

Total | 15 |

Students must complete all courses with a 3.000 GPA to earn the certificate.

Certificate in Quality Improvement and Outcomes Management in Health Care Systems

The graduate certificate program in quality improvement and outcomes management in health care systems prepares working clinicians and administrative support staff in health care organizations to implement quality improvement initiatives and manage populations of patients to optimize the efficiency and effectiveness of care and services. Participants acquire the knowledge and ability to work in interdisciplinary health care teams, to use the tools and techniques of statistical process control, and selected methods and tools from operations research and quality improvement. Additionally, they are able to use information management technology and qualitative decision making applications to identify opportunities for clinical and administrative improvement, support decision making optimization, and improve health service outcomes for identified populations.

Certificate Requirements

Applicants to the graduate certificate program must hold a bachelor's degree. Application is made through the College of Nursing and Health Science.

Required courses

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>HSCI 701 Quantitative Decision Making in Health Systems Management</td>
<td>3</td>
</tr>
<tr>
<td>HSCI 708 Operations/Quality Management of Health Services</td>
<td>3</td>
</tr>
<tr>
<td>HSCI 709 Health/Medical Informatics for Health System Managers</td>
<td>3</td>
</tr>
<tr>
<td>HSCI 730 Clinical and Managerial Optimization in Health Care</td>
<td>3</td>
</tr>
</tbody>
</table>

Total | 15 |

Students must complete all courses with a 3.000 GPA to earn the certificate.

Certificate in Nursing Administration

The graduate certificate program in nursing administration offers formal study in theory and practice in nursing administration in the health care delivery system.

Certificate Requirements

Applicants to the certificate program must hold a bachelor's degree in nursing. Application is made through the College of Nursing and Health Science.

Required courses

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>NURS 763 Administrative Theory in Nursing</td>
<td>3</td>
</tr>
<tr>
<td>NURS 765 Practicum in Nursing Administration I</td>
<td>3</td>
</tr>
<tr>
<td>or NURS 768 Practicum in Nursing Administration II</td>
<td>3</td>
</tr>
</tbody>
</table>

Electives

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Graduate courses as approved by the student's advisor</td>
<td>9</td>
</tr>
</tbody>
</table>

Total | 15 |

Students must complete all courses with a 3.000 GPA to earn the certificate.
Electives ................................................................. 3-6
Graduate courses as approved by the student's advisor.

Note: A course in basic computer skills (credit or noncredit) and HSCI 678 Introduction to the U.S. Health System (must be taken if a student has not had recent working experience in the U.S. health system/industry) are considered optional for students who already possess the requisite knowledge and skills and are required for those who do not.

Total ................................................................. 15-18
Students must complete all courses with a 3.000 GPA to earn the certificate.

Nursing, Ph.D.
The Ph.D. program in nursing builds on the M.S.N. degree and requires 60 credits beyond the master's degree. The objective of the program is to prepare nurses for executive roles in selected areas of nursing and health care. The graduate of the Ph.D. program in nursing will do the following:
1. Exemplify administrative and leadership characteristics essential to assuming executive roles
2. Conduct and support research in nursing and health care ethics, health care administration, and health policy
3. Influence the formation and implementation of public policy in health care through analysis of sociocultural, economic, fiscal, political, ethical, and governmental processes

Admission Requirements
In addition to fulfilling the admission requirements for graduate degree status, the applicant must have earned a master's degree from an accredited program and have a minimum GPA of 3.250 on a 4.000 scale in the master's program. The applicant must submit evidence of at least one year of professional nursing experience, and Miller Analogies Test (MAT) scores, along with evidence of current licensure to practice professional nursing. (Students on foreign student visas must present evidence of professional standing in their respective countries.) Three letters of recommendation are required from professional or academic sources. At least two of the references must be from persons in contact with the applicant within the last two years. An interview with one or more persons on the Graduate Admissions Committee and a short essay describing the applicant's doctoral study goals also are required. A graduate bivariate statistics and organizational behavior course must be completed before enrollment.

The Graduate Admissions Committee may offer provisional admission to a degree-seeking applicant even though all admission requirements for degree status have not been met if there is sufficient evidence to suggest capacity to pursue graduate work. Students admitted provisionally must resolve all deficits and be moved to degree status by completing 12 credits of doctoral-level courses.

Degree Requirements
In addition to meeting graduate admission requirements, students must satisfy the specific Ph.D. degree requirements. To earn the Ph.D. degree at George Mason University, the doctoral candidate must have earned a minimum of 90 graduate credits beyond the baccalaureate degree and a minimum of 60 graduate credits beyond the master's degree. A minimum of 48 graduate credits after admission to degree status in the Ph.D. program at George Mason University is required, of which 36 must have been earned at George Mason University. The candidate may apply a maximum of 12 graduate transfer credits toward the Ph.D. degree but may only present graduate credits with satisfactory grades that meet the requirements of the Ph.D. curriculum.

A written comprehensive examination must be successfully completed in addition to the program of study outlined in the curriculum for the Ph.D. in nursing program. Successful completion of a dissertation, for which 9 credits are awarded but to which no grade is assigned, and the final oral doctoral examination are required.

A graduate course in which a grade of C or below is earned may be repeated only once. Graduate students (both master's and doctoral students) may repeat no more than two courses in the total program of study.

Program of Study
The curriculum of the Ph.D. program in nursing includes the nursing core (26 credits), research core (22 credits), and nursing and related discipline electives (12 credits). Before advancing to candidacy and enrolling for dissertation credit, the student must have his/her program of study approved by the College of Nursing and Health Science and by the coordinator of the doctoral program in the College of Nursing and Health Science.

Internship in Health Care Administration/Policy/Ethics
Students are required to enroll in a one-semester internship, NURS 874 Internship in Health Care Administration/Policy/Ethics (5 credits), which includes planned seminars, for experiential learning in health care administration. For the internship, a student is assigned to a doctorally prepared executive who serves as the preceptor in the student's field of emphasis.
A field experience of at least 150 hours is required and NURS 874 Internship is scheduled at the end of the course sequence in the program of study.

Advancement to Candidacy
After a student has successfully completed the qualifying examinations and all required course work, the coordinator of the doctoral program of the College of Nursing and Health Science approves advancement to candidacy.

Doctoral Dissertation Committee
The Doctoral Dissertation Committee is composed of at least three George Mason University faculty members: a director and reader in nursing, and a reader from outside nursing. The Doctoral Dissertation Committee must be approved by the dean of the College of Nursing and Health Science. Additional members of the George Mason University faculty or individuals from outside the university who present credentials equivalent to criteria for faculty may join the committee at the discretion of the committee and with the approval of the dean of the College of Nursing and Health Science.

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Doctoral Dissertation Proposal
The proposal must focus on a topic in nursing and must be approved by the Doctoral Dissertation Committee, doctoral program coordinator, and College of Nursing and Health Science dean. The dissertation proposal and written dissertation must be consistent with the guidelines of the university outlined in Guide for Preparing Graduate Theses, Dissertations, and Projects.

Doctoral Dissertation
Before enrolling for dissertation credit, the student must have advanced to candidacy. The student also must have an approved program of study and an approved doctoral dissertation proposal. The student’s completed dissertation must be approved by the Doctoral Dissertation Committee, doctoral program coordinator, and College of Nursing and Health Science dean.

Final Oral Doctoral Examination
The chair of the Doctoral Dissertation Committee, upon preliminary approval of the doctoral dissertation by the committee, petitions the doctoral program coordinator in the College of Nursing and Health Science to schedule the final oral doctoral examination, which includes a defense of the doctoral dissertation. The final oral doctoral examination also demonstrates the candidate’s intellectual command and maturity of judgment in the area of emphasis chosen by the candidate and approved by the Doctoral Dissertation Committee. At the close of the final oral doctoral examination, the Doctoral Dissertation Committee makes a final judgment regarding approval of the doctoral dissertation and successful completion of the Ph.D. degree requirements. As outlined in the Guide for Preparing Graduate Theses, Dissertations, and Projects, copies of the approved doctoral dissertation must be submitted to the doctoral program coordinator.

Time Requirements
The student must complete all planned course work, excluding electives, and must advance to candidacy within six years of admission to degree or provisional status in the Ph.D. program. The student must successfully complete the doctoral dissertation, final oral doctoral examination, and all Ph.D. degree requirements within five years following the semester of advancement to candidacy.

Continuing Professional Development
Continuing nursing education is a commitment of the College of Nursing and Health Science and the university. Activities are planned to meet the special needs of individuals and groups in the community. The College of Nursing and Health Science offers opportunities for credit and noncredit courses. Contract courses are offered in a variety of health care agencies in the Northern Virginia area. These credits can be applied to a program of study in nursing.
Rooted in the strong democratic government traditions of the Commonwealth of Virginia, the School of Public Policy (SPP) is committed to transcending traditional conceptual boundaries of research and teaching by integrating real world experience and problem solving into public policy education. The school’s programs focus on the interplay of culture, organizations, and technology in a quest to find alternative approaches to public policy decisions and policymaking. Teaching and research are focused on, but not limited to, six themes:

- Governance and Public Management
- International Commerce and Policy
- Organizational Informatics and E-Government
- Regional Development and Transportation Policy
- Science and Technology Policy
- Society, Culture, and Values in Public Policy

The School of Public Policy contributes to new and innovative concepts in policy formation while building on the fundamental, pluralistic, and democratic characteristics of policymaking in the United States. SPP endorses creativity and responsibility in governance, public management, and the development of economic policy.

**Graduate Degree Programs**

- Knowledge Management, M.S.
- Public Policy, Ph.D.
- Public Policy, M.P.P.
- International Commerce and Policy, M.A.
- Enterprise Engineering and Policy, M.S.
- New Professional Studies: Organizational Learning, M.S.
- New Professional Studies: Peace Operations, M.S.
- New Professional Studies: Transportation Policy, Operations, and Logistics, M.S.

The school also offers non-degree certificate programs.

For the most current information regarding SPP, visit the web site at [http://policy.gmu.edu](http://policy.gmu.edu).

**Administration**

Kingsley E. Haynes, Dean
James H. Finkelstein, Senior Associate Dean
Roger R. Stough, Associate Dean for Academic Affairs
294 School of Public Policy

Charles H. Wharton, Assistant Dean for Student Services
Matthys van Schaik, Assistant Dean for Academic Administration
William H. Coester, Administrator

Faculty
Addleson, Armor, Baker, Bowen, Button, Dinan, Finkelstein, Fuller, Gifford, Gulledge, Haynes, High, Hill, Kash, LaPorte, Lipsert, Malawer, McNeely, Perry, Petersen, Pfifflner, Reintr, Rodrigo, Rudder, Ruth, Schintler, Sibley, Sommer, Stough, Thatchenkery, Tolchin, van Schaik

Associate Faculty
Avruch, Conlan, Dietz, Donahue, Friesz, Guagnano, Heclo, Hennessey, Mahler, Paden, Regan, Scimecca

Research and Visiting Faculty

Adjunct Faculty

Faculty Emeritus
Warfield

Course Work
The School of Public Policy offers courses designated PUBP, ITRN, MNPS, and LRNG in the Course Descriptions chapter of this catalog. Further academic courses are offered in conjunction with the research activities of the Mason Enterprise Center in regional analysis and in entrepreneurship.

GRADUATE PROGRAMS

Public Policy, Ph.D.
(703) 993-2280
spp@gmu.edu

The Ph.D. in Public Policy program is distinctive in its heavy emphasis on the combined influence of technology, culture, and institutions on public policy. Participants in the program investigate the increasing tensions created by technologically driven organizational change.

To investigate the policy issues associated with substantive policy areas, students develop in-depth understanding of American institutions, values, and culture; competence in research methods and advanced analytical methodologies; and a comparative, international perspective. At the time of admission, each student is assigned a faculty advisor who assists in the design and development of the student’s program.

Admission Requirements
The program seeks students with exceptional potential for accumulating, sorting, analyzing, and communicating information and findings effectively. Public policy is inherently complex and value laden. In the end, high-quality policy analysis requires thoughtful and judicious management of complex and incommensurate information, both quantitative and qualitative. Potential students must be able to manage and integrate both kinds of information and produce persuasive, well-organized written syntheses and analytical insight.

The ideal Ph.D. program applicant has demonstrated capabilities in research and writing, basic mathematical skills roughly equal to the first semester of calculus, competence in statistics, some background in economics, and a theoretical and working knowledge of public policy processes. Applicants with strong records who are lacking in one or more of these areas may be admitted to the program and will receive assistance in making up the deficiencies.

The following items should be included with the application for graduate admission:

- Graduate application with application fee (no fee waivers).
- A two-page written statement of student’s goals and interest in advanced study in public policy.
- A current resume or vita.
- A master’s degree from an accredited institution with a GPA of 3.0 or better, and two official transcripts of all university work. International students are also required to submit an evaluation and/or translation of all foreign-earned degrees.
- Graduate Record Examination (GRE) or the General Management Aptitude Test (GMAT) score results. (Exam scores should not be older than five years.)
- Two letters of recommendation. At least one recommendation should be from an individual who is qualified to attest to the candidate’s academic potential.
- A writing sample (approximately 10-20 pages in length), such as a technical report, professional publication, or term or seminar paper.
- TOEFL scores (for international applicants) — with a minimum score of 600 (paper-based) or 250 (computer-based). Students may also be required to be tested by the English Language Institute.

Prospective students are encouraged to meet with the program director.

Deadlines
The application deadline for students seeking financial aid is April 1. The deadline for all other students is May 1 for the fall semester. Students interested in admission for the spring semester are encouraged to meet with the program director.

Degree Requirements
Students are required to complete a minimum of 82 credits of course work, of which no more than 24 may be dissertation credits. Up to 30 credits from a prior master’s degree may be applied toward the doctoral requirements at the discretion of the program director. Credit is not given for comprehensive examinations passed at other universities.

Specific course work requirements for the doctorate include five core courses (two in research and analytic methods and three in foundational policy topics), two semesters of participation in the research colloquium, two courses in an area of program concentration, and four advanced courses tailored to the student’s research needs and interests. Courses are determined in collaboration with the student’s advisor and are usually drawn widely from other programs throughout the university as well as the school.

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At the completion of the first academic year of full-time study, students must pass a qualifying examination that evaluates their mastery of the first year's material and their ability to integrate that material in addressing important and complex public policy problems and issues. The program also requires that students pass a field examination structured around their specific field of proposed doctoral research, usually in the second or third year of study. Other requirements include the successful preparation and defense of both a doctoral research proposal and the ensuing dissertation.

A complete description of the program policies, procedures, and requirements is contained in the SPP Student/Faculty Handbook published each year.

**Public Policy, M.P.P.**

(703) 993-8200
spp@gmu.edu

The master's program in public policy leads to a degree for aspiring or experienced professionals who seek career advancement through cutting-edge education and training in policy analysis and development in increasingly technical and global environments. The program prepares the students as reflective practitioners to develop, implement, manage, analyze, evaluate, and affect innovative change in both the public and private sectors through a course of study emphasizing (1) the fundamentals of policy development; (2) the role of technology, analytic assessment, and modeling for policy evaluation; and (3) the implications of international and global perspectives on policy formation. Courses are offered in late afternoon and in the evening to fit the schedules of busy professionals.

**Admission Requirements**

Complete applications for both fall and spring semesters are reviewed on a rolling basis, with late applications considered on a space-available basis. To enter the program as a degree candidate, a student must meet the following minimum requirements:

- Graduate application with application fee (no fee waivers).
- A two-to-three page written statement of student's goals and interest in the program.
- A current resume.
- A bachelor's degree from an accredited institution with a preferred GPA of 3.00 or better (on a 4.0 scale) in the last 60 semester hours of baccalaureate study. Submit two official transcripts of all university work completed. International students are also required to submit an evaluation and/or translation of all foreign-earned degrees.
- Graduate Record Examination (GRE), GMAT, or MAT scores are optional.
- TOEFL scores (for international applicants) - with a minimum score of 575 (paper-based) or 230 (computer-based). Students may also be required to be tested by the English Language Institute.
- Two letters of recommendation. At least one recommendation should be from an individual who is qualified to attest to the candidate's academic potential.

Students may be admitted for non-degree study and take individual courses that satisfy requirements for a certificate. Students may apply courses toward the master's degree should they choose to apply to the degree program, in accordance with university policy.

**Degree Requirements**

To earn a master's degree in public policy, students must complete 39 credit hours of course work through a combination of core courses, a sequence of courses in their area of concentration, and a professional experience requirement. Appropriate professional experience can be demonstrated either through previous employment, a supervised internship, or an approved policy project activity. A student will also be exposed to the global nature of public policy activity through the core requirement of international comparative policy assessment. One of the courses in the concentration sequence will also have an international focus. The plan of study includes:

<table>
<thead>
<tr>
<th>Required Core Courses</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>PUBP 700 Theory and Practice in Public Policy</td>
<td>4</td>
</tr>
<tr>
<td>PUBP 702 Comparing Political Institutions</td>
<td>4</td>
</tr>
<tr>
<td>PUBP 703 Organizational Informatics in Public Policy</td>
<td>4</td>
</tr>
<tr>
<td>PUBP 704 Statistical Methods in Policy Analysis</td>
<td>4</td>
</tr>
</tbody>
</table>

**Additional Required Public Policy Courses**

Choose three of the following five courses (3 credits each):

- PUBP 713 Policy and Program Evaluation
- PUBP 720 Managerial Economics and Policy Analysis
- PUBP 730 U.S. National Policy Systems
- PUBP 731 Macro Economic Policy Assessment
- PUBP 741 Financial Policy Processes and Procedures

And one of the following:

- PUBP 705 Advanced Statistical Methods for Policy Research
- PUBP 711 Rational Choice and Uncertainty: Modeling Judgment
- PUBP 712 Policy Analysis and Management Science

**Substantive Policy Concentrations**

Electives are selected in one of the following policy concentrations:

- Transportation Policy, Operations, and Logistics
- Regional Economic Development and Technology Policy
- Governance Systems and Policy Management
- International Governance and Institutions
- Organizational Informatics in the Policy Enterprise
- Collaboration and Learning in Policy Organizations
- Science and Technology Policy
- Culture, Values, and Social Policy
- International E-Commerce and Telecommunications
- National Security and Public Policy

**Professional Experience Requirement**

Certification that the student has experience in the public policy process outside of the classroom and is ready to take leadership responsibilities must be exhibited in one of the following ways:

- Previous professional experience (approved by program director);
- Internship (minimum three months);
- Service as a project team leader with an external client for a minimum of six months half-time employment

**Total Credits**

39
Certificate Programs

Students pursuing the master's degree who complete an additional nine semester hours in their specified concentration (for a total of 48 hours) will receive a certificate in addition to their master's degree.

Graduate certificates will be awarded to non-degree students in a substantive policy sequence upon the completion of at least 15 credit hours, which must include a three-hour public policy core course and at least 12 hours of a policy concentration sequence. Certificate programs are offered in transportation policy, operations, and logistics; regional economic development and technology planning; governance systems and policy management; international governance and institutions; organizational informatics and the policy enterprise; collaborations and learning in policy organizations; science and technology policy; and international e-commerce and telecommunications policy. The programs are open to those with a bachelor's degree who seek continuing education and skills to remain competitive in an increasingly complex global economy. Admission requirements are the same as those for the master's program above.

International Commerce and Policy, M.A.

(703) 993-8200
spp@gmu.edu

The International Commerce and Policy (ICP) program is an interdisciplinary course of study to help students from around the world prepare for jobs in the new economy. Unlike traditional international affairs programs, the degree is focused on international economic issues such as global trade and investment. The Master of Arts in International Commerce and Policy differs from an M.B.A. program by providing training in the political, social, and technological aspects of the global economy. In today's world, it is critical for all participants in global markets to understand the multifaceted environment in which they work.

The core faculty is supplemented by adjunct faculty who bring a wealth of practical knowledge and experience, as well as strong academic qualifications, to the program. Adjuncts are drawn from the United States Departments of Commerce and State, the Office of the United States Trade Representative, and the International Trade Commission, among other government agencies, as well as from the private sector, the think tank community, and trade associations.

Courses are offered in the late afternoon and in the evening to fit the schedules of busy professionals. In addition to classroom study, the program emphasizes experiential learning by supporting student internships, cooperative planning, and research activities with private- and public-sector employers, and by sponsoring a variety of study abroad experiences. As an example, the ICP program has a special arrangement with Saint Peter's College, Oxford University that allows qualified students to study at Oxford during the summer session. A summer study abroad program has also been established with the Capitol University of Economics and Business in Beijing, while a winter study program visits India.

Admission Requirements

Students from all academic backgrounds are welcome to apply, though some knowledge of economics, preferably at least two undergraduate economics courses, is encouraged.

While many may have prior educational and work-related training in business and economics, others see the ICP program as a bridge from government, education, and other non-business occupations to careers in the global economy. Complete applications for both fall and spring semesters are reviewed on a rolling basis, with late applications considered on a space-available basis. To enter the program as a degree candidate, a student must meet the following minimum requirements:

- Graduate application with application fee (no fee waivers).
- A two-to-three page written statement of student's goals and interest in the program.
- A current resume.
- A bachelor's degree from an accredited institution with a preferred GPA of 3.00 or better (on a 4.0 scale) in the last 60 semester hours of baccalaureate study. Submit two official transcripts of all university work completed. International students are also required to submit an evaluation and/or translation of all foreign-earned degrees.
- Graduate Record Examination (GRE), GMAT, or MAT scores are optional.
- TOEFL scores (for international applicants) - with a minimum score of 575 (paper-based) or 230 (computer-based). Students may also be required to be tested by the English Language Institute.
- Two letters of recommendation. At least one recommendation should be from an individual who is qualified to attest to the candidate's academic potential.

Students may be admitted for non-degree study, and take individual courses that satisfy requirements for a certificate. Students may apply courses toward the master's degree should they choose to apply to the degree program, in accordance with university policy.

Degree Requirements

The ICP program requires 42 credits of course work. All degree candidates must take 25 credits of work in the required courses as described below. The remaining 17 credits, which must be chosen in consultation with an ICP faculty advisor and should relate to a student's career objectives, consist of electives and a final project, internships, independent studies, and study abroad. Most electives are grouped into thematic areas, such as international trade and finance, international marketing, international trade relations, and technology and international commerce. Many students focus their studies on a particular region of the world, a policy issue, or a business sector.

Students entering the program complete the foundation core courses first in order to prepare them for higher-level course work.

Core Courses

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>ITRN 500</td>
<td>Approaches to International Commerce and Policy</td>
<td>4</td>
</tr>
<tr>
<td>ITRN 504</td>
<td>Trade and Microeconomics for International Commerce</td>
<td>4</td>
</tr>
<tr>
<td>ITRN 503</td>
<td>Investment and Macroeconomics for International Commerce</td>
<td>4</td>
</tr>
<tr>
<td>ITRN 601</td>
<td>Research and Analysis Methods for International Commerce</td>
<td>3</td>
</tr>
<tr>
<td>ITRN 605</td>
<td>Culture and International Commerce</td>
<td>3</td>
</tr>
<tr>
<td>ITRN 603</td>
<td>International Trade Relations</td>
<td>3</td>
</tr>
</tbody>
</table>
ITRN 602 International Financial Institutions and Globalization 3
or ITRN 604 International Trade and Technology 3

Electives .................................................................................................................. 15
Electives to satisfy these credits may be grouped in a specific concentration, such as international marketing or international finance, or may be in different areas.

Final Project ........................................................................................................... 2
All students must integrate their knowledge and skills in a final project, required for graduation. It is assigned variable credit to complete the necessary 42 credit hours. The project is usually a 40-page capstone paper that draws on the key themes of the program.

Total Credits ........................................................................................................... 42

Certificate Programs
Students pursuing the International Commerce and Policy, M.A. who complete an additional nine semester hours in a designated area (for a total of 51 hours) will receive a certificate in addition to their master’s degree.

Graduate certificates will be awarded to non-degree students in one of the following areas upon completion of 15 credit hours, which must include ITRN 500. Certificate programs are offered in global trade management; international business planning; international market analysis; managing international commerce; regional trade policy and planning; and science, technology, and the global economy. The programs are open to those with a bachelor’s degree who seek continuing education and skills to remain competitive in an increasingly complex global economy. Admission requirements are the same as those for the master’s program above.

Enterprise Engineering and Policy, M.S.
(703) 993-8099
spp@gmu.edu

The Enterprise Engineering and Policy (EEP) M.S. degree program provides a technology degree for those interested in designing, integrating, and managing technology-enabled private and public organizations using modern enterprise solutions. The program is focused on teaching students how to design, integrate, manage, and optimize the extended enterprise, which includes customers, suppliers, and other organizational claimants. It emphasizes the impact that enterprise integration is having on the way organizations manage their business processes. This includes the implementation and tuning of enterprise resource planning systems, business-to-business extensions (including customer- and supplier-facing solutions), and other standard software solutions.

The EEP program is designed to provide students with significant experience in working with enterprise solutions in a problem-solving environment. This program is focused not on software development or engineering, but rather on integrating and implementing commercial software solutions in public and private organizations. It is focused on the engineering implementation consulting aspects of standard replicable software from major enterprise vendors, that is, enterprise consulting at the applications level.

Understanding the distinction between enterprise engineering and proprietary system development is critical. Enterprise engineering focuses on the configuration and integration of commercial software for replicable business processes. Proprietary design and development focuses on building new nonreplicable systems to meet particular needs.

The Schools of Information Technology and Engineering (IT&E) and Public Policy (SPP) jointly administer the EEP Program.

Admission Requirements
Courses are open to students who hold a baccalaureate degree from an accredited college or university, and who hold a B.S. or B.A. degree in any engineering, math, science, computer science, business (with a quantitative background), economics, or other analytic-related discipline. The following is required: a background in managerial accounting; proficiency in a procedural or object-oriented programming language; database familiarity (at least Access); and college-level mathematics through linear algebra, multivariate calculus, and statistics. Depending on their prior background, applicants may be required to complete 3 to 6 credit hours of preliminary course work before enrolling in any of the core courses or specialty courses in the program. A minimum 3.00 undergraduate GPA is required.

Complete applications for both fall and spring semesters are reviewed on a rolling basis, with late applications considered on a space-available basis. To enter the program as a degree candidate, a student must meet the following minimum requirements:
• Graduate application with application fee (no fee waivers).
• A two-to-three page written statement of the student’s goals and interest in the program.
• A current resume.
• A bachelor’s degree from an accredited institution with a preferred GPA of 3.00 or better (on a 4.0 scale) in the last 60 semester hours of baccalaureate study. Submit two official transcripts of all university work completed. International students are also required to submit an evaluation and/or translation of all foreign-earned degrees.
• Graduate Record Examination (GRE), GMAT, or MAT scores are optional.
• TOEFL scores (for international applicants) – with a minimum score of 575 (paper-based) or 230 (computer-based). Students may also be required to be tested by the English Language Institute.
• Two letters of recommendation. At least one recommendation should be from an individual who is qualified to attest to the candidate’s academic potential.

Students with academic deficiencies may be accepted conditionally pending removal of the deficiencies. Courses taken to remove admission deficiencies extend the minimum requirements for the degree. Students whose undergraduate training was in the quantitative social sciences or quantitatively oriented business administration may be allowed to complete a portion of the mathematics prerequisite by taking SYST 500.

All decisions related to the student’s course of study must be approved by his or her advisor, with consent of the director of the EEP program.
Degree Requirements

The program consists of 33 graduate credits.

Required Core Courses ....................................... 15
EEP 601/PUBP 771/ SYST 691 Introduction to Enterprise Engineering: Engineering and Policy ........................................... 3
EEP 602/PUBP772/SYST 692 Decision Support for Enterprise Integration ........................................... 3
INF 614 Database Management ................................ 3
ITRN 772 International Telecommunications or ECE 540 Modern Telecommunications ...... 3
SYST 530 Systems Management and Evaluation or SYST 512 Systems Engineering for Design and Development ........................................... 3

Concentration Modules ....................................... 12
The student selects four courses in one of the following three concentration areas, for at least 12 credit hours
  • E-Business
  • Supply Chain Integration and Management
  • Business Intelligence

Project ............................................. 6
All students are required to complete a 6-credit project course. This course will require that a student work with a corporation on an enterprise project. The master's project reflects significant independent effort. The work is conducted under the guidance of a faculty advisor, and the final written and oral project defense are approved by a three-member faculty committee and submitted to the EEP director.

Total Credits ........................................... 33

New Professional Studies: Organizational Learning, M.S. (703) 993-1142
spp@gmu.edu

The Program on Social and Organizational Learning (PSOL) is an integrated, 21-month program designed for professionals with several years of work experience. Providing conceptual tools and practical guidance to foster organizational change, the program focuses on three related areas: creating and leveraging knowledge through networks of people who communicate and collaborate; understanding and managing change by integrating the diverse roles of people, processes, and technology; and enhancing and facilitating collaboration by building effective relationships in technology-rich environments. A feature of this program is the group-oriented approach to learning. This is supported by the use of Lotus Notes and web-based collaborative computer technologies. Students develop the competencies to apply these technologies to make organizations more effective.

Admission Requirements

Applicants are admitted for the fall semester as a cohort. Admissions for the spring semester are on a limited basis. To enter the program as a degree candidate, a student must meet the following minimum requirements:
  • Graduate application with application fee (no fee waivers).
  • A two-to-three page written statement of student’s goals and interest in the program.

• A current resume.
• A bachelor’s degree from an accredited institution with a preferred GPA of 3.00 or better (on a 4.0 scale) in the last 60 semester hours of baccalaureate study. Submit two official transcripts of all university work completed. International students are also required to submit an evaluation and/or translation of all foreign-earned degrees.
• Graduate Record Examination (GRE), GMAT, or MAT scores are optional.
• TOEFL scores (for international applicants) – with a minimum score of 575 (paper-based) or 230 (computer-based). Students may also be required to be tested by the English Language Institute.
• Two letters of recommendation. At least one recommendation should be from an individual who is qualified to attest to the candidate's academic potential.

Degree Requirements

Organizational Learning is a 33-credit, part-time program. The participants work in teams and complete most of the courses in sequence. Elective choices are available in the fourth and fifth semesters. The second academic year includes an action learning component where participants undertake projects in organizations and apply research methods. Overall, the process and methods of evaluation stress the cumulative development of competencies and the capacity to apply the insights gained. Students are expected to have easy access to a computer with collaborative computing software and Internet access. Minimum computer specifications can be obtained from the program office. Successful completion of the following courses is necessary to fulfill the course requirements of the program.

Core Courses ........................................... 12
MNPS 700 The New Professionalism: Theory and Practice* ........................................... 3
MNPS 702 The New Professional as Reflective Practitioner* ........................................... 3
MNPS 703 Technology and Learning in the New Professions* ........................................... 3
MNPS 704 Research Methodologies in the New Professions* ........................................... 3

Additional Requirements ................................... 15
The following required courses add depth to the student's core knowledge:
LRNG 602 Group Dynamics and Team Learning .. 3
LRNG 672 Organizations Learning Laboratory ... 3
LRNG 762 Strategic Knowledge Management .... 3
LRNG 764 Learning Across Cultures ........... 3
MNPS 720 Learning Community .................. 3

Electives (minimum of two courses) ..................... 6

Total Credits ........................................... 33

* Certain sections of MNPS 700, 702, 703, and 704 are designated for the PSOL program, and only those will satisfy the degree requirements.

Individual LRNG courses and sequences of courses serve to fulfill requirements and restricted electives in a number of additional graduate programs, including the Ph.D. in Public Policy; the M.A. in International Commerce and Policy; the M.A. in Telecommunications; the MNPS in Transporta-
tion Policy, Operations, and Logistics; and the Master's in Public Policy. LRNG courses can satisfy students wishing to concentrate in a variety of areas.

- **New Professional Studies: Knowledge Management, M.S.**

  (703) 993-1142
  spp@gmu.edu

  The Master of Science in New Professional Studies: Knowledge Management (KM) is a 36-credit hour program offered jointly with the National Defense University (NDU) Information Resources Management College (IRMC). Admission is limited primarily to holders of NDU certificates, although other applicants will be considered for a graduate certificate in Knowledge Management. Masters degree applicants must have completed either the Chief Information Officer (CIO) Program or Advanced Management Program (AMP) offered by the NDU IRMC or its equivalent. These applicants will generally be eligible to transfer in 15 hours of graduate credit towards their master's degree.

  Courses offered by George Mason University comprise the additional 21 hours required for the master's degree. These consist of 12 credit hours of core courses, 6 hours of electives, and an experiential component of 3 credits. The courses focus on the social-organizational aspects of knowledge management. Students undertake a series of projects in their organizations and their learning is supported by the use of collaborative technology.

  **Admission Requirements**

  Students entering the MNPS in Knowledge Management must have completed an approved NDU program in order to be eligible. To enter the program as a degree candidate, a student must meet the following minimum requirements:
  - Graduate application with application fee (no fee waivers).
  - A two-to-three page written statement of student's goals and interest in the program.
  - A current resume.
  - A bachelor's degree from an accredited institution with a preferred GPA of 3.00 or better (on a 4.0 scale) in the last 60 semester hours of baccalaureate study. Submit two official transcripts of all university work completed. International students are also required to submit an evaluation and/or translation of all foreign earned degrees.
  - Graduate Record Examination (GRE), GMAT, or MAT scores are optional.
  - TOEFL scores (for international applicants)—with a minimum score of 575 (paper-based) or 230 (computer-based). Students may also be required to be tested by the English Language Institute.
  - Two letters of recommendation. At least one recommendation should be from an individual who is qualified to attest to the candidate's academic potential.

  **Degree Requirements**

  The 21 credit hours offered by George Mason University are as follows:

<table>
<thead>
<tr>
<th>Core Courses</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>MNPS 700 The New Professionalism: Theory and Practice*</td>
<td>3</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Electives</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>ITRN 773 International Strategic Management</td>
<td>3</td>
</tr>
<tr>
<td>ITRN 701 International Issues in Knowledge Management</td>
<td>3</td>
</tr>
<tr>
<td>PUBP 736 E-Commerce and the Digital Divide</td>
<td>3</td>
</tr>
<tr>
<td>PUBP 775 Economics of Electronic Commerce</td>
<td>3</td>
</tr>
<tr>
<td>PUBP 777 Critical Information Technology Infrastructures</td>
<td>3</td>
</tr>
</tbody>
</table>

  | Experiential Component | 3 |

  This may include relevant work experience or a supervised internship, subject to the approval of the program director.

  | Total (George Mason University) | 21 |

  - Certain sections of MNPS 700, 702, 703, and 704 are designated for the PSOL program, and only those will satisfy the Knowledge Management degree requirements.

- **Certificate Program**

  Students who do not hold NDU certificates may be awarded a certificate upon completion of the George Mason University component of the Knowledge Management master's degree, as described above. Admission requirements are the same as those for the master's program above.

- **New Professional Studies: Transportation Policy, Operations, and Logistics, M.S.**

  (703) 993-8200
  spp@gmu.edu

  The New Professional Studies: Transportation Policy, Operations, and Logistics (TPOL) M.S. program is designed for students and practicing professionals engaged in planning, regulating, managing, and operating transportation facilities and services. Students obtain a working knowledge of the theory, policy, law, research, and practices required for effectively and efficiently supplying and operating transportation facilities and services. They also learn to think critically and analytically about the problems and challenges in this field, and to communicate their analyses clearly and effectively, both through written and oral presentations.

  **Admission Requirements**

  The TPOL program admits students for the fall and spring semesters. Complete applications are reviewed on a rolling basis, with late applications considered on a space-available basis. To enter the program as a degree candidate, a student must meet the following minimum requirements:
  - Graduate application with application fee (no fee waivers).
  - A two-to-three page written statement of student's goals and interest in the program.
  - A current resume.
A bachelor's degree from an accredited institution with a preferred GPA of 3.00 or better (on a 4.0 scale) in the last 60 semester hours of baccalaureate study. Submit two official transcripts of all university work completed. International students are also required to submit an evaluation and/or translation of all foreign-earned degrees.

- Graduate Record Examination (GRE), GMAT, or MAT scores are optional.
- TOEFL scores (for international applicants) – with a minimum score of 575 (paper-based) or 230 (computer-based). Students may also be required to be tested by the English Language Institute.
- Two letters of recommendation. At least one recommendation should be from an individual who is qualified to attest to the candidate’s academic potential.

**Degree Requirements**

The degree requires completion of 11 courses (33 credits). The time to complete the degree varies. Part-time enrollees may take up to a maximum of six years. Other students enroll in cohorts that complete courses at a pace equivalent to 15 credits per year; these students complete the degree in two years. Accelerated programs for cohort groups from the same employer are actively promoted allowing completion of the 33 credits in a shorter time.

**Core courses** .................................................. 18

The following six courses are required:

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>MNPS 700 The New Professionalism: Theory and Practice*</td>
<td>3</td>
</tr>
<tr>
<td>MNPS 702 The New Professional as Reflective Practitioner*</td>
<td>3</td>
</tr>
<tr>
<td>MNPS 703 Technology and Learning in the New Professions*</td>
<td>3</td>
</tr>
<tr>
<td>MNPS 704 Research Methodologies in the New Professionalism*</td>
<td>3</td>
</tr>
<tr>
<td>PUBP 722 Practicum in Transportation Policy, Operations, and Logistics</td>
<td>3</td>
</tr>
<tr>
<td>PUBP 723 Metropolitan Transportation Policy</td>
<td>3</td>
</tr>
</tbody>
</table>

**Electives** .................................................. 15

The student may choose the remaining five elective courses. All eligible elective courses will be circulated via e-mail each semester by the program director. A student may request to take courses not listed only with the approval of the program director.

**Total Credits** .................................................. 33

*Certain sections of MNPS 700, 702, 703, and 704 are designated for the TPOL program, and only those will satisfy the degree requirements.

**New Professional Studies: Peace Operations, M.S.**

(703) 993-8200
spp@gmu.edu

The New Professional Studies: Peace Operations, M.S. program is designed for students and practicing professionals engaged in the planning, regulation, management, and conduct of peace operations. Through this program, students obtain a working knowledge of the theory, policy, law, research, and practices required for effectively and efficiently participating in, and/or conducting, a peace operation. Students also learn to think critically and analytically about the problems and challenges in this field, and to communicate their analyses clearly and effectively, through both written and oral presentations.

**Admission Requirements**

Complete applications for both fall and spring semesters are reviewed on a rolling basis, with late applications considered on a space-available basis. To enter the program as a degree candidate, a student must meet the following minimum requirements:

- Graduate application with application fee (no fee waivers).
- A two-to-three page written statement of student’s goals and interest in the program.
- A current resume.
- A bachelor’s degree from an accredited institution with a preferred GPA of 3.00 or better (on a 4.0 scale) in the last 60 semester hours of baccalaureate study. Submit two official transcripts of all university work completed. International students are also required to submit an evaluation and/or translation of all foreign-earned degrees.
- Graduate Record Examination (GRE), GMAT, or MAT scores are optional.
- TOEFL scores (for international applicants) – with a minimum score of 575 (paper-based) or 230 (computer-based). Students may also be required to be tested by the English Language Institute.
- Two letters of recommendation. At least one recommendation should be from an individual who is qualified to attest to the candidate’s academic potential.

**Degree Requirements**

Students must complete 36 credit hours consisting of ten courses and a thesis.

**Required Core Courses** .................................. 12

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>MNPS 700 The New Professionalism: Theory of Peace Operations*</td>
<td>3</td>
</tr>
<tr>
<td>MNPS 702 The New Professional as Reflective Practitioner*</td>
<td>3</td>
</tr>
<tr>
<td>MNPS 703 Technology and Learning in the New Professions*</td>
<td>3</td>
</tr>
<tr>
<td>MNPS 704 Research Methodologies in the New Professionalism*</td>
<td>3</td>
</tr>
</tbody>
</table>

**Required Domain Courses** ................................ 6

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CONF 501 Introduction to Conflict Analysis and Resolution</td>
<td>3</td>
</tr>
<tr>
<td>ITRN 503 Investment and Macroeconomics for International Commerce</td>
<td>3</td>
</tr>
</tbody>
</table>

**Electives** .................................................. 12

Students choose the remaining four elective courses with the assistance of the program director to develop a specific substantive policy area. No more than two courses may be at the 500 level.

**Thesis** .................................................. 6

Students are also required to complete a thesis on an approved topic under the direction of the director.

**Total Credits** .................................................. 36
*Certain sections of MNPS 700, 702, 703, and 704 are designated for the Peace Operations program, and only those will satisfy the degree requirements.

Research Centers

**Center for Regional Analysis**
Steven Fuller, Director
Professor of Public Policy

The Center for Regional Analysis provides a forum for local, national, and international research on regional economic development issues and trends. It provides information and research services to local governments and private organizations. Among these are the *Washington Economic Index* and the *Fairfax County Economic Index*, both published monthly. Additionally, the center accepts commissions and grants to support research on economic topics ranging from economic and fiscal impact analysis to employment and income forecasts. The center also provides survey research services and conference and training services.

**Policy Analysis Center (PAC)**
Thomas Gulledge, Director
Professor of Public Policy and Operations Research

The Policy Analysis Center provides research and teaching in the analytical aspects of public policy. Focus areas include defense and international security policy; enterprise integration, including implementation planning for standard software solutions; management and policy aspects of information technology, information systems, and systems engineering economics; and policy and planning aspects of electronic commerce. The PAC is concerned with analytical methods to support the management and improvement of organizational processes.

**International Center for Applied Studies in Information Technology (ICASIT)**
Stephen Ruth, Director
Professor of Public Policy

ICASIT's theme is leveraging the benefits of information technology in the work place. The center has received large research grants to study cost effectiveness of distance learning, knowledge management, and Internet diffusion. ICASIT currently has information technology projects in more than 30 countries on five continents.

**Center for Science and Technology Policy**
Don Kash, Director
John T. Hazel, Sr. and Ruth D. Hazel Professor of Public Policy, Director

The Center for Science and Technology Policy investigates the interdependence of technological innovation and national social/economic performance. A major area of attention is the role technological innovation plays in world trade. The center facilitates the exchange of information and knowledge among researchers and practitioners in the worldwide science, technology, trade, and policy communities.

**Center For Transport Policy, Operations and Logistics**
Kenneth Button, Director
Professor of Public Policy

The Transport Center is concerned with all aspects of transportation policy and in the ways transportation interacts with the wider economy. The expertise of its core faculty extends across economics, planning, geography, political science, and transportation modeling. The center conducts research, and is involved in graduate training, across all modes of transportation at the local, state, federal, and international levels. It embraces the National Center for Intelligent Transportation Systems Deployment Research, one of the 44 national university transportation centers supported by the Research and Special Projects Administration of the United States Department of Transportation.

**Mason Enterprise Center (MEC)**
Roger Stough, Director
Northern Virginia Endowed Professor of Public Policy

The Mason Enterprise Center provides business assistance and development assistance through a set of federal supported franchise organizations, including several small business development centers, a procurement and technical assistance program, and a mentor protégé program. The center manages three telework centers and two business incubators in Fairfax and Arlington County. MEC has recently initiated a new business mentoring program in collaboration with the Virginia Center for Innovative Technology called the STAR Technology Program, which guides technology ventures through the business and initial financing process. Finally, the MEC has initiated courses in seven different schools and departments, along with a university-wide introductory course in entrepreneurship.

http://catalog.gmu.edu
Web: gmu.edu/cvpa
Phone: (703) 993-4551
Performing Arts Building, A407

Departments
- Art and Visual Technology
- Dance
- Music
- Theater

Degrees
- Music: B.A., B.M., and M.M.
- Theater: B.A.

Minors
- Art and Visual Technology
- Arts Administration
- Dance
- Jazz Studies
- Multimedia
- Music
- Theater

"George Mason is deeply committed to the arts and to educating our students about the significance the arts have in all our lives. This is why the arts are integral to our institution. We encourage active student participation in the many programs and related courses in the arts that are scheduled throughout the year. Students are able to receive a more balanced education, develop a deeper appreciation of the arts, and achieve a more enlightened perspective of the world."

Alan G. Merten
President, George Mason University

The College of Visual and Performing Arts was established to create an academic environment in which the arts may be considered both as individual disciplines and as interdisciplinary forms that strengthen each other. Courses of study in the college's four departments—Art and Visual Technology, Dance, Music, and Theater—are designed to lead to careers as creators, performers, teachers, and scholars of the arts, as well as to prepare students for the challenges of a rapidly changing world. In addition to providing strong programs for arts majors and minors, the college strives to ensure that the entire George Mason University student population has the opportunity to experience and study the arts as a key component of a well-rounded liberal arts education.

Studying the arts goes hand in hand with creation and performance. The College of Visual and Performing Arts provides the theaters, studios, rehearsal spaces, computer laboratories, recital halls, and performance classrooms in which students hone their skills. The college's faculty of practicing artist-teachers works closely with students in a
variety of curricular and co-curricular creative projects. Once basic techniques are established, students are encouraged to stretch, grow, and experiment within this supportive environment. Students regularly perform, create, exhibit, and otherwise develop their art forms in a wide variety of public venues, enhancing their experience as working artists while enriching the cultural life of the George Mason community.

An education in the arts is deepened by regular contact with the work of distinguished visiting artists. The college is home to the Center for the Arts, which comprises a variety of professional presenting and producing units that provide a diverse program of challenging and entertaining cultural experiences for the entire university community, as well as Northern Virginia and the greater Washington, D.C. area. Artists from across the country and around the world regularly perform in the Concert Hall, give master classes, work with students during extended residencies, and interact with the community in a variety of other ways. The accessibility and vitality of the Concert Hall, TheaterSpace, Johnson Center Gallery, Harris Theater, and other campus venues make the arts pervasive at George Mason University and in our larger community.

Administration
William F. Reeder, Dean
Rick Davis, Associate Dean
Scott Martin, Assistant Dean of Technology and Advancement
Linda G. Miller, Assistant Dean of Academic Affairs and Student Advancement

Academic Programs

Each CVPA major features both strong academic preparation in the history and theory of the art form and a wide range of discipline-based technique courses offered by professional artist-teachers. Opportunities for creative work and performance are at the core of most courses of study in the college.

Graduate Degree Programs
The college offers four master’s degrees, including one master of arts, one master of music, and two masters of fine arts. The requirements for each degree are described in the sections that follow.

Undergraduate Degree Programs
The undergraduate degree consists of course work in general education, course work in a major area of study, and electives. The college offers four bachelor of arts (B.A.) degrees, two bachelor of fine arts (B.F.A.) degrees, and one bachelor of music (B.M.) degree. To earn a bachelor’s degree, students must complete a minimum of 120 credits, of which at least 45 must be upper-level courses (numbered 300 and above). At least one course at the 300 or 400 level must be designated “writing intensive.” All entering students who have not yet satisfied the university-wide requirement in quantitative reasoning are required to take the math placement test prior to enrollment.

Students should consult the “Academic Policies” and “General Education” chapters for information concerning university-wide requirements for undergraduate degrees.

General Education Program
The baccalaureate degree requires students to take a range of courses which:
1. provide students with a broad knowledge of the world
2. develop the ability to think both conceptually and critically
3. acquaint students with many different methods of inquiry
4. provide students with the skills to continue intellectual growth throughout their lives

Students select from a range of courses outlined in the section on general education. Students accepted into the Honors Program in General Education fulfill their core general education requirements with completion of that program of study. The Mason Topics Program provides a way for students to register for two or more complementary general education courses at the same time for four semesters. The professors who teach in this program have coordinated readings and assignments.

CVPA Courses
The college sponsors some courses that transcend individual disciplines. These courses are administered by the Dean’s Office and are designated CVPA in the “Course Descriptions” chapter of this catalog.

♦ Minor in Arts Administration

Faculty
Davis (coordinator)

The field of visual and performing arts offers many career paths that rely on a strong foundation in one or more art forms but also require specific knowledge and skills in administration and management. The minor in Arts Administration consists of 18 credits, including CVPA 305 (3 credits) and CVPA 489 (3-6 credits). All other credits are to be selected in consultation with a program advisor from relevant courses in the College of Visual and Performing Arts, the Non-Profit Management program in the Department of Public and International Affairs, the School of Management, the Department of Communication, or other appropriate areas of study. The minor is open to all majors in the College of Visual and Performing Arts, and to majors in Art History. All other students must complete 9 credits of arts-related coursework to be eligible for this minor. See the program coordinator for more information.

Physical Education Courses
Students earning undergraduate degrees in the College of Visual and Performing Arts may apply up to 3 credits of activity courses offered by the Health, Fitness, and Recreation Resources Department to their general electives requirement.

Academic Course Load
Undergraduate students earning degrees in the College of Visual and Performing Arts may register for 18 credits per fall and spring semester without dean’s permission. Students are advised that they will be required to pay additional tuition beyond the 17-credit university full-time academic load. Students should be cognizant of the time commitments when they register for their courses, especially if they register for high numbers of credits.
Art and Visual Technology

Web: avt.gmu.edu
Scott Martin, Chair
College Hall, C200
703-993-8898

Faculty
Professors: Kravitz, Mandes
Associate Professors: Carbonneau, Clapsaddle, Martin
(Chair), White
Visiting Associate Professors: Frederick, Olgyay
Assistant Professor: Ashcraft
Visiting Assistant Professors: Chung, Crawford (Assistant Chair), Feerick, Frenn, MacDonald, Malone (Gallery Director)
Adjuncts: Di Cicco, Karametou, Kim, Lee, McPherson, Winant, Yates

Course Work
The Department of Art and Visual Technology offers all course work designated AVT in the “Course Descriptions” chapter of this catalog.

NOTE: On July 1, 2001, the Division of Art and Visual Technologies (formerly housed within the Institute of the Arts) became the Department of Art and Visual Technology (AVT) within the College of Visual and Performing Arts (CVPA). All courses formerly listed with prefixes of ARTS and VIT are now listed with a prefix of AVT. Courses formerly listed with the prefix ARIN are now listed either with a prefix of AVT or CVPA.

UNDERGRADUATE PROGRAMS
The Department of Art and Visual Technology offers two undergraduate degrees: a Bachelor of Arts in Art and Visual Technology, and a Bachelor of Fine Arts in Art and Visual Technology. These two programs prepare students for graduate study, research, and professional work in studio and digital art. These programs do not satisfy all requirements for teaching in the public schools.

Writing-Intensive Requirement
The university requires all students to complete at least one course designated “writing intensive” in their majors at the 300 level or above. Students in the Art and Visual Technology B.A. and B.F.A. programs fulfill this requirement by successfully completing AVT 395.

Art and Visual Technology, B.A.
The B.A. in Art and Visual Technology (AVT) offers a broad course background for students who want a liberal arts education with a major in studio or digital art. The B.A. degree does not require a portfolio or essay for admission to the program. All students are admitted as B.A. majors. Students can concentrate a portion of their study in digital arts, graphic information design, InterArts (Interdisciplinary Arts), painting, photography, printmaking, or sculpture. The InterArts concentration offers courses that cross traditional boundaries and encourage intercultural understanding.

Students are required to take an AVT bus trip to visit art galleries, museums, and/or sculpture parks each fall and spring semester. Seniors are required to participate in the visiting critics program.

Degree Requirements

General Education
In addition to satisfying the university-wide general education requirements, candidates must complete the following:

AVT Major Requirements

General Electives

Concentration

Art History, Critical Analysis

Breadth and Experience

Any 2 of the following 8 classes:

AVT 215 Graphic Information Design I
AVT 232 Painting I
AVT 243 Printmaking I
AVT 252 Photography I
AVT 262 Sculpture I
AVT 272 InterArts I: History and Theory of Performance Art
AVT 280 Digital Arts I
AVT 399 Special Topics in Art and Visual Technology
AVT 497 Senior Project

12 credits in 1 of the following areas:

Digital Arts, AVT 381, 382, 483
Graphic Information Design, AVT 311, 313

12 credits from

232, 335, 336, 354, 382, 393, 414, 422, 423, 489, 491, or 492
InterArts, AVT 373, 473 and 4 credits from

393, 414, 422, 423, 489, 491
Painting and Drawing, AVT 333, 432, 433
Photography, AVT 353 and 8 credits from

354, 355, 356, 452, 453, 454, 455
Printmaking, AVT 343 and 8 credits from

345, 346, 442, 443
Sculpture, AVT 363, 462, 463

B.A. students must use their general electives to fulfill one of the following two options:

1. Choose a minor program in addition to the major field of study (15—18 credits)

2. Choose to study a foreign language through the intermediate level (12 credits)

After fulfilling one of the above options, the remaining general electives may be taken inside or outside of the Department of Art and Visual Technology. As all students are required to take a minimum of 45 credits of upper division

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courses (300-400 level), taking at least 10 elective credits at the 300 level or above is recommended.

Total .......................................................... 20

Art and Visual Technology, B.F.A.
The B.F.A. in Art and Visual Technology is an intensive 120-credit studio production program with an emphasis in analytical, creative, and experiential aspects of studio and digital arts. This program is designed to prepare students professionally as visual artists, or for graduate study in the fine arts. Students in this program devote a significant portion of their college careers to an in-depth study in one of the following concentrations: digital arts, graphic information design, InterArts, painting, photography, printmaking, or sculpture.

Students are required to take an AVT bus trip to visit art galleries, museums, and/or sculpture parks each fall and spring semester. Seniors are required to participate in the visiting critics program.

Application deadlines for the B.F.A. program are December 1 and May 1 of each year. Admission to the program is highly competitive. B.F.A. admission requirements include the following:

1. Currently a B.A. student in Art and Visual Technology
2. Completion of AVT 104 and 105 or equivalent
3. A portfolio of 10 to 15 original examples of college-level art work
4. A three-page, double-spaced essay
5. Transcripts of all college-level study

Students interested in applying to the B.F.A. program should contact the Department of Art and Visual Technology for specific application information.

Degree Requirements

General Education ................................................. 43

In addition to satisfying the university-wide general education requirements, candidates must complete the following:

AVT Major Requirements ...................................... 73

Studio Foundation .............................................. 16

AVT 104 and 105 Studio Fundamentals
I and II .......................................................... 8
AVT 222 and 323 or 324 Drawing I and II
or Figure Drawing ........................................... 8

Art History, Critical Analysis, Contemporary Practice ........................................... 21

ARTH 200, 201 Survey of Western Art .......................... 6
ARTH 300 or 400 level ........................................... 3
ARTH 374 Art Now .............................................. 3
ARTH 307 Aesthetics .............................................. 3
ARTH 395 Writing for Artists .................................... 3
ARTH 472 Critical Theory in the Visual Arts .................................. 3

Breadth and Experience ...................................... 16

Any 3 of the following 8 classes: ................................ 12
AVT 215 Graphic Information Design I
AVT 232 Painting I
AVT 243 Print Making I

AVT 252 Photography I
AVT 262 Sculpture I
AVT 272 InterArts I: History and Theory of Performance Art
AVT 280 Digital Arts I
AVT 399 Special Topics
AVT 497 Senior Project ........................................ 4

Concentration ...................................................... 20

20 credits in 1 of the following areas:
Digital Arts, AVT 381, 382, 483, and
8 credits from 300-499
Graphic Information Design, AVT 311, 313
and twelve credits from 323, 345, 346,
353, 354, 382, 393, 414, 422, 423, 489,
491, or 492
InterArts, AVT 373, 473 and 12 credits
from 372, 374, 375, 376, 377, 378, 379,
491, or 492
Photography, AVT 333, 432, 433, and
8 credits from 300-499
Printmaking, AVT 343 and 8 credits from
345, 346, 442, 443 and 8 credits from
300-499
Sculpture, AVT 363, 462, 463 and
8 credits from 300-499

General Electives ................................................ 4

These general electives may be taken inside or outside of the Department of Art and Visual Technology. NOTE: AVT 393 Internship and AVT 489 Field Experience in the Arts are not required courses but are recommended as electives for B.F.A. students.

Total .......................................................... 120

Additional Academic Requirements for B.A.
and B.F.A. Degree Programs

• Students are required to take a minimum of 45 credits of upper division courses at the 300-499 level.
• A maximum of 12 hours of a “D” grade may be applied toward graduation.
• A maximum of 6 hours of “D” grade may be applied in the major.

Honors Students Requirement

Honors students must take a total of 4 credits of AVT 394, Honors Seminar. Students interested in the Honors Program in Art and Visual Technology should contact the chair of the Art and Visual Technology Department.

Minor in Art and Visual Technology

The minor in AVT requires 20 credits and offers a core of foundational studies with the opportunity for further study in the following areas: digital arts, graphic information design, InterArts, painting, photography, printmaking, or sculpture. The requirements for this minor are as follows:

AVT 104 and 105 Studio Fundamentals I and II ... 8
AVT 222 Drawing I .............................................. 4
AVT 200-299 ...................................................... 4
AVT 300-399 ...................................................... 4

http://catalog.gmu.edu
The M.A. degree requires 45 credits, during which time students fulfill 45 credits of core and studio requirements plus an additional 15 credits of comprehensive experience. The M.A. is a terminal degree that prepares students to become professional artists, work in technology and/or arts-related fields, and teach at the university level.

Admission Requirements
In addition to meeting the general requirements for admission to the university for graduate study, candidates for the M.A. or M.F.A. in Art and Visual Technology must meet the following requirements:
1. B.A. or B.F.A. degree
2. Portfolio submission
3. Statement of intent and professional goals
4. Three letters of reference

Diversity among the students accepted for study is another consideration. Applicants with degrees in areas other than art are welcome, although they may be required to complete undergraduate core courses.

The student’s portfolio is a major selection criterion for graduate admission. Portfolios from applicants must include 20 slides (labeled and numbered), a slide list, and one optional 1/2” VHS NTSC videotape, not to exceed four minutes in length. Slides should represent the student’s most accomplished work. Applicants may supplement their portfolios with CD-ROMs, zip disks, and/or web addresses.

Facilities and Equipment
The Art and Visual Technology Graduate Program is located in the Fine Arts Building which houses art studios in drawing, painting, photography, printmaking, and sculpture. AVT has four computer labs that cross platforms and are installed with current software applications used for 2D imaging, 3D modeling, animation, video production, sound editing, multimedia authoring, and web publishing.

Art and Visual Technology, M.A.
Degree Requirements

Core Requirements

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>AVT 500+ Art Studio Course Work</td>
<td>10</td>
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<tr>
<td>AVT 599 Special Topics in Art and Visual Technology</td>
<td>4</td>
</tr>
<tr>
<td>AVT 600 AVT Research Methodologies</td>
<td>3</td>
</tr>
<tr>
<td>AVT 610 Graduate Seminar (1 credit repeated for 4 credits)</td>
<td>4</td>
</tr>
<tr>
<td>AVT 620 Philosophy, Theory, and Criticism</td>
<td>3</td>
</tr>
<tr>
<td>AVT 693 Apprenticeship</td>
<td>6</td>
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Total credits required for the M.A. 45

Digital Arts Emphasis

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>AVT 614 Problems in Typography</td>
<td>5</td>
</tr>
<tr>
<td>AVT 616 Internet Multimedia Art</td>
<td>5</td>
</tr>
<tr>
<td>AVT 618 Problems in Graphic Design</td>
<td>5</td>
</tr>
<tr>
<td>AVT 676 Sound and Music for Video and Animation</td>
<td>5</td>
</tr>
<tr>
<td>AVT 678 Interface and CD-ROM Design</td>
<td>5</td>
</tr>
<tr>
<td>AVT 684 Two-Dimensional Digital Art</td>
<td>5</td>
</tr>
<tr>
<td>AVT 686 Three-Dimensional Digital Art</td>
<td>5</td>
</tr>
<tr>
<td>AVT 688 Digital Animation</td>
<td>5</td>
</tr>
</tbody>
</table>

Total credits required for the Digital Arts Emphasis 15

Graduate Programs

Art and Visual Technology, M.A. and M.F.A.

The Art and Visual Technology Department offers an M.A. in Digital Arts with courses that integrate visual information design, 2D imaging, 3D modeling, animation, video production, sound editing, multimedia authoring, and Web publishing within a program that is grounded in both theory and application.

The M.A. degree requires 45 credits and is a professional program aimed at preparing students for employment in high-tech industries and businesses. These include computer animation and video production firms, graphic design firms, web development and design companies, and computer-related research industries.

M.F.A. students in the Department of Art and Visual Technology may concentrate in digital arts, graphic information design, InterArts, painting, photography, printmaking, or sculpture.
Art and Visual Technology, M.F.A.
Degree Requirements

Core Requirements ................................. 30
AVT 500+ Art Studio Course Work .................. 10
AVT 599 Special Topics in Art and Visual Technology ......................... 4
AVT 600 Research Methodologies ....................... 3
AVT 610 Graduate Seminar (1 credit repeated for 4 credits) .................. 4
AVT 620 Philosophy, Theory, and Criticism ............... 3
AVT 670 Teaching Practicum ............................ 6

Studio Emphasis ..................................... 15
M.F.A. students must complete 15 credits in 1 of the following areas:

Digital Arts—Take any 3 of the following courses:
AVT 614 Problems in Typography ...................... 5
AVT 616 Internet Multimedia Art ......................... 5
AVT 618 Problems in Graphic Design ................. 5
AVT 676 Sound and Music for Video and Animation ............... 5
AVT 678 Interface and CD-ROM Design ................. 5
AVT 684 Two-Dimensional Digital Art .................... 5
AVT 686 Three-Dimensional Digital Art ................... 5
AVT 688 Digital Animation ............................. 5

InterArts—Take any 3 of the following courses:
AVT 672 InterArts I: History and Theory of Performance Art ................. 5
AVT 673 InterArts II: Performance Art Studio ............ 5
AVT 674 Advanced InterArts Topics ...................... 5
AVT 676 Sound and Music for Video and Animation ............... 5

Painting—Take the following 3 courses:
AVT 632 Graduate Painting I ............................ 5
AVT 633 Graduate Painting II ............................ 5
AVT 634 Advanced Graduate Painting .................... 5

Photography—Take the following 3 courses:
AVT 652 Graduate Photography I ........................ 5
AVT 653 Graduate Photography II ....................... 5
AVT 654 Advanced Graduate Photography ................. 5

Printmaking—Take the following 3 courses:
AVT 642 Graduate Printmaking I ......................... 5
AVT 643 Graduate Printmaking II ......................... 5
AVT 644 Advanced Graduate Printmaking .................. 5

Sculpture—Take the following 3 courses:
AVT 662 Graduate Sculpture I ............................ 5
AVT 663 Graduate Sculpture II ............................ 5
AVT 664 Advanced Graduate Sculpture .................... 5

M.F.A. Comprehensive Experience ..................... 15
Candidates must complete all of the above core and studio requirements and the following:
AVT 796 Directed Project ................................ 9
AVT 798 Directed Reading ............................... 3
AVT 799 Thesis ........................................... 3

The comprehensive experience involves a study of the historical basis for a studio project, an independent creative production suitable for public viewing, and a written thesis documenting the evolution of the creative problem and exploring the intention, purpose, and relative success of the finished project.

Total credits required for the M.F.A. ............... 60

Dance

Web: dance.gmu.edu
Linda G. Miller, Chair
Performing Arts Building, A300
703-993-1114

Faculty
Professor: Miller (chair)
Associate Professors: Carbonneau, Lepore, Studd
Assistant Professors: Price, Nicholas-Walker, Shields (on leave)
Visiting Assistant Professor: Joyce
Instructor: Willis
Adjuncts: Jarvie, St. Amour, Thomas

Course Work
The Department of Dance offers all course work designated DANC in the "Course Descriptions" chapter of this catalog.

UNDERGRADUATE PROGRAMS
The Dance Department offers a Bachelor of Fine Arts in Dance and a Bachelor of Arts in Dance. Entrance to all dance degree programs is by audition. Information about the audition process, including dates and audition application, can be found on the department web page (dance.gmu.edu) or by contacting the department office at (703-993-1114). Admission to the university is determined by the Admissions Office.

Writing-Intensive Requirement
The university requires all students to complete at least one course designated "writing intensive" in their majors at the 300-level or above. Students in the B.F.A. and B.A. in dance programs fulfill this requirement by successfully completing DANC 390 or 391.

Virginia Licensure (Certification) to Teach
Pending approval of the Virginia State Department of Education (effective Fall 2003)

This program is being developed in collaboration with the Graduate School of Education, which is accredited by the National Council for the Accreditation of Teacher Education (NCATE).

To be a candidate for licensure in dance education, a student must successfully complete the requirements for a B.A. or B.F.A. in Dance, and in addition:

- Be formally accepted into the dance education program by the departmental Dance Education Committee. Before requesting an interview with the Committee, a student must: complete 45–60 credit hours with a G.P.A. of 2.80 or higher; and submit scores for the Praxis I tests (Reading Writing, and Mathematics). It is strongly recommended that students take the Praxis I tests as soon as ENGL 302 and a course in literature and mathematics have been completed. A passing composite score is required for licensure.
### College of Visual and Performing Arts

#### Synthesis Requirement
- DANC 114 Rhythmic Analysis and Music Resources for Dance ... 3
- DANC 150 Dance Improvisation ... 3
- DANC 170 Introduction to Dance Production ... 1
- DANC 210 Dynamic Alignment ... 3
- DANC 251 Dance Composition I ... 3
- DANC 252 Dance Composition II ... 3
- DANC 270 Dance Production Lab ... 1
- DANC 325/425 Int./Adv. Modern Dance ... 18
- DANC 345/445 Int./Adv. Ballet ... 9
- DANC 360 Choreography ... 3
- DANC 362 Directed Choreography ... 1
- DANC 370 Dance Performance ... 4
- DANC 372 Advanced Dance Production ... 1
- DANC 390 Dance History: Pre-20th Century ... 3
- DANC 391 Dance History: 20th Century ... 3
- DANC 454 Teaching Principles of Modern Dance ... 3
- DANC 480 Introduction To Laban Movement Analysis ... 3

### Dance, B.F.A.

**Because of the professional nature of the B.F.A. degree, the program requires completion of 126 credits of course work.**

The B.F.A. in Dance is a performance-oriented program designed to prepare students professionally as performers, choreographers, and teachers, as well as to prepare them for graduate study. Students in this program demonstrate significant technical mastery and devote a large portion of their college study to an intensive and comprehensive dance curriculum.

The B.F.A. degree offers a general modern dance major that allows for concentrated study in performance, choreography, or teaching. Technical training includes ballet, jazz, world dance forms, and a strong emphasis on modern dance. Entrance into the B.F.A. program is by audition during the candidate's freshman year. Student progress in the B.F.A. program is assessed annually.

#### Degree Requirements

**General Education**

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>Written communication</td>
<td>6</td>
</tr>
<tr>
<td>Non-native speakers</td>
<td>6</td>
</tr>
<tr>
<td>Information technology</td>
<td>3</td>
</tr>
<tr>
<td>Core Requirements</td>
<td>3</td>
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<tr>
<td>Literature</td>
<td>3</td>
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<tr>
<td>Arts</td>
<td>9</td>
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<tr>
<td>MUSI 101</td>
<td>(3)</td>
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<td>AVT/ARTH</td>
<td>(3)</td>
</tr>
<tr>
<td>THR 210</td>
<td>(3)</td>
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<tr>
<td>Natural science</td>
<td>7</td>
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<tr>
<td>U.S. history</td>
<td>3</td>
</tr>
<tr>
<td>Western civilization</td>
<td>3</td>
</tr>
<tr>
<td>Global understanding</td>
<td>3</td>
</tr>
<tr>
<td>Social science</td>
<td>3</td>
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**Foundation Requirements**

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
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<tbody>
<tr>
<td>ENGL 101 and ENGL 302</td>
<td>6</td>
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<tr>
<td>Oral communication</td>
<td>3</td>
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<tr>
<td>Quantitative reasoning</td>
<td>3</td>
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<tr>
<td>Information technology</td>
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**Electives**

<table>
<thead>
<tr>
<th>Credits</th>
</tr>
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<tbody>
<tr>
<td>3</td>
</tr>
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</table>

**Total Credits**

<table>
<thead>
<tr>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>126</td>
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</tbody>
</table>

### Dance, B.A.

The B.A. degree is a 120 credit general program of dance study within a liberal arts degree framework.

#### Degree Requirements

**General Education**

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Written communication</td>
<td>6</td>
</tr>
<tr>
<td>Non-native speakers</td>
<td>6</td>
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**Foundation Requirements**

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENGL 101 and ENGL 302</td>
<td>6</td>
</tr>
</tbody>
</table>

http://catalog.gmu.edu
250 College of Visual and Performing Arts

100 for ENGL 101. Students must attain a minimum grade of C to have ENGL 100 or 101, and 302 fulfill degree requirements.

Core Requirements

- Literature ........................................... 6
- Arts .................................................... 6
- (3 credits from university general education “Arts” courses plus any MUSI, THR, AVT, or ARTH)
- Natural science (must include a laboratory science) .......... 7
- U.S. history ......................................... 3
- Western civilization ................................. 3
- Global understanding .................................. 3
- Social science ......................................... 3
- Philosophy or religion ................................ 3

Synthesis Requirement ................................ 3

Other

- Foreign language .................................... 0-12
  - Elementary ......................................... (6)
  - Intermediate ........................................ (6)

A student must demonstrate intermediate-level proficiency in one foreign language. This requirement is fulfilled by completion of one foreign language course at the 202 level or higher, or by a satisfactory score on an approved proficiency test. International students should consult with the College of Visual and Performing Arts about a possible waiver of this requirement.

Dance Major Core ..................................... 44

- DANC 114 Rhythmic Analysis ........................... 3
- DANC 150 Dance Improvisation ......................... 3
- DANC 170 Introduction to Dance Production ........... 1
- DANC 210 Dynamic Alignment .......................... 3
- DANC 251 Dance Composition I ........................ 3
- DANC 252 Dance Composition II ........................ 3
- DANC 270 Dance Production ............................ 1
- DANC 325/425 Int./Adv. Modern Dance .................. 6
- DANC 370 Dance Performance ........................... 2
- DANC 390 Dance History: Pre-20th-Century ............. 3
- DANC 391 Dance History: 20th-Century .................. 3
- DANC 454 Teaching Principles of Modern Dance ........ 3
- DANC 480 Introduction to Laban Movement Analysis .... 3

Dance Electives ....................................... 4

Chosen from:
- DANC 118 World Dance
- DANC 120 Special Topics in Dance
- DANC 131, 231 Beginning, Intermediate Jazz
- DANC 161 Beginning Tap
- DANC 225 Beginning Modern Dance
- DANC 245 Beginning Ballet
- DANC 314 Music Accompaniment for Dance
- DANC 325 Intermediate Modern Dance
- DANC 326 Dance Performance Practicum
- DANC 330 Dance/Movement Therapy I
- DANC 345 Intermediate Ballet

DANC 350 Advanced Dance Improvisation
DANC 362 Directed Choreography
DANC 370 Dance Performance
DANC 371 Residency Workshop
DANC 399 Independent Study
DANC 418 Global Dance Intensive
DANC 420 Special Topics in Dance
DANC 425 Advanced Modern Dance
DANC 430 Dance/Movement Therapy II
DANC 445 Advanced Ballet
DANC 453 Teaching Creative Movement
DANC 455 Teaching Practicum

Electives ............................................... 12

Total ...................................................... 120

- Minor in Dance

The minor in Dance consists of 21 credits selected from courses designated DANC. The program of study is designed by both the student and the dance faculty advisor and is approved by the entire dance faculty. Program approval takes into consideration the student’s major area of interest and includes a combination of technique and theory courses in both upper- and lower-level designations.

GRADUATE PROGRAM

Dance, M.F.A.

The M.F.A. in Dance is a 60-credit program of study grounded in the modern dance genre that emphasizes performance, choreography and teaching. Candidates are expected to enter the program with advanced technical proficiency in ballet or modern technique and competence in choreography exemplified by a significant body of work. The curriculum allows for and encourages apprenticeships and internships, experimentation in academic pursuits, and the development of independent artistic projects.

Admission Requirements

In addition to fulfilling the admission requirements for graduate study, the applicant must submit directly to the Dance Department a resume and a 10-minute VHS video that illustrates the applicant’s choreography. All candidates must also demonstrate advanced technical proficiency through an audition. Contact the Dance Department at 703-993-1114 for dates and times.

All candidates must satisfy the following prerequisites: advanced dance technique; improvisation; two semesters of dance composition; two semesters of dance history; rhythmic analysis or music for dance; anatomy/kinesiology; and dance production. Prerequisite courses may be completed before or concurrent with graduate coursework and are usually fulfilled if the applicant has earned a B.A. or B.F.A. in Dance.

Degree Requirements

All students are required to take the following:

- DANC 501 Graduate Dance Seminar .................... 3
- A total of 18 credits of advanced dance technique:
  - DANC 525 Advanced Modern Dance ................. 9-12
  - DANC 545 Advanced Ballet ........................... 6-9
  - DANC 560 Advanced Choreography .................... 6

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DANC 570/571 Advanced Performance/Residency Workshop ........................................ 3
DANC 580 Laban Movement Analysis .......................................................... 3
DANC 598 Philosophy and Aesthetics of Dance ............................................. 3
DANC 615 Contemporary Trends ..................................................................... 3
DANC 627 Advanced Teaching Seminar ......................................................... 3
DANC 680 Dance Management ....................................................................... 3
DANC 790 Internship ..................................................................................... 3
DANC 799 Thesis ......................................................................................... 6

Electives ........................................................................................................ 6

Total Credits ............................................................................................... 60

The university does not guarantee the availability of these courses every semester. Some are offered in alternating years.

Music

Web: gmu.edu/departments/music
James Gardner, Chair
Performing Arts Building, A417
703-993-1380

Faculty

Professors: Burton (Heritage Chair in Music), J. Gardner (Chair), Maiello, Miller, Smith
Associate professors: Engebretson
Assistant professors: Bullard, Carroll, Nalley, T. Owens, Wang
Adjuncts: Beckwith, Berkshire-Brown, Casagrande, D. Gardner, Lapple, Longmyer, Lynnerd, Maley, Mann, McCarthy, Monson (Assistant Chair), M. Owens, Rendler, Rosado, Schultz, Taylor

Applied Music Faculty

Bassoon. Truman Harris, Adjunct Associate Professor. B.A., North Texas State University; M.M., The Catholic University of America; bassoonist, National Symphony Orchestra.


Loran Stephenson, Adjunct Assistant Professor. B.M., Curtis Institute of Music; M.M., The Catholic University of America; National Symphony Orchestra; former member, U.S. Army Band of Washington, D.C.

Clarinet. Sharon Bonneau, Adjunct Assistant Professor. B.M., B.M.E., Eastman School of Music; M.A., George Mason University; former clarinetist, U.S. Air Force Band of Washington, D.C.

Lora Ferguson, Adjunct Associate Professor. B.M., Oberlin Conservatory; M.M., The Catholic University of America; clarinetist, Kennedy Center Opera House Orchestra; Capitol Woodwind Quintet.

Brian Jones, Assistant Adjunct Professor. B.M.E., Florida State University; M.M., Baylor University; D.M.A., The Catholic University of America; former member, U.S. Air Force Band of Washington, D.C.; instructor of clarinet, The Levine School of Music.

Composition. Steve Antosca, Adjunct Assistant Professor. B.A., Tulane University; M.M. Peabody Conservatory of Music of The Johns Hopkins University; Artist-in-Residence, Duke Ellington School of the Arts; Co-Chair, Composition Department at Levine School of Music.


Glenn Smith, Professor. B.A., M.A., California State University, Hayward; D. Mus., Indiana University.

Conducting. Stanley Engebretson, Associate Professor. B.A., M.A., University of North Dakota; D.M.A., Stanford University; Director of Choral Studies, George Mason University; artistic director, Masterworks Chorus and Orchestra; music director, New York Avenue Presbyterian Church; former associate conductor, Minnesota Chorale.

Anthony Maiello, Professor. B.S., M.S., Ithaca College; Director of Instrumental Music Studies, George Mason University; former chairman of performance, Potsdam College of The State University of New York; former associate conductor, McLean (Va.) Orchestra.

Euphonium. Roger Behrend, Associate Professor. B.M.E., Michigan State University; M.A., George Mason University; solo/principal euphoniumist, U.S. Navy Band of Washington, D.C.

Flute. Judith Lapple, Adjunct Assistant Professor. B.M., Eastman School of Music; M.M., Northeast Louisiana University; former principal flutist, U.S. Air Force Band of Washington, D.C.

Thomas Perazzoli, Adjunct Associate Professor. Philadelphia Musical Academy; flutist, National Symphony Orchestra.

Guitar (Classical). Larry Snitzler, Adjunct Professor. Former student of Andres Segovia (guitar) and Nadia Boulanguer (theory); international concert tours; former freelance music producer, National Public Radio.

Guitar (Jazz). Shawn Purcell, Adjunct Assistant Professor. B.M., Duquesne University; premier jazz guitarist, U.S. Air Force Airmen of Note Jazz Ensemble.

Harp. Jeanne Chalifoux, Adjunct Assistant Professor. Artist Diploma, Curtis Institute of Music; former harpist, National Gallery Orchestra and National Symphony Orchestra.

Horn. Edwin Thayer, Adjunct Associate Professor. B.M., M.M., University of Illinois; hornist, National Symphony Orchestra.

David Whaley, Adjunct Associate Professor. B.M.E., Drake University; M.M., D.M.A., University of Illinois; hornist, National Symphony Orchestra.

Koto. Kyoko Okamoto, Adjunct Assistant Professor. Bachelor in Languages, Kyoto University of Foreign Studies; Toho Kinshu Kai (Koto School).


Organ. Celia Amstutz, Adjunct Assistant Professor. B.A., Oberlin Conservatory; M.M., University of Maryland; M.M., D.M.A., Peabody Conservatory; recitalist; Director of Music, Fairfax United Methodist Church; Spivey International Competition winner.

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William Neil, Adjunct Associate Professor. B.A., Pennsylvania State University; M.M., Syracuse University; University of Michigan; The Juilliard School; organist and keyboardist, National Symphony Orchestra, Chamber Soloists of Washington, Handel Festival Orchestra, New York Trumpet Ensemble; Director of Music, Washington Street Methodist Church, Alexandria.

Percussion. Kenneth Harbison, Adjunct Associate Professor. B.M., Eastman School; M.M., The Catholic University of America; assistant principal percussionist, National Symphony Orchestra.

Piano. Anna Balakerskaia, Adjunct Assistant Professor. M.M., D.M.A., St. Petersburg State Conservatory, Russia; piano soloist and chamber musician throughout the U.S., Europe, South America, and Russia. Former faculty member, Moscow and St. Petersburg State Conservatories.

Joanne Haroutounian, Adjunct Associate Professor. B.A., Trenton State College; M.A., The American University; Ph.D., University of Virginia; pedagogy author, lecturer, and clinician.

Linda Apple Monson, Adjunct Assistant Professor. B.M.Ed., M.M., D.M.A., Peabody Conservatory of Music of the Johns Hopkins University; diploma (piano performance), Santiago de Compostela, Spain; soloist, accompanist, and chamber musician in the U.S. and Europe; piano faculty member, Northern Virginia Community College; music director, Springfield United Methodist Church.

James Nalley, Assistant Professor of Music. B.M., M.M., Temple University; D.M.A., Eastman School of Music; winner of many national and international competitions; concertized across the United States, Canada, and Europe as a recitalist, accompanist, chamber musician, and soloist with Philadelphia Orchestra and San Francisco Symphony; frequent guest artist/teacher, lecturer, and adjudicator.

Edward Newman, Adjunct Associate Professor. B.M., M.M., Juilliard School of Music; international concert artist.

Saxophone. Richard Parrell, Adjunct Assistant Professor. B.A., B.M., George Mason University; M.M.E., North Texas State University; solo principal saxophonist, U.S. Army Band of Washington, D.C.

Dale Underwood, Adjunct Professor. Texas Tech University; former saxophone soloist, U.S. Navy Band of Washington, D.C.


Trombone. Paul Schultz, Adjunct Associate Professor. B.M., North Central College (Illinois); M.M., Northwestern University; D.M.A., The Catholic University of America; Baltimore Opera Orchestra; former trombonist, U.S. Army Band of Washington, D.C.


David Flowers, Adjunct Associate Professor. B.M., M.M., University of Michigan; D.M.A., The Catholic University of America; trumpetist, National Symphony Orchestra.
work in musical activities, and for state licensure (certification) to teach vocal/choral or instrumental music on the elementary and secondary school levels.

Through its strategic plan, Music Outreach and the Teaching Professions, the Department of Music enables students to pursue worthwhile vocational goals as teachers, performers, conductors, and composers. The department also seeks to educate its students to reflect a concern for cultural and humanistic values as future ambassadors and advocates of music and the other arts. Through innovative learning experiences, the department provides all students in the B.A. and B.M. programs with opportunities to become effective musicians, teachers, and advocates of music. Teaching music is the principal area in which students can find employment in the private studios, public and private schools, academies, and higher education within the ever-changing workplace. Because of this, all music majors at George Mason receive some training in the teaching of music.

The Department of Music also recognizes the critical outreach role it provides in serving students from all majors as well as members of the community who significantly benefit from the values and experiences of an education in music. The department seeks to provide unique educational opportunities through its various course offerings, workshops, presentations, and performances for those seeking music enrichment.

**Entrance to all music degree programs is by audition. Arrangements for an audition must be made in advance by contacting the Department of Music before the scheduled audition date. Auditions are held in November, January, and March through August (normally on the first Monday of each month except for January and August, when dates are scheduled during the university registration period).**

A fundamentals of music test is given during the first week of classes to all students enrolled in MUSI 115 (Theory I). This test consists of the following: standard musical notation in treble and bass clefs; key signatures; all intervals up to a perfect octave; and all major, natural minor, harmonic minor, and melodic minor scales (ascending and descending).

**Competency placement tests** are required of all transfer students who desire to present transfer credit in any of the following areas: sight singing, ear training, and keyboard skills, including keyboard harmony.

**Writing-Intensive Requirement**

The university requires all students to complete at least one course designated "writing intensive" in their majors at the 300 level or above. Students majoring in music may fulfill this requirement by successfully completing one of the following: MUSI 331, 332, 431, or 432. Students who transfer all of these courses into George Mason may be required to repeat one of them or to enroll in some other suitable course in order to fulfill the writing intensive requirement.

**Music, B.A.**

Students pursuing a Bachelor of Arts degree must complete a general education program as outlined below. This distribution enables students to develop a breadth of knowledge as well as the necessary skills to make the in-depth study of a major truly meaningful. In addition to general education requirements, students must also either demon-

- **Degree Requirements**
  - **General Education**
    - **Credits:** 43-64
  - **Foundation Requirements**
    - **Written communication**
      - ENGL 101 and ENGL 302
    - **Non-native speakers of English with limited proficiency in the language**
      - Must substitute ENGL 100 for ENGL 101
    - **Credits:** 3
  - **Core Requirements**
    - **Literature**
      - ENGL 101
    - **Natural science**
      - One course must have laboratory experience
    - **U.S. history**
      - 3
    - **Western civilization**
      - 3
    - **Social and behavioral sciences**
      - 3
    - **Arts**
      - 3
    - **Global understanding (MUSI 431)**
      - 3
  - **Synthesis Requirement**
    - **Synthesis**
      - 3
  - **Other**
    - **Credits:** 0-21
  - **Music Major**
    - **Required Courses**
      - **Credits:** 53-54
        - MUSI 115, 116, 215 Theory I, II, III
        - MUSI 216 Form and Analysis
        - MUSI 113, 114 Sight Singing and Ear Training I, II
        - MUSI 171, 172, 273 Keyboard Skills I, II, II
        - MUSI 331, 332, 431, 432 Music History in Society (I, II, III)
        - or I, III, IV or II, III, IV
        - MUSI 221, 421 Major Instrument or Voice
        - (Private Music Instruction)
        - Ensemble
        - MUSI 251 The Art of Teaching Music
        - MUSI 300 Recital Attendance (five semesters)
        - MUSI 351, 352, or 353 Pedagogy
        - MUSI 395 Teaching Internship
        - MUSI 415 Music in Computer Technology
    - **Electives**
      - **Credits:** 14-36

 1 Certain general education requirements may be satisfied with courses in the major which would reduce the total number of credits.

http://catalog.gmu.edu
Students whose major instrument is a keyboard instrument must substitute Techniques of Accompanying I and II for Keyboard Skills I and II. They must take Keyboard Skills III or earn credit-by-examination by successfully passing the appropriate competency placement examination.

Students whose major instrument is voice must earn 4 credits in University Chorale, Symphonic Chorus, and/or Chamber Singers. Students whose major instrument is an orchestral string instrument must earn 4 credits in Symphony Orchestra, and students whose major instrument is a wind or percussion instrument must earn 4 credits in Symphony Orchestra, Symphonic Band, and/or Wind Ensemble. Students whose major instrument is the piano, harpsichord, organ, or guitar must earn 4 credits in large ensembles: University Chorale, Symphonic Chorus, Chamber Singers, Symphony Orchestra, Symphonic Band, and/or Wind Ensemble. Transfer students must earn at least two ensemble credits at George Mason.

All students who enroll as freshmen must take MUSI 300 for 5 semesters. Transfer students must take MUSI 300 each semester they are enrolled (excluding the Internship in Music Education semester) up to a maximum of 5 semesters. A grade of "S" (Satisfactory) must be earned each semester.

Music, B.M.
A total of 120 credits are required for the Bachelor of Music degree. Admission to a concentration normally occurs at the end of the sophomore year.

Concentration in Performance

General Education

Foundation Requirements
Written Communication ................................................................. 6
ENGL 101 and 302
Non-native speakers of English with limited proficiency in the language may substitute ENGL 100 for ENGL 101. Students must attain a minimum grade of C to have ENGL 100 or 101, and 302 fulfill degree requirements.
Oral communication................................................................. 3
Quantitative reasoning .................................................................. 3
Information technology............................................................... 3

Core Requirements
Literature .................................................................................. 3
Natural science .......................................................................... 3
U.S. history ................................................................................ 3
Western civilization ................................................................... 3
Social or behavioral science ....................................................... 3
Arts1 .......................................................................................... 3
Global understanding (MUSI 431) .............................................. 3

Synthesis Requirement
Synthesis2 .................................................................................. 3

Other
Foreign languages and free electives5 ...................................... 10

Students whose major instrument is voice must earn 9 credits in foreign language(s).

Musicianship Courses.................................................................. 71
MUSI 115, 116, 215 Theory I, II, III ...........................................9
MUSI 216 Form and Analysis ......................................................3
MUSI 113, 114 Sight Singing and Ear Training I, II ....................4
MUSI 171, 172, 273 Keyboard Skills I, II, III ................................3
MUSI 331, 332, 431, 432 Music History in Society I, II, III, IV ........12
MUSI 319 Class Composition and Arranging ................................3
MUSI 415 Music in Computer Technology ..................................3
MUSI 391 Conducting I ...............................................................2
MUSI 221, 421 Major Instrument or Voice ................................... 20

(Private Music Instruction)
MUSI 324 Junior Recital ................................................................1
MUSI 424 Senior Recital .............................................................1
MUSI Performance Synthesis ......................................................1
MUSI 379 Improvisation .............................................................1
Ensembles ................................................................................... 8
MUSI 300 Recital Attendance (five semesters)..............................0

Students whose major instrument is a keyboard instrument must substitute Techniques of Accompanying I and II for Keyboard Skills I and II. They must take Keyboard Skills III or earn credit-by-examination by successfully passing the competency placement examination.

Students whose major instrument is voice must earn 8 credits in University Chorale, Symphonic Chorus, and/or Chamber Singers. Students whose major instrument is an orchestral string instrument must earn 8 credits in Symphony Orchestra, and students whose major instrument is a wind or percussion instrument must earn 8 credits in Symphony Orchestra, Symphonic Band, and/or Wind Ensemble. Students whose major instrument is piano, harpsichord, organ, or guitar must earn at least 4 credits in large ensembles: University Chorale, Symphonic Chorus, Chamber Singers, Symphony Orchestra, Symphonic Band, and/or Wind Ensemble. Transfer students must earn at least two ensemble credits at George Mason University.

All students who enroll as freshmen must take MUSI 300 for 5 semesters. Transfer students must take MUSI 300 each semester they are enrolled (excluding the Internship in Music Education semester) up to a maximum of 5 semesters. A grade of "S" (satisfactory) must be earned each semester.

Emphases and Teaching Sequences .......................................... 15
(One of the following must be chosen)

Keyboard Emphasis and Teaching Sequence
MUSI 325 Performance Seminar for Singers and Accompanists I .... 2
MUSI 492H Keyboard Literature ................................................. 3
MUSI 251 The Art of Teaching Music ......................................... 3
MUSI 351 Keyboard Pedagogy .................................................. 3
MUSI 395 Teaching Internship .................................................. 4

Voice Emphasis and Teaching Sequence
MUSI 325, 326 Performance Seminar for Singers and Accompanists I, II 4
MUSI 396 Conducting II ............................................................ 2
MUSI 251 The Art of Teaching Music ......................................... 3
MUSI 352 Vocal Pedagogy and Diction ...................................... 2
MUSI 395 Teaching Internship .................................................. 4

1 Certain general education requirements may be satisfied with courses in the major which would reduce the total number of credits.
Total: 120

◆ Concentration in Music Education

Virginia Licensure (Certification) to Teach

The music education concentration is approved by the Virginia State Department of Education and administered through the Graduate School of Education, which is accredited by the National Council for the Accreditation of Teacher Education (NCATE). Minimum scores on the Praxis I & II tests must be achieved before state licensure can be granted.

To complete the concentration in music education, a student must satisfy the following requirements:

• Be formally accepted into the music education concentration by the departmental Music Teacher Education Committee when:
  a. 45 to 60 credits have been earned
  b. Sight Singing and Ear Training II, Keyboard Skills III, and Theory III have been completed with a grade of C or better and
  c. scores have been submitted for the Praxis I (Reading, Writing, and Mathematics) tests to the Music Teacher Education Committee. It is strongly recommended that students take the Praxis I tests as soon as ENGL 302 and a course in literature and mathematics have been completed

• Maintain an overall GPA of 2.800 in all course work done at George Mason University and in course work done at all institutions of higher learning combined

• Earn no grade lower than a C in music and in professional education courses needed for graduation

• Successfully pass sight singing, ear training, keyboard, and conducting proficiency examinations during the first music methods course (MUSI 461, 463, 464, or 466). Students in the voice emphasis must also pass a voice proficiency examination, and students in the instrumental emphasis must pass a musical instrument fingering proficiency examination during the first music methods course

• Complete all course work in the program sequence

• Upon completion of the above, do 15 weeks of a full-time internship (student teaching). Applications for placement, subject to approval of the Music Teacher Education Committee, are submitted to the Office of Teacher Education at the beginning of the previous semester

• Pass the Praxis II (Music: Content Knowledge) test during the internship semester (student teaching)

General Education

Credits: 42

Foundation Requirements

Written communication: 6
ENGL 101 and 302
Non-native speakers of English with limited proficiency in the language may substitute ENGL

100 for ENGL 101. Students must earn a minimum grade of C to have ENGL 100 or 101, and 302 fulfill degree requirements.

Oral communication: 3
Quantitative reasoning: 3
Information technology: 3

Core Requirements

Literature: 3
Natural science: 3
U.S. history: 3
Western civilization: 3
Social or behavioral science: 3
Arts: 3
Global understanding (MUSI 431): 3

Synthesis Requirement

Synthesis: 3

Other

Free Electives: 3

Musicianship Courses

MUSI 115, 116, 215 Theory I, II, III: 9
MUSI 216 Form and Analysis: 3
MUSI 113, 114 Sight Singing and Ear Training I, II: 4
MUSI 171, 172, 273 Keyboard Skills I, II, III: 3
MUSI 331, 332, 431, 432 Music History in Society I, II, III, IV: 12
MUSI 319 Class Composition and Arranging: 3
MUSI 415 Music in Computer Technology: 3
MUSI 391, 396 Conducting I, II: 4
MUSI 221, 421 Major Instrument or Voice (Private Music Instruction): 12
MUSI 323 Music Education Recital: 6
Ensembles: 6
MUSI 300 Recital Attendance (five semesters): 0

1 Certain general education requirements may be satisfied with courses in the major which would reduce the total number of credits.

2 Students whose major instrument is a keyboard instrument must substitute Techniques of Accompanying I and II for Keyboard Skills I and II. They must take Keyboard Skills I or earn credit-by-examination by successfully passing the competency placement examination.

3 All students who enroll as freshmen must take MUSI 300 for 5 semesters. Transfer students must take MUSI 300 each semester they are enrolled (excluding the Internship in Music Education semester) up to a maximum of 5 semesters. A grade of “S” (satisfactory) must be earned each semester.

4 Students who wish to concentrate in music education must successfully pass sight singing, ear training, keyboard, and conducting proficiency examinations during their first music methods course (MUSI 461, 463, 464, or 466). Students in the voice emphasis must also pass a voice proficiency examination during their first music methods course, and students in the instrumental emphasis must pass a musical instrument fingering proficiency examination during the first music methods course.

5 Students in the instrumental emphasis whose major instrument is something other than a band or orchestral instrument must earn a minimum of 6 additional credits of
undergraduate private music instruction (or the equivalent) on such an instrument, the actual number to be determined by an audition committee. Students in the vocal/choral emphasis whose major instrument is a band or orchestral instrument must earn a minimum of 6 additional credits of undergraduate private music instruction (or the equivalent) in either voice, piano, organ, harpsichord, or guitar, the actual number to be determined by an audition committee.

11 Students whose major instrument is voice, piano, harpsichord, organ, or guitar must earn 6 credits in University Chorale, Symphonic Chorus, and/or Chamber Singers. Students whose major instrument is an orchestral string instrument must earn 6 credits in Symphony Orchestra, and students whose major instrument is a wind or percussion instrument must earn 6 credits in Symphony Orchestra, Symphonic Band, and/or Wind Ensemble. For students in the instrumental emphasis whose major instrument is something other than a band or orchestral instrument, 4 of the 6 required ensemble credits must be earned in Symphony Orchestra, Symphonic Band, and/or Wind Ensemble. For students in the vocal/choral emphasis whose major instrument is a band or orchestral instrument, 4 of the 6 required ensemble credits must be earned in University Chorale, Symphonic Chorus, and/or Chamber Singers. Transfer students must earn at least two ensemble credits at George Mason University.

Teaching Sequences ........................................... 34

(One of the following must be chosen)

### Instrumental Emphasis Teaching Sequence

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>MUSI 251</td>
<td>The Art of Teaching Music</td>
<td>3</td>
</tr>
<tr>
<td>MUSI 393</td>
<td>Music Administration and Management</td>
<td>2</td>
</tr>
<tr>
<td>MUSI 361</td>
<td>Class Strings: Violin and Viola</td>
<td>8</td>
</tr>
<tr>
<td>MUSI 362</td>
<td>Class Strings: Cello and String Bass</td>
<td></td>
</tr>
<tr>
<td>MUSI 363</td>
<td>Class Woodwinds: Flute and Clarinet</td>
<td></td>
</tr>
<tr>
<td>MUSI 364</td>
<td>Class Woodwinds: Oboe and Bassoon</td>
<td></td>
</tr>
<tr>
<td>MUSI 365</td>
<td>Class Brass</td>
<td></td>
</tr>
<tr>
<td>MUSI 366</td>
<td>Class Percussion</td>
<td></td>
</tr>
<tr>
<td>MUSI 367</td>
<td>Class Guitar</td>
<td></td>
</tr>
<tr>
<td>MUSI 368</td>
<td>Class Voice</td>
<td></td>
</tr>
<tr>
<td>MUSI 464</td>
<td>466 Instrumental Music</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Methods I, II</td>
<td></td>
</tr>
<tr>
<td>EDUC 302</td>
<td>or EDUC 539 Human Growth and Development</td>
<td>6</td>
</tr>
<tr>
<td>EDUC 301</td>
<td>Educationally Diverse Populations: Handicapped,</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Gifted, Multicultural or Pluralism and Exceptionality in</td>
<td></td>
</tr>
<tr>
<td></td>
<td>U.S. Education</td>
<td></td>
</tr>
<tr>
<td>EDUC 300</td>
<td>Literacy, and Curriculum</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Integration for Specialist Teachers</td>
<td>3</td>
</tr>
<tr>
<td>MUSI 495</td>
<td>Internship in Music Education (Student Teaching)</td>
<td>6</td>
</tr>
</tbody>
</table>

### Vocal/Choral Emphasis Teaching Sequence

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>MUSI 251</td>
<td>The Art of Teaching Music</td>
<td>3</td>
</tr>
<tr>
<td>MUSI 393</td>
<td>Music Administration and Management</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Secondary instruments</td>
<td>6</td>
</tr>
<tr>
<td>MUSI 352</td>
<td>Vocal Pedagogy and Diction</td>
<td>2</td>
</tr>
<tr>
<td>MUSI 461</td>
<td>The Teaching of General Music in the Elementary and Middle School</td>
<td>3</td>
</tr>
<tr>
<td>MUSI 463</td>
<td>The Teaching of Vocal Music in the Secondary School</td>
<td>3</td>
</tr>
<tr>
<td>EDUC 302</td>
<td>or EDUC 539 Human Growth and Development</td>
<td>3</td>
</tr>
<tr>
<td>EDUC 301</td>
<td>Educationally Diverse Populations: Handicapped,</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Gifted, Multicultural or Pluralism and Exceptionality in</td>
<td></td>
</tr>
<tr>
<td></td>
<td>U.S. Education</td>
<td></td>
</tr>
<tr>
<td>EDUC 300</td>
<td>Literacy, and Curriculum</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Integration for Specialist Teachers</td>
<td>3</td>
</tr>
<tr>
<td>MUSI 495</td>
<td>Internship in Music Education (Student Teaching)</td>
<td>6</td>
</tr>
</tbody>
</table>

Total ...................................................... 120

### Teacher Licensure (Certification)

Undergraduate students seeking licensure (certification) to teach vocal/choral or instrumental music on the elementary and secondary levels must earn the Bachelor of Music degree as specified under Concentration in Music Education. Students who have earned a baccalaureate degree and who are seeking state licensure (certification) to teach music must also complete this sequence of courses, which constitute a state-approved program for teacher education in music.

#### Minor in Music

All music minors must pass a music audition. Music minors in the keyboard area use the Keyboard Skills I credit as a music elective.

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>MUSI 101</td>
<td>Introduction to Classical Music</td>
<td>3</td>
</tr>
<tr>
<td>MUSI 171</td>
<td>Keyboard Skills I</td>
<td>1</td>
</tr>
<tr>
<td>MUSI 115</td>
<td>116 Theory I and II</td>
<td>6</td>
</tr>
<tr>
<td>MUSI 113</td>
<td>Sight Singing and Ear Training I</td>
<td>2</td>
</tr>
<tr>
<td>MUSI 221</td>
<td>Undergraduate private music instruction (major instrument or voice)</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>Ensembles</td>
<td>3</td>
</tr>
<tr>
<td>MUSI 300</td>
<td>Recital Attendance (two semesters)</td>
<td>0</td>
</tr>
</tbody>
</table>

#### Minor in Jazz Studies

This minor is open to music and non-music majors who wish to explore America's unique art form. It is open to all instrumentalists and vocalists, including students who perform on instruments not normally associated with jazz. No prior
experience in jazz is needed, but candidates must pass a music audition. Jazz studies minors in the keyboard area use the Keyboard Skills I credit as a music elective.

<table>
<thead>
<tr>
<th>Total Required</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>MUSI 107 The Development of Jazz</td>
<td>3</td>
</tr>
<tr>
<td>MUSI 379 Jazz Improvisation</td>
<td>1</td>
</tr>
<tr>
<td>MUSI 311 Jazz Studies</td>
<td>3</td>
</tr>
<tr>
<td>MUSI 485 Jazz Chamber Ensembles</td>
<td>3</td>
</tr>
<tr>
<td>MUSI 115, 116 Theory I and II</td>
<td>6</td>
</tr>
<tr>
<td>MUSI 113 Sight Singing and Ear Training I</td>
<td>2</td>
</tr>
<tr>
<td>MUSI 171 Keyboard Skills I</td>
<td>1</td>
</tr>
<tr>
<td>MUSI 221 Undergraduate Private Music Instruction (Major Instrument or Voice)</td>
<td>2</td>
</tr>
<tr>
<td>MUSI 300 Recital Attendance (two semesters)</td>
<td>0</td>
</tr>
</tbody>
</table>

All students who enroll as music minors and jazz studies minors must take MUSI 300 for 2 semesters. A grade of “S” (Satisfactory) must be earned each semester.

**GRADUATE PROGRAM**

**Music, M.M.**

The expansion of professional education in the arts is paramount for the growth and development of a rich and vital cultural community and a supporting network of individual artists. The dynamics of contemporary society suggest that the impact of the arts on public life will continue to expand well into the 21st century. Each year, opportunities increase for creative work by performers, composers, sculptors, painters, dancers, actors, historians, theoreticians, and musicologists.

The Master of Music is offered as an educational channel to meet the intellectual and career needs of qualified students. It is a comprehensive and advanced program of study with a choice of concentrations in performance (single or multiple instruments), music education, composition, and conducting. The M.M. with a concentration in music education does not provide licensure to teach music in public or private schools.

**Admission Requirements**

In addition to fulfilling the admission requirements for graduate study, the applicant is expected to hold a baccalaureate degree in music or in another discipline with courses equaling the music requirements (minus the seven- to eight-credit teaching sequence) for the Bachelor of Arts in Music offered at George Mason.

The following admission requirements must also be met:

1. **Performance:** Audition (single or multiple instruments)
2. **Conducting:** Audition
3. **Composition:** Submission of a portfolio of compositions
4. **Music Education:** Submission of a two- to three-page paper on the applicant’s philosophy of music education

**Diagnostic Entrance Examination**

All new graduate students are required to take an entrance examination to demonstrate competence in music history, music theory, and general musicianship. The examination is offered during a three-hour period normally on the Saturday before the first day of classes of the fall and spring semesters. All sections of the examination must be passed prior to graduation.

**Foreign Language Examinations (Vocal Performance Emphasis)**

Students in the M.M. degree program (emphasis in vocal performance) must take proficiency exams in French, German, Italian, and English to prove diction competency. Students who do not pass the Italian or English diction test are required to take MUSI 525 Performance Seminar for Singers and Accompanists I. Students who do not pass the French or German diction test are required to take MUSI 526 Performance Seminar for Singers and Accompanists II.

**Comprehensive Exit Examination**

All students completing the M.M. in Music are required to pass a comprehensive exit examination administered during the graduation semester or, in the case of students selecting the thesis option in the music education concentration, upon completion of 24 credits of course work and immediately before beginning work on the thesis. August graduates must take this examination during the preceding spring term. This exam normally consists of a one-hour oral examination, and the questions are based primarily on the courses the student has taken at George Mason University.

**Degree Requirements**

A student must successfully complete 30 credits in graduate music courses. With the approval of the department, 3 non-music graduate credits may be taken.

The student must satisfy the following requirements:

<table>
<thead>
<tr>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>MUSI 662 Introduction to Research in Music</td>
</tr>
<tr>
<td>MUSI 511 Analytical Techniques</td>
</tr>
<tr>
<td>MUSI 531 Advanced Topics in Music History and Literature</td>
</tr>
<tr>
<td>Ensemble</td>
</tr>
</tbody>
</table>

**Additional Requirements for the Concentration in Performance: Single Instrument**

<table>
<thead>
<tr>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>MUSI 621 Graduate Private Music Instruction: Instrumental/Vocal</td>
</tr>
<tr>
<td>MUSI 512 Advanced Orchestration</td>
</tr>
<tr>
<td>MUSI 531 Advanced Topics in Music History and Literature</td>
</tr>
<tr>
<td>MUSI 724 Graduate Recital</td>
</tr>
<tr>
<td>Electives</td>
</tr>
</tbody>
</table>

**Additional Requirements for the Concentration in Performance: Multiple Instruments**

<table>
<thead>
<tr>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>MUSI 621 Graduate Private Music Instruction: Major Instrument</td>
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<tr>
<td>MUSI 622 Graduate Private Music Instruction: Secondary Instrument #1</td>
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<td>MUSI 623 Graduate Private Music Instruction: Secondary Instrument #2</td>
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<tr>
<td>MUSI 553 Instrumental Pedagogy and Literature</td>
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<tr>
<td>MUSI 724 Graduate Recital: Multiple Instruments</td>
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<tr>
<td>Electives</td>
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**Additional Requirements for the Concentration in Music Education**

<table>
<thead>
<tr>
<th>Credits</th>
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<tbody>
<tr>
<td>MUSI 562 Psychology of Music Teaching and Learning</td>
</tr>
<tr>
<td>MUSI 663 Aesthetics of Music Education</td>
</tr>
</tbody>
</table>
To organize their advanced work within the major, students select a course of study that includes classes and studies to create a shared body of knowledge within the department's student population. Education in the belief that such study, various practical training and experience, offers the best preparation for a life in the theater. Students electing to major in theater complete the theater core, a group of courses that provides a broad introduction to the various arts of the theater and strives to create a shared body of knowledge within the department's student population.

To organize their advanced work within the major, students elect a course of study that includes classes in at least two of three areas: performance, design and technical theater, and theater studies. The department aims to prepare students for graduate study and/or entry into the profession through rigorous, concentrated and individualized training. However, students are encouraged to maintain wide-ranging interests both inside the department and throughout the university's extensive offerings.

Writing-Intensive Requirement
The university requires all students to complete at least one course designated "writing intensive" in their majors at the 300 level or above. Students in the B.A. in Theater program fulfill this requirement by successfully completing THR 350 or THR 351.

Diagnostic Examination
Theater students are required to take a diagnostic examination during their junior year or upon reaching 30 credits in Theater Department courses, whichever comes first. This examination cannot be "passed" or "failed"; it is a tool with which the faculty can assess each student's progress in the major to provide better advising for the student's final year and for preparation for life after college. The exam also serves to assess the curriculum's effectiveness. Arrangements for the diagnostic exam are initiated by the student through the department chair.

Theater, B.A.

Degree Requirements

General Education

Credits

Foundation Requirements
Written communication. ENGL 101 and 302........ 6
Non-native speakers of English with limited proficiency in the language may substitute ENGL 100 for ENGL 101. A student must attain a minimum grade of C to have ENGL 100 or 101, and 302 fulfill degree requirements. Students are reminded that the English Department offers proficiency exams for credit and exemption from this requirement.
Oral communication ........................................ 3
Quantitative reasoning ..................................... 3
Either: appropriate placement score on quantitative skills and one of MATH 108, 110, 111, 113, 115, 125, or IT 250, or STAT 250 or lower placement score requiring MATH 106
Information technology ...................................... 3

Core Requirements

Literature ...................................................... 3
Arts (outside the major) ...................................... 3
Natural science (including laboratory science) .... 7
U.S. history ..................................................... 3
Western civilization ......................................... 3
Global understanding ...................................... 3
Social and behavioral sciences ............................. 3
Synthesis Requirement
Synthesis Requirement ................................. 3
College of Visual and Performing Arts  

Other
Foreign language ........................................... 0-12
   Students must demonstrate proficiency (at the intermediate level) in one foreign language offered by the university either by examination or course work.

Major ......................................................... 53-54

Theater Core Requirements .................................. 32-33
   Additional Literature ........................................ 3
   Additional Arts (outside the major) ......................... 3-4
   THR 150, 151 Drama, Stage, and Society I and II ........... 6
   THR 200 Play Production Practicum (1 each, repeated for a total of 4) 4
   THR 210 Acting I ........................................... 3
   THR 230 Introduction to Technical Theater I ................. 3
   THR 240 Directing I ........................................ 3
   THR 350 Script Analysis .................................... 3
   One upper-level dramatic literature seminar
   (THR 351, 352, or 355) .................................. 3
   One from the following group of one-credit mini-courses: ......... 1
   THR 201 Stage Management, THR 202
   Literary Management, or THR 203 Production/Company Management

Upper-Level Units ............................................. 21
   Twenty-one credits of 300- and 400-level courses, chosen
   from at least two of the following areas: performance, design
   and technical theater, and theater studies.

Performance
   This area is designed for the serious student of acting with
   performance aspirations. Solid grounding in the fundamentals
   of analysis and basic training of the actor's instrument is complemented by intensive, individualized instruction in the various facets of the actor's craft.
   THR 300 Voice and Speech Fundamentals .................... 3
   THR 301 Voice and Speech for the Performer ............... 3
   THR 310 Acting II .......................................... 3
   THR 320 Beginning Modern Acting .......................... 3
   THR 321 Acting Shakespeare ............................... 3
   THR 322 Alexander Technique/Stage Combat ............... 3
   THR 345 Puppetry: History and Technique .................. 3
   THR 420 Advanced Modern Acting .......................... 3
   THR 421 One-Person Show .................................. 3
   THR 423 Audition Techniques: Stage and Camera ......... 3
   THR 425 Verse Speaking ...................................... 3

Design and Technical Theater
   This area prepares students for further study and work in the design and technical fields. Courses in this area are also strongly recommended for students interested in directing.
   THR 314 Lighting Stagcraft ................................ 3
   THR 330 Seminar in Technical Theater ...................... 3
   THR 333 Stage Design ...................................... 3
   THR 334 Lighting Design ................................... 3
   THR 335 Costume Design .................................. 3
   THR 336 Advanced Theater Technology ...................... 3
   THR 343 Costume Draping and Drafting ..................... 3

Theater Studies
   This area is designed to provide the theater generalist with thorough preparation for further study and work in directing, dramaturgy, theater criticism, theater scholarship, playwriting, and teaching. For specific teacher licensure (certification) requirements, students are directed to the Office of Teacher Education.
   THR 340 Directing II ....................................... 3
   THR 351 Dramatic Theory and Criticism ..................... 3
   THR 352 Dramatic Literature Seminar ...................... 3
   THR 355 Moral Vision in American Theater ................. 3
   THR 359 World Stages ...................................... 3
   THR 380, 381 Playwriting I, II .............................. 3, 3
   THR 424 Contemporary Women Playwrights ................ 3
   THR 440 Advanced Studies in Directing/ Dramaturgy .... 3
   THR 480 Advanced Playwriting .............................. 3
   THR 490 Special Topics in Drama, THR 494 Field Experience, and THR 497 Independent Study may be applied to the appropriate area.

Practicum (1 credit)
   Students must earn a total of 4 practicum (THR 200) credits,
   1 from each of the 3 groups below. Students will select their fourth practicum assignment from the group of their choice.
   Group 1: Performance/Design (e.g., acting, directing,
   design, stage management)
   Group 2: Production Crew (e.g., run crew, wardrobe, set
   construction, costume construction, electrics)
   Group 3: Production Administration (e.g., positions such
   as master electrician, company manager, publicity manager,
   dramaturg)

Electives ..................................................... 11-24
   ♦ Minor in Theater
   The theater minor consists of 18 credits in theater, selected
   in consultation with a faculty adviser and approved by the
   department chair.

Honors in Theater
   Students wishing to pursue Honors in Theater should contact
   the department chair.

Production Opportunities
   Participation in Theater Department (GMU Players) productions is expected of all declared majors. Up to 4 practicum credits (one per assignment) can be awarded for satisfactory completion of performance/production assignments in the major (i.e. faculty- or guest-directed GMU Players mainstage, studio, or TFA productions).
   Theater of the First Amendment (TFA), a professional theater in residence within CVPA, offers students the chance to work closely with professional artists. TFA productions regularly employ student assistants in stage management, directing, dramaturgy, technical crews, and production/company management. Students are eligible to audition for roles or understudy assignments in TFA productions and may participate in the membership candidate program through Actor's Equity Association.

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### Glossary

This section lists undergraduate and graduate courses offered by the university and available for credit. Courses are listed in alphabetical order. The subject code for courses and the programs offering the courses are listed below:

<table>
<thead>
<tr>
<th>Course Title</th>
<th>Code</th>
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<tbody>
<tr>
<td>Accounting</td>
<td>ACCT</td>
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<td>Administration of Justice</td>
<td>ADJ</td>
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<td>Adult Education</td>
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<td>Bachelor of Arts in Interdisciplinary Studies</td>
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<td>Bachelor of Individualized Study</td>
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<td>Comparative Literature</td>
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<td>Counseling and Development</td>
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<td>Engineering</td>
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<td>Foreign Languages</td>
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### 262 Course Descriptions

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**Urban and Suburban Studies**  USST
Women's Studies  WMST

**Semester Notation**

At the end of some course descriptions, a semester notation informs the reader of the semester in which the course is usually taught. For example, fall (f) means that the course is usually only taught in the fall semester; fall, summer (f,s) means the course is taught fall and summer only; a fall, spring, summer designation (f,s,s) means that the course is usually available every semester. A course offered only in alternate fall or spring semesters would be designated with af or as. A course offered only alternate years would be designated with ay. If the course is offered on an irregular basis at the discretion of the department or school, irregular (ir) follows the description. Although circumstances may cause a unit to deviate occasionally from these notations, students should use this information to plan their programs of study.

**Course Numbering**

**General**

1. Course titles are followed by numbers in parentheses (0:0:0), separated by colons. The numbers have the following significance:
   - First number: credits for the course
   - Second number: hours of lecture/seminar per week for the course
   - Third number: hours of laboratory/studio per week for the course

2. For independent study, readings, topics, or similar courses, individual instructors set hours.

**Undergraduate**

Courses numbered 499 and below are undergraduate courses. Course numbers in the 100 series are customarily taken by freshmen, the 200 series by sophomores, the 300 series by juniors, and the 400 series by seniors.

The number designations of the course descriptions below have the following significance:

1. A single number (as HIST 301) indicates that the course is complete within a single semester, and that the semester course may be taken separately with credit toward a degree.

2. A double number separated by a comma indicates that the subject matter or content of the course extends through two semesters but that either semester may be taken by itself. Unless otherwise specified, the first semester is not prerequisite to the second semester.

**Graduate**

Graduate courses are divided into the following categories:

- 500-699 Open only to graduate students admitted to master's or doctoral programs, to other bachelor's degree holders, and to approved, advanced undergraduate students. Advanced undergraduate students who have secured the permission of the department offering the course may select from these courses to accumulate the hours necessary for completion of an undergraduate degree. With the written permission of the dean of their college, they may take these courses for reserve graduate credit.

- 700-799 Open only to students admitted to graduate degree or certificate programs.

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800-999 Primarily doctoral courses open only to students admitted to graduate degree programs.

Degree programs may extend permission to enrol bachelor's degree holders.

Courses with the following numbers are reserved for the uses designated:

600-609 Limited applicability, graduate-credit courses.

Courses normally intended for in-service professional development and not directly leading to a graduate degree. A limited number of hours from these courses may be applied to a graduate degree.

798 Master's research
799 Master's thesis
800 Studies for the Doctor of Philosophy in Education program
998 Doctoral dissertation proposal
999 Doctoral dissertation research
790, 890 Supervised practicum
794, 894 Internship
796, 896 Directed reading and research courses for master's and doctoral students

Courses

Accounting (ACCT)

School of Management

If a student takes noncore, upper-level business courses before admission to the School of Management, those courses will not count on an undergraduate degree application for any major in the school (except as general elective credit). A grade of C or higher must be presented on the graduation application for each upper-level course in the major. Course prerequisites are strictly enforced. Degree status is defined as formal admission to the School of Management.

203 Survey of Accounting (3:3:0). Provides students with an introduction to accounting from the viewpoint of those who prepare and use financial information. Topics include the uses of accounting information, the creation of financial statements, an overview of the firm's operating, financing, and investing activities, and an introduction to product costing, operating budgets, and capital investment decisions.

301 Financial Accounting and Managerial Decision Making (3:3:0). Prerequisite: ACCT 203 and SOM 301. Examines financial accounting from the viewpoint of both users and preparers of financial statements, with an emphasis on using financial statement information to make financing, operating, and investing decisions.

311 Managerial and Cost Accounting (3:3:0). Prerequisites: degree status and ACCT 30. This course develops student skills in identifying business processes, transforming data into useful information, and making managerial decisions. It is designed for students in all areas of management, especially those whose career aims include cost management. Topics include analyzing and managing costs, developing cost systems that facilitate decision-making, identifying opportunities for improving business process, creating financial and operating budgets for planning and control, and developing measures to assess performance.

321 Financial Reporting and Analysis (3:3:0). Prerequisites: degree status and ACCT 301. This course is designed to serve as the intermediate course for students who wish to obtain substantial training in financial accounting. It also serves the needs of students who desire additional understanding of financial statements beyond the introductory level. The course discusses the role of financial information in valuation, cash-flow analysis, credit risk assessment, and contracting. In addition, the course covers such specific topics as: receivables, inventories, long-lived assets, financial instruments, leases, pension and post-retirement benefits, inter-corporate equity investments, and international reporting.

351 Taxation and Managerial Decision Making (3:3:0). Prerequisites: degree status and ACCT 301. This course is designed to produce managers with sufficient understanding of the tax environment to identify important issues when evaluating business transactions. The course develops a framework of taxpayer-activities and taxable-income components that enables students to learn the fundamental tax concepts and apply them to a variety of business, investment, employment, and personal transactions. Further, students learn to weigh both tax and non-tax costs and benefits in making decisions. Specific topics include business formation and organization; capital expenditures; employee and executive compensation; international and multi-state operations; and the financial statement disclosure of tax information.

361 Information Technology in Accounting and Finance (3:3:0). Prerequisites: degree status and ACCT 301. An introduction to financial information and knowledge processing. Topics include basic hardware and software concepts; telecommunications; business process design, strategic use of information systems and information systems value; database design and applications, artificial intelligence; computer crime, security, and privacy; ethical and legal issues, including information systems auditing fundamentals.

372 Business Analysis and Valuation (3:3:0). Prerequisites: degree status and ACCT 301. Expands upon the student's ability to use financial statement information for such important business valuation and financial analysis transactions as credit analysis, risk assessment, risk management, bankruptcy prediction, and equity valuation. This course uses actual case studies to provide an in-depth analysis of the use of financial statement information.

382 Financial Analysis of the Business Life-Cycle. Prerequisites: degree status ACCT 301. The course uses a multidisciplinary approach to analyze major events in the financial life-cycle of business firms. Topics include: start-up activities, such as obtaining venture capital and selecting the appropriate business form; high-growth transactions, such as stock option arrangements and initial public offerings; complex corporate structure issues including mergers and alliances; multi-jurisdictional operations, especially consolidated financial statements, foreign tax credits, currency translations, and currency hedges, downsizing the firm via spin-offs, divestitures, plant closings, and asset sales; and bankruptcy proceedings, including loan work-outs.
41 Advanced Financial Accounting Topics. Prerequisites: degree status and ACCT 32J. This course is intended for students who seek to gain expertise in preparing financial statements for complex business organizations. Specific topics include the preparation of segmental and consolidated financial statements, especially for multinational firms with complicated corporate structures. In addition, especially intricate accounting issues, such as business combinations, segmental disclosures, and foreign currency translation are covered.

461 Assurance and Audit Services (3:3:0). Prerequisites: degree status and ACCT 361. This course focuses on the process and techniques of providing various assurance services, including financial and operational auditing. In addition, the course is designed to provide students with the necessary information to successfully complete the auditing portion of the CPA examination.

491 Seminar in Accounting (3:3:0). Prerequisite: degree status. Advanced study of accounting concepts and selected topics.

499 Independent Study (1-3:0:0). Prerequisites: Nine credits in upper-level accounting courses and degree status. Research and analysis of selected problems or topics in accounting. Must be arranged with an instructor and student must receive written approval from the associate dean for undergraduate programs before registration. Written report required. May be repeated for a maximum of six credits if topics vary.

Administration of Justice (ADJ)

100 Introduction to Criminal Justice (3:3:0). Overview of the American system of criminal justice, covering theories of justice, criminal law, policing, courts and associated pretrial and posttrial legal processes, punishment and corrections, and juvenile justice.

300 Research Methods and Analysis (4:3:1). Prerequisite: GOVT 103. Required for all administration of justice majors. Students are strongly encouraged to take ADJ 300 before or during the first semester of enrolling in 300-level courses. Emphasis is on asking clear, researchable questions and using appropriate evidence to answer them. Students are introduced to and learn to use a broad range of evidence, including quantitative and qualitative information. Design and analysis of surveys, government archives, case studies, and interpretations of events in journals are studied. The ethical implications of information technologies are examined.

301 Public Law and the Judicial Process (3:3:0). Prerequisite: GOVT 103. American judicial organization and operation, role of the Supreme Court in policy formation, and selected constitutional principles.

302 Sociology of Delinquency (3:3:0). Prerequisite: SOCI 101 or permission of instructor. Theories of juvenile delinquency and societal reactions to delinquency. Presents gender differences in rates and types, historical overview emphasizing origins, and development of juvenile justice system. Critical assessment of juvenile justice and its alternative.

303 Experiencing the Criminal Justice System (3:3:0). Prerequisite: ENGL 302; COMM 100, 101, or 104, and 60 credits. An experiential learning course designed to give preservice administration of justice students a firsthand, practical journey through the criminal justice process and system.

306 Criminal Justice Ethics (3:3:0). Prerequisite: 60 credits or permission of instructor. Analysis of the ethical principles relevant for those working in criminal justice.

377 Public Safety Officers and the Law (3:3:0). Prerequisite: ENGL 302. Law applicable to fire and police protection, firefighters, and police officers, and their relationship to the public, their employers, the courts, and other societal institutions. Rights and obligations of the uniformed services in tort and criminal law, historical development of each, Virginia law, and other local topics are discussed. Writing-intensive course.

390 Applied Criminal Psychology (3:3:0). Uses an overview of psychological and criminological theories to apply behavioral science theory to practical application in forensic settings. Focuses on such subjects as analysis of various crime scenes, such as homicide and rape, and the characteristics of the various offenders.

401 Policing in America (3:3:0). Prerequisite: ADJ 100. Fundamental issues relevant to contemporary public policing in America: the role and history of police; impact on crime, disorder, and other social problems; discretion and its control; moral hazards; police legitimacy and public support; police culture and the police organization; and community policing.

402 Sociology of Punishment and Corrections (3:3:0). Prerequisite: 6 credits of sociology including SOCI 101, or permission of instructor. Theories explaining forms of punishment systems; punishment and corrections as a product of historical, cultural, and political changes; differences by race and gender in punishment and corrections. Problems of social control and violence in prisons, alternative rehabilitation, and community prevention strategies.

404 Crime Victims and Victimization (3:3:0). Prerequisite: ADJ 100. Exploration of the experiences of crime victims, the distribution of the risks of victimization, and the causes and consequences of victimization. Nature and impact of victim's rights advocates are also considered.

405 Law and Justice around the World (3:3:0). Prerequisite: ADJ 100. Comparative inquiry into the models of legal and justice systems around the world. Consideration of how social and legal norms are created and how different societies exercise their powers of social control. Evaluation of justice models in action, including such areas as law and courts, policing, corrections, and juvenile justice.

406 Family Law and the Justice System (3:3:0). Prerequisite: ADJ 100. Introduction to the elements of family law and exploration of its influence on American social life and contemporary notions of justice. Topics include marriage and parenting, divorce, custody and support, nontraditional families, and domestic violence.

407 Law and Society (3:3:0). Prerequisite: ADJ 100 or GOVT 301. Exploration of the relationship between law and society, including the concept of law; the origin, development, and role of law in society, and the relationship between law and social change. Different approaches to
the study of law and society will be considered and different methodologies assessed.

408 Criminal Courts (3:3:0). Prerequisite: ADJ 100 or GOVT 301. Study of the workings, advantages, and frailties of the criminal courts. How the criminal courts are set up, what they do, how they vary, why they are structured as they are, and whether the system works effectively and efficiently.

409 Community Policing (3:3:0). Prerequisite: ADJ 100. Study of community policing, focusing especially on the United States. Covers history and development of community policing, community relations, problem solving, and issues of organizational change.

423 Constitutional Law: Civil Rights and Liberties (3:3:0). Prerequisite: GOVT 103. Study of the First Amendment freedoms of speech, press, assembly, association, and religion; the right to privacy; and Fourteenth Amendment right to equal protection.

424 Constitutional Law: Criminal Process and Rights (3:3:0). Prerequisite: GOVT 103. Study of constitutional law pertaining to the rights of the criminally accused from the stages of investigations and evidence through attorney, trial, and punishment stages at federal and state levels.

425 Criminal Justice Management (3:3:0). Explains the management function for current and future criminal justice managers. Emphasis on communication, motivation, leadership skills, and organizational development.

460 Surveillance and Privacy in Contemporary Society (3:3:0). Prerequisite: ADJ 100. Philosophical perspectives, historical context, technological developments, and institutional changes that surround controversies about privacy and surveillance in contemporary society. Explores public and private institutions doing surveillance, how they calculate and manage risk, and legal constraints on surveillance activities.


475 Theory and Politics of Terrorism (3:3:0). Explores the origins of terrorism and traces its development from early states to a modern mode of conflict. National, regional, and global perspectives are presented.

479 Preparation for Internship (3:3:0). Prerequisites: ADJ 100, ADJ/GOVT 300, ADJ 303, and at least 21 credits of other upper-level courses required for the Administration of Justice major (from one or more of the following categories: justice system, law, and the legal process; social and human problems; legal, philosophical, and ethical standards). Students may be simultaneously enrolled in ADJ 303 and ADJ 479. Prepares students to conduct an internship in a justice organization or perform justice-related work activity. Students develop a relationship with a prospective internship sponsor and develop a plan for the internship and the research to be reported.

480 Internship in Justice Administration (3-9:0:0). Prerequisite: ADJ 479. Before enrolling, students must have a plan approved by the instructor. Application of classroom learning to an applied justice setting. Students maintain daily journals, conduct research, and deliver both written and oral reports. Seminars are held three times during the semester for discussion and oral presentation. Minimum of 50 hours of on-the-job work time is required for each credit hour. Students may take the course for 3, 6, or 9 credits. Course may be taken more than once, but total accumulated credits may not exceed 9. Amount of required written work is calibrated to credit hours.

490 Special Topics in Administration of Justice (1-3:1-3:0). Recent developments in the field. Content varies. Recent topics have covered violence in the workplace and international terrorism. May be repeated for credit four times.

491 ADJ Honors Seminar I (3:3:0). Prerequisites: Admission to the Administration of Justice honors program. First of a two-course sequence. Subject varies. Course includes readings, individual or group projects, and discussion of seminar papers.

492 ADJ Honors Seminar II (3:3:0). Prerequisites: ADJ 491. Second of a two-course sequence. Subject varies. Course includes readings and discussion of seminar papers, leading to a research project under the direction of a faculty member. Oral examination on the research and report may be required.

499 Independent Study in Administration of Justice (1-3:0:0). Prerequisite: ADJ 100. Open to majors in Administration of Justice and Public and International Affairs with 90 credits and permission of instructor and program. Reading and research on a specific topic under the direction of a faculty member. Written report is required; an oral examination or report may also be required. Degree requirements to be fulfilled by a particular independent study will be determined by the student's advisor.

577 Legal Issues for the Law Enforcement Manager (3:3:0). Studies the civil liability of individual officers, managers, and agencies. Constitutional right of public employees, employee rights, and constitutional issues are covered.

590 Special Topics in Administration of Justice (1-3:1-3:0). Recent developments in the field. Content varies. Recent topics have covered violence in the workplace and international terrorism. May be repeated for credit.

Adult Education (EDAL)

Graduate School of Education

541 Understanding Adult Learners (6:6:0). Examines a variety of adult learning issues, including adult learning theory, adult developmental psychology, and adult learner motivation and experience. Adult learners are considered in terms of individual learning needs, incentives, support systems, and learning style differences.

542 Arranging Conditions for Adult Learning (6:6:0). Focuses on linking adult learners to resources and establishing the environment for learning. Emphasizes program development processes and teaching and learning strategies for adults. Other topics covered include technology and adult learning, workplace learning, and learning organizations.
## African American Studies (AFAM)

### African American Studies Program

200 Introduction to African American Studies (3:3:0).
An interdisciplinary introduction to the field of African American studies, including a comparative analysis of approaches, methodologies, and key concepts related to the study of people of African descent in the United States, in continental Africa, and throughout the African diaspora. Lectures and discussion integrate attention to the current and changing status of such issues as diversity and multiculturalism from national and global perspectives.

390 Special Topics in African American Studies (3:3:0).
A study of selected topics related to the field of African American studies. Topics include foundations of African American literature; African American literature of the 20th century; the African American experience in the United States from Reconstruction to the present; music, movies, and civil rights; and black political thought.

490 Internship (3:3:0). Prerequisites: AFAM 200 and 60 credits. Credit to be determined by the African American Studies Program.

499 Independent Study (1-3:0:0). Prerequisites: Undergraduate senior status and permission of the director. Investigation of an area related to African American studies according to individual interest, with emphasis on research.

### Alternative Education (EDAE)

#### Graduate School of Education

600 Alternative Education for At-Risk Youth (1:1:0).
Provides an overview of the nature of at-risk students, why alternative education programs exist, and the types of alternative programs available locally, statewide, and nationally.


603 Communication and Management Strategies for Alternative Education (3:3:0). Focuses on techniques to manage crisis management, resolve conflicts, implement peer mediation, and develop positive peer and adult relationships. Emphasizes strategies for working successfully with families, diverse populations, substance abusers, and dually diagnosed students.

604 Multidisciplinary and Interagency Collaboration (3:3:0). Examines the Comprehensive Services Act of Virginia and other legislation about at-risk youth. Emphasizes agency functions, case management, collaboration, identifying resources, and networking.

### Anthropology (ANTH)

#### Sociology and Anthropology

114 Introduction to Cultural Anthropology (3:3:0). For non-Western credit. Overview of major ideas and approaches in the study of cultures around the world. Survey of kinship, social organization, political economy, religious beliefs, and other aspects of non-Western cultures.

120 Introduction to Archaeology (3:3:0). Introduction to survey of anthropological archaeology. Development and use of contemporary theory and field and lab methods.


299 Independent Study (1-3:0:0). Prerequisite: ANTH 114 or permission of instructor. Individual study in anthropology on topic organized in advance by student and instructor.

300 Civilizations (3:3:0). Prerequisite: ANTH 114, 60 credits, or permission of instructor. For non-Western credit. Cross-cultural and transtemporal examination of complex societies and civilizations. Exploration of developmental schema for rise, articulation, spread, and decline of historic and contemporary civilizations.

301 Native North Americans (3:3:0). Prerequisite: ANTH 114, 60 credits, or permission of instructor. For non-Western credit. Exploration of native North American cultures and selected aspects of Indian-white historical relations. Emphasis on cultural persistence as well as change.

302 Peoples and Cultures of Latin America (3:3:0). Prerequisite: ANTH 114, 60 credits, or permission of instructor. For non-Western credit. Examination of Latin American cultures and selected aspects of historical record.

303 Peoples and Cultures of Selected Regions (3:3:0). Prerequisite: ANTH 114, 60 credits, or permission of instructor. Examination of cultures of a specific region (e.g., Middle East, Amazonia).

304 Peoples and Cultures of the Pacific (3:3:0). Prerequisite: ANTH 114, 60 credits, or permission of instructor. For non-Western credit. Survey of 20th-century Melanesian, Polynesian, and Micronesian cultures: Case studies of interplay between cultural systems and island ecology.

305 Hunter-Gatherer Societies (3:3:0). Prerequisite: 60 credits, 6 credits of anthropology including ANTH 120, or permission of instructor. For non-Western credit. Examination of early human societies with emphasis on environmental, technological, and cultural aspects of hunting and gathering as a successful prehistoric and contemporary means of adaptation.

306 Peoples and Cultures of Island Asia (3:3:0). Prerequisite: ANTH 114, 60 credits, or permission of instructor. For non-Western credit. Examination of cultures of the Island Asia culture region; focus on native cultures of Indonesia, Borneo, and the Philippines.

309 Peoples and Cultures of India (3:3:0). Prerequisites: ANTH 114 and 60 credits or permission of instructor. Examination of South Asia, with emphasis on India. Focus includes (1) a general overview of prehistory and history; (2) the impact of colonialism; (3) contemporary Indian cul-
ture, including the changing relations of caste and class, family organization, and the roles of women, religion, and ideology; and (4) current trends in economic development and socioeconomic differences in different parts of the country.

310 Social Organization and Kinship (3:3:0). Prerequisite: ANTH 114, 60 credits, or permission of instructor. Examination of social organization, kinship, descent, and kinship terminologies in mainly non-Western cultures, emphasizing both the meaning of specific cultural systems and cross-cultural similarities and differences.

311 Peoples and Cultures of Mainland Southeast Asia (3:3:0). Prerequisite: ANTH 114, 60 credits, or permission of instructor: For non-Western credit. Survey of societies of mainland Southeast Asia, with emphasis on successive waves of outside cultural influences and relations between contrasting ethnic groups in modern states. Focus on Thailand and Malaysia.

312 Comparative Political Systems (3:3:0). Prerequisite: ANTH 114, 60 credits, or permission of instructor. Examination of cultural and ecological contexts of political structures and competition for power in selected societies; a cross-cultural and comparative approach to study of political conflict, leadership, values, and symbolism.

313 Anthropological Perspectives on Religion (3:3:0). Prerequisite: ANTH 114, 60 credits, or permission of instructor: For non-Western credit. Examination of religion as a cultural system. Topics include mythology, ritual, symbolism, and dogma. Cross-cultural and predominantly non-Western material is emphasized.

315 Socialization Processes (3:3:0). Prerequisite: ANTH 114, 60 credits, or permission of instructor. Examination of selected aspects of the cultural transmission process in specific local cultures, selected from various world culture regions, with emphasis on transmission of cultures.

320 Laboratory Techniques in Archaeology (4:3:2). Prerequisite: ANTH 120, 60 credits, or permission of instructor: Study of research techniques by directed group projects in analysis of materials such as ceramics, glass, and lithics through discussions, demonstrations, and participation.

321 Field Techniques in Archaeology (3:6:0:0). Prerequisite: ANTH 120, 60 credits, or permission of instructor: Intensive study of archaeological field techniques by directed group projects in site survey, site testing, recording techniques, and stratigraphy through discussions, demonstrations, and hands-on experience. May be repeated for a maximum of 6 credits.

322 Historical Archaeology (3:3:0). Prerequisite: ANTH 114, 60 credits, or permission of instructor. Examination of materials, theories, and methods of archaeology derived from and applied to historical sites, as they complement archival records.

323 Field Techniques in Archaeology (3:6:0:0). Prerequisite: ANTH 120, 60 credits, or permission of instructor. Introduction to the causes and consequences of forced dislocation as a global issue. Course covers formally recognized refugees, as well as those people (such as internally displaced persons and asylum seekers) who are in refugee-like circumstances. Attention is directed to understanding the personal experiences of refugees and examining the efforts on their behalf at the national and international levels.

324 Cultures in Comparative Perspective (3:3:0). Prerequisite: ANTH 114 or permission of instructor. For non-Western credit and credit toward the B.A. in Sociology. Examination of the varieties of cultural experience. Several cultures are studied in depth, with attention to local histories, global contexts, and shifting perspectives on the practice of ethnography.

331 Refugees (3:3:0). Prerequisite: ANTH 114, 60 credits, or permission of instructor. Introduction to the causes and consequences of forced dislocation as a global issue. Course covers formally recognized refugees, as well as those people (such as internally displaced persons and asylum seekers) who are in refugee-like circumstances. Attention is directed to understanding the personal experiences of refugees and examining the efforts on their behalf at the national and international levels.

333 Humanitarian Action (3:3:0). Prerequisite: ANTH 114, 60 credits, or permission of instructor. Examination of humanitarian action, drawing on anthropology's holistic and comparative perspective developed to ground understanding of humanitarian action within larger cultural contexts. Attention is directed toward cultural, biological, environmental, and political sources of humanitarian crises and the actual and potential responses to them. Focuses on large-scale response to social emergencies as culturally informed behavior.

360 Biological Aspects of Human Sociality (3:3:0). Prerequisite: ANTH 135, 60 credits, or permission of instructor. Inquiry into the biological, ecological, and cultural aspects of human society as a whole. Focus on the relationship between human and non-human culture-bearing animals. Topics include altruism, aggression, primate social organization, morphology, comparative ethology, and microevolutionary genetic differentiation.

366 Race and Ethnicity (3:3:0). Prerequisite: ANTH 114, 60 credits, or permission of instructor. Examination of the social and cultural construction of race. Focus on the meaning of race as a concept. Evolution of human biodiversity in culturally distinct human groups related to environment, physiology, genetics, nutrition, and disease is discussed. Use of scientific analyses of human biodiversity is explored.

367 Ecology and Culture (3:3:0). Prerequisite: ANTH 114, 60 credits, or permission of instructor. Examination of the relationships among environment, culture, and human behavior with an emphasis on cultural ecological explanations in mainly non-Western contexts.

369 Biological Aspects of Human Sociality (3:3:0). Prerequisite: ANTH 135, 60 credits, or permission of instructor. Examination of the social and cultural construction of race. Focus on the meaning of race as a concept. Evolution of human biodiversity in culturally distinct human groups related to environment, physiology, genetics, nutrition, and disease is discussed. Use of scientific analyses of human biodiversity is explored.

370 Professional Ethics (3:3:0). Prerequisite: ANTH 114, 60 credits, or permission of instructor. Survey of issues in study of relationships between cultural and psychological variables. Major topics covered are cross-cultural body image, gender, sexuality, and cultural behavior with an emphasis on cultural ecological explanations in mainly non-Western contexts.

371 Psychological Anthropology (3:3:0). Prerequisite: ANTH 114, 60 credits, or permission of instructor. Survey of issues in study of relationships between cultural and psychological variables. Major topics covered are cross-cultural body image, gender, sexuality, and cultural behavior with an emphasis on cultural ecological explanations in mainly non-Western contexts.

372 Historical Archaeology (3:3:0). Prerequisite: ANTH 114, 60 credits, or permission of instructor. Examination of materials, theories, and methods of archaeology derived from and applied to historical sites, as they complement archival records.

373 Anthropological Linguistics (3:3:0). Prerequisite: ANTH 114, 60 credits, or permission of instructor. Historical methods of language study and their application to modern and historical languages. Special emphasis on the use of linguistic data to analyze and interpret the social, cognitive, and cultural contexts of language use.

375 Comparative Medical Systems (3:3:0). Prerequisite: ANTH 114, 60 credits, or permission of instructor. Survey of the varieties of medical systems and practices in different cultures, including traditional and modern medical systems, with a focus on the relationship between culture and health.

376 Gender, Class, and Ethnicity in Latin America (3:3:0). Prerequisite: ANTH 114, 60 credits, or permission of instructor. Examination of the role of gender, class, and ethnicity in the development and maintenance of social systems in Latin America, with a focus on the interplay between cultural, economic, and political factors.
ences and similarities across a variety of societies and cultures in Latin America. Interrelationships among constructions of gender, class, and ethnicity are examined.

390 Theories, Methods, and Issues I (3:3:0). Prerequisites: ANTH 114 and 60 credits, or permission of instructor. First part of a two-course sequence that reviews the major theoretical traditions and schools of thought in anthropology. Required for anthropology majors.

399 Issues in Anthropology (3:3:0). Prerequisite: ANTH 114 and 60 credits, or permission of instructor. Topic of contemporary interest in anthropology, changing from semester to semester, and focusing on topics such as sex roles, anthropology and ethics, and primate social organization. May be repeated for credit.

418 Women's Life History (3:3:0). Prerequisites: Completion of 60 credits and ANTH 114. Examination of ethnographic life histories of women, generally written to exemplify typical life patterns within a given cultural tradition, and selected autobiographies recording extraordinary lives. These two genres are considered keys to the relationship between individual uniqueness and shared culture, and the ways in which particular individuals resolve tensions inherent in a cultural milieu.

420 Interpretation in Archaeology (3:3:0). Prerequisite: 6 credits of anthropology including ANTH 120 or permission of instructor. Exploration of theoretical and methodological issues encountered in archaeology. Patterns and contexts of archaeological remains, analytic problems, and interpretation of material culture are considered.

425 Public Archaeology (3:3:0). Prerequisite: 6 credits of anthropology including ANTH 120 or permission of instructor. Consideration of the public significance of archaeology and anthropological contributions to public concerns such as antiquities legislation and cultural resource management.

427 Historic Cemetery Survey (4:4:0). Prerequisite: ANTH 120 or permission of instructor. Exploration of demographic, stylistic, and religious aspects of historic cemeteries. Students learn to survey, record, and analyze gravestone data through field projects.

428 Patterns in Prehistory (3:3:0). Prerequisite: 60 credits or permission of instructor. Exploration of the diversity of prehistoric cultures in light of major cultural development (hunting-gathering, agriculture, pastoralism, complex societies).

430 Research Methods in Archaeology (3:3:0). Prerequisite: ANTH 120, 60 credits, or permission of instructor. Archaeological research process is studied through discussions of current archaeological methodologies and through student participation in designing and critiquing research projects.

435, 436 Special Projects: Archaeology and Biological Anthropology (1-3:0:0). Prerequisites: ANTH 120 or 135, 60 credits, and permission of instructor. Lab or field project leading to a written report of the research. Research and paper are completed under the instructor's guidance.

440 Applied Anthropology (3:3:0). Prerequisite: ANTH 114, 60 credits, or permission of instructor. Focus on anthropologists' contributions to major policy issues in development agencies in the United States and abroad. Attention to techniques that lead to prevention or management of social and cultural conflict.

450 Qualitative Methods in Sociocultural Research (3:3:0). Prerequisites: 60 credits and 6 credits of anthropology including ANTH 114, or permission of instructor. Exploration of some of the most useful nonquantitative research techniques used in social sciences and practice in their application.

488 Gender, Sexuality, and Culture (3:3:0). Prerequisite: ANTH 340, 60 credits, or permission of instructor. Examination of how gender, sexuality, race, and class come together as analytically distinct, yet practically intertwined, systems of meaning and practice. Examples highlight questions of political economy and history while focusing on specific ethnographic or historical readings.

490 Theories, Methods, and Issues II (3:3:0). Prerequisites: 60 credits and 9 credits of anthropology including ANTH 390, or permission of instructor. Second part of a two-course sequence that reviews the major theoretical traditions and schools of thought in anthropology. Required for anthropology majors and usually taken as a senior seminar.

492 Contemporary Controversies in Anthropology (3:3:0). Prerequisites: 60 credits and 9 credits of anthropology including ANTH 390, or permission of instructor. Examination of recent important works, issues, and controversies in anthropology.

495 Internship (3-6:0:0). Prerequisite: ANTH 120, 60 credits, or permission of instructor. Supervised project in applying anthropology (i.e., public archaeology, development anthropology, museums). May be repeated for a maximum of 6 credits.

496 On Evolution (4:2:2). Prerequisites: 60 credits and 9 credits of anthropology including ANTH 340, or permission of instructor. Course considers evolution as a biological as well as cultural concept. Parallels and contrasts among conceptual approaches allow a critique of the potential of evolution as a unifying biosocial theory.

499 Independent Research (1-3:0:0). Prerequisite: 60 credits, 9 credits of anthropology, or permission of instructor. Individual research on a topic to be organized in advance by student and instructor. May be repeated for credit.

535 Anthropology and the Human Condition (3:3:0). Prerequisite: Graduate standing or permission of instructor. Examination of contemporary human problems from cross-cultural and biocultural perspectives. Historical background and future implications of current cultural and biocultural issues are discussed.

560 Human Osteology (4:3:3). Prerequisites: Course in human evolution or anatomy and senior or graduate standing, or permission of instructor. Examination of the structure and function of the human skeletal system. Discussions include age criteria, pathology, epigenetic traits, biomechanics, and phylogenetic relationships.

568 Human Origins (3:3:0). Prerequisite: Graduate standing or permission of instructor. Detailed survey of the genetic, morphological, and behavioral origins of hominids. Current interpretations and debates are discussed.

580 Evolution and Human Ecology (3:3:0). Prerequisite: Graduate standing or permission of instructor. Examination of the complex relationships among human cultures,
biocultural adaptation, and the natural world from an evolutionary perspective.

620 Theory: Archaeology and Biological Anthropology (3:3:0). Prerequisite: Course in archaeology or permission of instructor. Examination of theoretical approaches in archaeology, paleoanthropology, and biological anthropology.

625 Research Design and Methods in Archaeology and Biological Anthropology (3:3:0). Prerequisite: Course in archaeology or permission of instructor. Examination of the research strategies and methods in archaeology, paleoanthropology, and biological anthropology.

630 Anthropology and Humanitarian Action (3:3:0). Prerequisite: Graduate standing. Examination of humanitarian action from an anthropological perspective, with attention to the cultural, biological, environmental, and political dimensions of humanitarian crises and the actual and potential responses to them.

631 Refugees in the Contemporary World (3:3:0). Prerequisite: Graduate standing. Seminar on the major refugee flows in the second half of the 20th century, with emphasis on the mechanisms for providing assistance, asylum, and resettlement.

679 Regional Studies in Archaeology (3:3:0). Prerequisite: Permission of instructor. Regional survey of specific culture area in archaeology to be chosen by student and instructor.

675 Laboratory Techniques (4:3:3). Prerequisite: Course in archaeology and permission of instructor. Techniques of data collection, analysis, and management in archaeology and biological anthropology.

680 Readings in Archaeology (3:3:0). Prerequisite: Permission of instructor. Directed readings and research on a specific topic in archaeology to be chosen by student and instructor. May be repeated for a maximum of 6 credits.

682 Readings in Biological Anthropology (3:3:0). Prerequisite: Permission of instructor. Directed readings and research on a specific topic in biological anthropology chosen by student and instructor. May be repeated for a maximum of 6 credits.

684 Readings in Cultural Anthropology (3:3:0). Prerequisite: Permission of instructor. Directed reading and research on a specific topic in cultural anthropology chosen by student and instructor. May be repeated for a maximum of 6 credits.

710 Contemporary Issues in Archaeology and Biological Anthropology (3:3:0). Prerequisites: ANTH 620, ANTH 625, completion of 24 graduate credits, and approval of graduate advisor. Contemporary research developments and the ways in which various scientific disciplines and theoretical approaches are integrated in the study of biocultural evolution, adaptation, and diversity.

750 Ethnographic Genres (3:3:0). Prerequisite: Graduate standing or permission of instructor. "Genre" refers to kind, sort, or type. Course surveys the various modes of representation anthropologists use in elaborating participant-observation field work, as well as how these styles refer to and construct the ethnographic other. It thus explores a set of central philosophical and methodological issues in social-cultural anthropology (e.g., framing, perspective, authority, reflexivity, the politics of style).

Arabic (ANTH) • Art History (ARTH) 269

Arabic (ARAB)

Modern and Classical Languages

101 Introduction to the Arabic Language (3:3:1). Introduction to modern standard Arabic, with emphasis on the written language. Lab work required.

102 Introduction to the Arabic Language (3:3:1). Prerequisite: ARAB 101 or permission of instructor. Continuation of Arabic 101. Lab work required.

201 Intermediate Arabic I (3:3:1). Prerequisite: ARAB 102 or equivalent. Further development of skills acquired in prerequisites Arabic 101 and 102, including grammar, vocabulary, listening, speaking, reading, and writing. Must be taken in sequence. Lab work required.

202 Intermediate Arabic II (3:3:1). Prerequisite: ARAB 201 or equivalent. Continuation of Arabic 201 with emphasis on the application of language skills to reading, composition, and discussion. Must be taken in sequence. Lab work required.

Art History (ARTH)

History and Art History

Students taking ARTH courses should expect to participate in field trips or assignments outside the classroom at area museums.

101 Introduction to the Visual Arts (3:3:0). Introduction to the content and principles of the visual arts. Approach varies with instructor.

102 Symbols and Stories in Art (3:3:0). Themes and imagery in art from early Greece to the modern era.

150 Freshman Seminar (3:3:0). Prerequisite: Freshman standing. Seminars focus on skills and methods of learning as well as subject matter as a way of introducing the discipline of art history. Topics will vary.

200, 201 Survey of Western Art (3:3:0). Major periods, monuments, and themes of Western art and architecture. Provides an introduction to the Washington, D.C., museum collections and a historical framework for further study in art history. Designed as a two-course sequence, but each part may be taken independently without prerequisite. ARTH 200 covers prehistory, the ancient world, and the Middle Ages; ARTH 201 covers the art of the Renaissance, the baroque period, and modern Europe and the Americas.

203 Survey of Asian Art (3:3:0). For non-Western credit. Introduction to the arts of south, southeast, and east Asia. An examination of aspects of the culture and history of Asia. Monuments and artifacts in a variety of media are discussed in relation to their social and historical contexts. Each 300-level course is generally offered once every two years.

303 National Traditions (1-3:1-3:0). Prerequisite: 24 credits. Study of the traditions of art and architecture within a single selected country or historical region. Topic varies. May be repeated for credit with different course content.

311 Design of Cities (3:3:0). Prerequisite: 24 credits. Problems in urban design in a particular geographical region or historical period. Approach varies with instructor and may
involve archaeological or theoretical approaches appropriate to the specific context. May be repeated when course content is different.

315 Modern Architecture (3:3:0). Prerequisite: 24 credits. Studies in modern architecture from the Beaux Arts movement to the present; an investigation of stylistic, structural, and/or theoretical innovations.

319 Art and Archaeology of the Ancient Near East (3:3:0). Prerequisite: 24 credits. For non-Western credit. Aspects of the art, archaeology, and culture of ancient Near East and Bronze Age Mediterranean. Approach varies; emphasis may be on Mesopotamia, Iran, Egypt, Anatolia, the Levant, or the Aegean, depending on instructor.

320 Art of the Islamic World (3:3:0). Prerequisite: 24 credits. For non-Western credit. Introduction to Islamic art, from the time of Muhammad to the present day. Cultural and regional approach, taking advantage of local museum collections.

321 Greek Art and Archaeology (3:3:0). Prerequisite: 24 credits. History of ancient Greek architecture, sculpture, and painting.

322 Roman Art and Archaeology (3:3:0). Prerequisite: 24 credits. History of Roman architecture, sculpture, and painting.

324 From Alexander the Great to Cleopatra: The Hellenistic World (3:3:0). Prerequisite: 24 credits. The arts of the Hellenistic age within the context of the history and culture of the period. Many aspects of the Hellenistic world are explored: the powerful dynasties ruling wealthy empires; the achievements in learning and literature housed in the Great Library at Alexandria; the baroque sculpture adorning the Altar of Zeus at Pergamon; and the Roman collectors of Greek art and antiques.

333 Early Christian and Byzantine Art (3:3:0). Prerequisite: 24 credits. Aspects of medieval art and culture in the eastern Mediterranean world. Topics may include late antiquity, early Christianity, and the Byzantine empire and its neighbors. Designed to take advantage of unique local museum resources. Specific focus varies with instructor.

334 Western Medieval Art (3:3:0). Prerequisite: 24 credits. Aspects of art and architecture in medieval Europe, from the fall of the Roman Empire through the Gothic period. Specific focus may vary with the instructor. May be repeated when course content is different.

340 Early Renaissance Art in Italy, 1300–1500 (3:3:0). Prerequisite: 24 credits. Studies in architecture, sculpture, and painting in the age of Giotto, Ghiberti, Masaccio, and Botticelli.

341 Northern Renaissance Art (3:3:0). Prerequisite: 24 credits. Studies in the art of France, Germany, and the Netherlands in the age of Van Eyck and Dürer.


350 History of Photography (3:3:0). Prerequisite: 24 credits. Development of photography from origins in France in the 19th century to the present.

360 Nineteenth-Century European Art (3:3:0). Prerequisite: 24 credits. Movements from neoclassicism to symbolism discussed in relation to social, cultural, political, and technological changes in Europe.

362 Twentieth-Century European Art (3:3:0). Prerequisite: 24 credits. Study of major movements (fauvism, cubism, futurism, constructivism, surrealism, and expressionism) and important artists in 20th-century painting and sculpture. Focus may vary.

371 American Architecture and Material Culture (3:3:0). Prerequisite: 24 credits. Studies in the history of American architecture or decorative arts in cultural context. Topics range from the 17th century through the 20th century, depending on instructor.

372 Studies in 18th- and 19th-Century American Art (3:3:0). Prerequisite: 24 credits. Developments in visual culture and the changing status of art practitioners throughout these periods. Focus of the course is either chronological (the Colonial Period, the Gilded Age) or thematic (19th-century genre scenes, the American landscape and national identity, etc.). May be repeated once for credit with different topic. Lecture, discussion.


374 Art Now (3:3:0). Prerequisite: Any course in art history or art studio or permission of instructor. A look at visual art production since 1980, drawing on regional resources. Examines the social, institutional, and political issues in recent art and its markets. Requires students to work collaboratively and make several field trips, including one Saturday bus trip to New York. Specific topics and assignments vary with the changing art season and with the instructor. Lecture, discussion.

380 African Art (3:3:0). Prerequisite: 24 credits. For non-Western credit. Art of sub-Saharan Africa in terms of styles and aesthetics, materials and techniques, and contexts (geographical, social, cultural, and religious). Specific focus may vary with the instructor.

382 Arts of India (3:3:0). Prerequisite: 24 credits. For non-Western credit. The history, culture, and arts of south Asia from the earliest civilizations along the Indus River to the onset of Western colonialism. Emphasis is placed on the role that the material evidence has provided in the creation of the south Asian history and the ways political, social, and religious developments affected the arts. Monuments and artifacts in a variety of media are discussed in relation to their historical contexts.

383 Arts of Southeast Asia (3:3:0). Prerequisite: 24 credits. For non-Western credit. Examination of the various
cultural and artistic traditions of ancient Southeast Asia, from the earliest archaeological evidence to the onset of colonialism. Lectures and discussions focus on the material culture of the great civilizations that arose within the borders of modern Thailand, Cambodia, Indonesia, Burma (Myanmar), Vietnam, Laos, and Malaysia.

384 Arts of China (3:3:0). Prerequisite: 24 credits. For non-Western credit. Explores the complex and dynamic history of China by examining the ways in which social, religious, and political shifts have given rise to new and variant forms of material culture.

385 Arts of Japan (3:3:0). Prerequisite: 24 credits. For non-Western credit. The art and architecture of Japan, with particular attention to the ways in which political changes, religious movements, and social developments influenced and shaped those creations. Monuments and artifacts in a variety of media are discussed in relation to their social and historical contexts.

393 Art History Internships (3-6:0:0). Prerequisite: Art history major or minor and permission of instructor. Internship with a professional arts institution, organization, or individual in the Washington, D.C., area. Project to be arranged by student in consultation with faculty instructor and field supervisor. Strongly recommended for advanced art history students seeking exposure to professional work in the visual arts. May be taken for 3 to 6 credits or repeated for up to 6 credits.

394 The Museum (3:3:0). Prerequisite: 24 credits. Examination of the history, theory, practice, ethics, and current problems of collecting and displaying art and artifacts to the public. Emphasis on issues central to museums in Washington, D.C., or museums in other locations; focus varies with instructor.

399 Special Topics in the History of Art (3:3:0). Topics vary. At least one 400- or 500-level course is offered each semester; each topic area is generally offered every two years.

400 Historiography and Methods of Research in Art History (3:3:0). Prerequisites: ENGL 302 and 6 credits in art history at the 300 level or permission of instructor. Historical investigation of theories, methods, and critiques involved in the discipline of art history. Approach or focus may vary with instructor. May be repeated for credit.

420 Advanced Studies in Ancient Art (3:3:0). Prerequisite: ENGL 302 and 300-level course in ancient art or permission of instructor. Study in a particular area of ancient art of the Mediterranean, the Near East, or the Middle East. Topics may be an art form or medium, a geographical area, a theme, a function, or a context. May be repeated for credit.

430 Advanced Studies in Medieval or Islamic Art (3:3:0). Prerequisite: ENGL 302 and a 300-level course in medieval art or permission of instructor. Study of a single topic in medieval or Islamic art. May focus on a particular period, region, or medium, or may explore cultural interconnections within the medieval Eurasian world. May be repeated for credit.

440 Advanced Studies in Renaissance and Baroque Art (3:3:0). Prerequisite: ENGL 302 and 300-level course in Renaissance or baroque art or permission of instructor. Study in a particular aspect of Renaissance or baroque art. Topics may be monographic, thematic, or concentrated on the art of a smaller time period or a particular area. May be repeated for credit.

471 Advanced Studies in American Art (3:3:0). Prerequisite: ENGL 302 and 300-level course in American art. Study in a particular area of American art, focusing on a form (landscape or genre painting), a theme (nationalism, regionalism, the iconography of the family), or a movement (American modernism). May be repeated for credit.

482 Advanced Studies in Asian Art (3:3:0). Prerequisite: ENGL 302 and 300-level course in any area of Asian art or permission of instructor. For non-Western credit. Seminar-style discussions on a specific topic in Asian art. Course may focus on the art of a particular period, movement, reign, or region, as well as theoretical issues or works in a particular medium. Because the content varies, course may be repeated for credit.

490, 491 Independent Study in Art History (3:3:0), (3:3:0). Prerequisites: 60 credits, ENGL 302, permission of instructor and chair, plus 9 credits in art history beyond ARTH 200, 201. Intensive study of a particular artist, period, or theoretical problem to be conducted by an individual student in consultation with instructor. Study proposal submitted before registration.

492, 493 Honors Directed Readings, Honors Directed Research (3:3:0), (3:3:0). Prerequisites: Admission to the art history honors program, ENGL 302, and permission of instructor. These are linked individualized courses, normally given by the same instructor. ARTH 492 involves directed readings, and ARTH 493 culminates in a research paper related to the subject of the readings. Students must have completed at least one course in the field (or with the professor) chosen for these honors courses. The 3 credits of readings should normally be taken before the 3 credits of research, however, they may be taken concurrently.

593 Art History Internships (3-6:0:0). Prerequisite: Baccalaureate degree or equivalent, or permission of instructor. Internship with a professional arts institution, organization, or individual in the Washington, D.C., area. Project to be arranged by the student in consultation with faculty instructor and field supervisor. Recommended for advanced art history students seeking exposure to professional work in the visual arts. May be taken for 3 to 6 credits or repeated for up to 6 credits.

594 The Museum (3:3:0). Prerequisite: Baccalaureate degree or equivalent, or permission of instructor. Examination of the history, theory, practice, ethics, and current problems of collecting and displaying art and artifacts to the public. Emphasis on issues central to museums in Washington, D.C., or museums in other locations. Specific focus may vary with instructor.

596 Independent Study (1-3:3:0). Prerequisite: Baccalaureate degree or equivalent, or permission of instructor. Independent reading and research on a specific project under the direction of a department member. Written report is required. May be repeated for credit.

599 Special Topics in the History of Art (3:3:0). Prerequisite: Baccalaureate degree or equivalent, or permission of instructor. Topics vary.

699 Topics in Art History (3:3:0). Prerequisite: Graduate standing. Research seminar on aspects of art history.
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Topics vary, but course entails extensive critical readings and discussion, development of bibliographies, and advanced-level research papers.

Art and Visual Technology (AVT)

College of Visual and Performing Arts

NOTE: On July 1, 2001, the Division of Art and Visual Technologies (formerly housed within the Institute of the Arts) became the Department of Art and Visual Technology (AVT) within the College of Visual and Performing Arts (CVPA). The former Division of InterArts and the VIT Graduate Program are both included within AVT. All courses formerly listed with prefixes of ARTS and VIT are now listed with the prefix of AVT. Courses formerly listed with the prefix ARIN are now listed with the prefix AVT or CVPA.

103 Introduction to the Artist’s Studio (3:3:0). For non-majors only. Through a series of projects, readings, class critiques, videos, CD-ROMs, slides, and field trips, students are encouraged to explore materials, techniques, concepts, and processes that are essential to the understanding of the language of the visual arts and the role of the artist. Students also develop imaginative thinking and sensitivity to their visual environment.

104 Studio Fundamentals I (4:2:4). First half of a two-semester course concerning basic visual decision-making and the choices involved in ordering elements of a visual vocabulary into a unified, coherent whole. Focusing on two-dimensional design and color in a variety of media, the course establishes a basis for comprehension and use of a visual language.

105 Studio Fundamentals II (4:2:4). Prerequisite: AVT 104, or permission of instructor. The second half of a two-semester course that will introduce students to the basic principles of three-dimensional design and how this information applies to art making and the practical world. Course activities are a blend of studio projects, discussions, and presentations that focus on understanding the creative and conceptual realm of the three dimensional arts, including sculpture, architecture, furniture, environmental design, and time based media.

180 Computers in the Creative Arts (3:1:2). Introduction to computing from an artist’s perspective. Emphasis on employing computers for artistic creation and research. Overview of hardware, software, operating systems, peripherals, 2D graphics, and web design.

204 Visual Thinking (3:3:0). Introduction to visual thinking. Topics include information from visual perception, memory, classical and modern art, performance, and dance. Opportunities for students to assess themselves as visual thinkers.

205 Creative Processes (3:3:0). Study of the creative process in general, with particular emphasis on the inspiration, working methods, and final creations of various artists. Students are encouraged to explore their own creative processes through regular journal keeping, collaborative exercises, and two major projects.

207 Writing Out Loud (3:3:0). Explores the relationship between writing and the voice, looking at texts that were written to be performed aloud. Students will write and present their own work and have the opportunity to develop personal and collaborative projects. This course emphasizes composition for oral presentations, and delivery, poise, persuasiveness, clarity, and comprehensibility in public delivery.

215 Graphic Information Design I (4:2:4). Introduction to the elements of basic typographical composition, including the historical development of letter forms; recognition, use and specification of existing typefaces; and alphabet design.

222 Drawing I (4:2:4). An introduction to the fundamentals of drawing with emphasis on observational study and formal composition. The student’s perceptual and rendering skills are developed through exposure to a range of materials, methods, and formal concepts, including effective and expressive use of lines, mass, value, perspective, and composition.

232 Painting I (4:2:4). An introduction to the basic techniques and principles of oil and water-based painting through projects which combine observational study, technical development, and the fundamentals of formal composition, color interaction, and the articulation of form. Students are given basic knowledge of and experience in the preparation of various supports, the mixing of color, and the techniques of paint application.

243 Printmaking I (4:2:4). An introduction to the basics of hand printing with an emphasis on the translation and transferal of images, the tools, equipment and technical skills that enable the making of a well defined print. Students will explore various print media with reference to historical and contemporary models. Discussion, presentation, and field trips will focus on the practical and conceptual concerns of making multiple images.

252 Photography I (4:2:4). Introduction to the basic principles and aesthetics of photography, 35mm camera operation, and darkroom practices including film processing and print development.

262 Sculpture I (4:2:4). An introductory course that will give students a foundation in basic technical and formal processes of sculpture and introduce the diverse methods and concepts underlying the work of historic and contemporary sculptors. Emphasis will be placed on the exploration of various materials, technical execution, conceptualization, and creative problem solving to enable students to visually manifest their individual ideas.

272 InterArts I: History and Theory of Performance Art (4:4:2). Studio seminar—with readings, slide lectures, video screenings, multimedia presentations, demonstrations, discussion, writing assignments, and research projects—examining the interdisciplinary roots and manifestations of performance in the visual arts, literature, theater, cinema, dance, and music.

280 Digital Arts I (4:2:4). Prerequisite: AVT 104 or permission of instructor. Students will learn to use both vector and raster graphics software programs. Emphasis will be placed on concept development, visual aesthetics and technique. Students will produce a series of art works to be presented in digital, printed, and HTML format.

307 Aesthetics (3:3:0). This course aims at the creation of heightened aesthetic perception and understanding. Emphasis is placed on examining a broad range of contempo-

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rary art and culture to engage an expansive conception of aesthetic experience.

311 Graphic Information Design II (4:2:4). Prerequisite: AVT 213, 280, or permission of instructor. Introduction to graphic communication design concepts, processes, and production. Students create a portfolio of graphic products which solve typical problems in communication design.

313 Graphic Information Design III (4:2:4). Prerequisite: AVT 311 or equivalent, or permission of instructor. An intermediate graphic design course with an emphasis on publication and information design. Students will develop a series of professional graphic communication products.

323 Drawing II (4:2:4). Prerequisite: AVT 222 or permission of instructor. This course builds on skills and concepts covered in Drawing I. The student will continue to develop rendering and observational skills, while utilizing formal concepts and a knowledge of materials and expressive techniques.

324 Figure Drawing (4:2:4). Prerequisite: AVT 222 or permission of the instructor. This course will focus on drawing through the study of the human body. Composition, action, and design will be emphasized through a variety of media such as graphite, charcoal, color pencil, oil stick, watercolor, gouache, and mixed techniques.

333 Painting II (4:2:4). Prerequisite: AVT 232 or permission of instructor. Building on concepts, knowledge of materials, and techniques covered in Painting I, this course seeks to further develop the student's formal and technical skills while enhancing her/his perceptual awareness. As students continue to practice and develop traditional techniques of observational painting, their development will be enriched by the introduction of concepts, methodologies, and approaches relevant to contemporary painting.

336 Experimental Painting (4:2:4). Prerequisite: AVT 232, or permission of instructor. Using late 20th century and contemporary painting as a starting place, students will explore recent experimental and conceptual approaches to the practice of painting. Through a series of structured and free problems, students will be encouraged to investigate non-traditional materials, scale, formats, surfaces, and methods of paint application, as well as content and concept-driven approaches to the picture plane. In the context of expanding and defining their own practices, students will be engaged with questions as basic as: what should a painting look like? What should a painting do? The course will include one field trip, slide lectures and video screenings.

337 Figurative Painting (4:2:4). Prerequisite: AVT 232, or permission of instructor. In this course students will explore the human form as the main subject for a broad array of visual, conceptual and expressive inquiries. By using a human model for all class projects and self-portraiture for several home assignments, students are challenged to hone their observational skills and to investigate formal pictorial issues. By directing attention to the expressive properties of color, scale, space and process within the context of observational practice, students learn conceptual and visual thinking that makes art purposeful and engaging.

343 Printmaking I (4:2:4). Prerequisite: AVT 243 or permission of instructor. An introduction to relief printing, including the study of historical antecedents and their relevance to contemporary printmaking. Students will learn reductive and additive techniques in preparing printing surfaces for single color, multi-color, and multi-block printmaking.

345 Digital Bookmaking (4:2:4). Prerequisite: AVT 180 or permission of the instructor. An intermediate course in the hand printing of digitally processed images in book format. Projects will focus on developing visual ideas in electronic imagery and digital printing on specialized papers for hand binding. Elements of time and space will be explored in movable and sculptural structures. Personal content will evolve in making booklets of sequential or narrative digital images.

346 Digital Printmaking (4:2:4). Prerequisite: AVT 180 or permission of the instructor. A beginning course in the hand printing of digitally processed images. Projects will focus on electronic means of creating and manipulating imagery for application within various processes in printmaking. By exploring personal content, with an emphasis on images of the self and languages of the body, students will achieve skills in the multiple steps and incremental development required in making prints.

353 Photography II (4:2:4). Prerequisite: AVT 252, or permission of instructor. A continuation of Photography I, with further investigation into the aesthetics of photography through experimentation with new films, developers, and papers, and development of a portfolio of photographic images.

354 Digital Darkroom (4:2:4). Prerequisite: AVT 252 and AVT 280 or permission of the instructor. A computer-intensive class in which the student creates digital images from the viewpoint of a photographic artist. The course concentrates on developing technical proficiency in the use of digital tools from image capture to digital manipulation and creating digital negatives for use in the analog darkroom. On-going discussions and critiques of projects allow the student to develop insight and aesthetic awareness concerning the impact of computer technology on traditional photography.

355 Color Photography I (4:2:4). Prerequisite: AVT 353, or permission of instructor. This course provides an introduction to the basic concepts, theories, modern materials, and processes of color photography with a concentration on creative photographic expression and technique. This combined lecture and darkroom course will expand the student's photographic repertoire through work both with color negative, print and transparency materials.

356 Studio Lighting I (4:2:4). Prerequisite: AVT 353, or permission of instructor. An introduction to the theory, concepts and applications of photographic studio lighting with an emphasis placed on the ability to control and manipulate light. Students will investigate both artificial and natural light sources and produce a series of photographs based on a combination of technical understanding and creative problem solving.

363 Sculpture II (4:2:4). Prerequisite: AVT 262, or permission of instructor. An intermediate level studio course which will give students the opportunity to investigate a wider variety of materials, techniques, and conceptual issues. Emphasis will be placed on individual creative work and increasing familiarity with historical and contemporary aesthetics.

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371 Visual Perception and the Arts (3:3:0). Review of the major approaches to the study of visual perception. Topics include an analysis of picture perception, visual thinking, the relationship between symbolic and nonsymbolic thinking and representation, and how pathologies of vision affect art production.

372 Global Motion (3:3:0). Through live events, videos, and texts, performance will be examined for the ways it reflects its culture of origin and how it migrates interculturally. Subjects vary, including global hip hop, Indian epics and performance, and Japanese culture's dialogue with the West.

373 InterArts II: Performance Art Studio (4:2:4). Prerequisite: AVT 272 or permission of instructor. Studio introduction to the practice of performance art. Detailed analysis of the creation and production processes, in conjunction with practical training in solo and collaborative forms of live art, stage and multimedia technologies, body art, time-based art, and theater of images.

374 Sound and Vision (4:2:4). Prerequisite: AVT 180 or permission of instructor. Combined lecture and studio course that will focus on the selection, editing, processing, and integration of sound and music (post-production) into video and animation. Time, frequency, and amplitude domain techniques, as well as SMPTE synchronization formats and MIDI control will be studied. Students will post-produce the sound and music for a 5 minute video/animation that will be due at the end of the semester.


376 Live Movies (4:2:4). Prerequisite: AVT 373 or permission of instructor. Advanced performance studio with emphasis on cinematic forms and multimedia technologies. Also covers sound design, scenic design and materials, production planning, and interdisciplinary approaches to narrative and content in performance. Students collaborate on production projects.

377 Cyberpunk (4:6:0). This course traces how cinema, music, fiction, cultural theory, visual art, television, theater, and performance have embraced and been shaped by Cyberpunk and cyber-culture. Seminar, with readings, writings, discussion, screenings, guest speakers, research projects.

378 The African American Experience in the Performing Arts (3:3:0). Through lectures, slides, audio recordings, videos, and films, students examine African American contributions to the cultural fabric of American forms and institutions. Artistic contributions are examined within the aesthetic, political, historical, and social contexts within which they occurred and which they, in turn, have shaped.

379 InterArts Figures (3:3:0). Seminar examining artists-thinkers whose work has served as a nexus of interlocking artistic concerns and disciplines. Subjects vary, but may include such artists as Paul Robeson, Jean Cocteau, Gertrude Stein, Serge Diaghilev, John Cage and Merce Cunningham.

381 Digital Arts II (4:2:4). Prerequisite: AVT 280 or permission of instructor. Students will learn how to create realistic, three-dimensional scenes with scaled objects, surface textures, lights, and shadows. These scenes will in turn serve as the sets for short animations. Web. Emphasis will be placed on idea generation, concept development, visual aesthetics, and technical abilities.

382 Digital Art and Animation (4:2:4). Prerequisite: AVT 381, or permission of instructor. Digital imaging concepts as applied to computer animation. Lab assignments introduce the technical and aesthetic challenges of computer animation techniques. Students learn to animate hand-drawn and computer generated images. This course focuses on the production of a short animated digital "film" with sound.

390 Digital Media and Video Art (4:2:4). Prerequisite: AVT 381 or permission of instructor. Integration of the study of contemporary theory, philosophy, and artistic practices with the application of new media and technology. Special focus will be placed on video, visual digital, and internet artists, their relationship to technology, and the socio-political implications of their work. Form and content, medium, and process of art works will be studied, analyzed, and discussed.

392 Gallery Practices (4:1:3). Prerequisite: Three credits of AVT or three credits of ARTH or junior standing, or permission of instructor. Introduction to gallery practices associated with the department's galleries, including planning, curatorial, budgetary, advertising, installation, and docentship activities. May be repeated for credit.

393 Internship in Art and Visual Technology (1-6:0:0). Prerequisite: Junior standing and completion of six credits of AVT courses in the area of residency, or permission of instructor. Unpaid residency, internship, or field experience in a professional art organization or with an individual artist, providing an opportunity to apply classroom training. May be repeated for a maximum of 12 credits.

394 Honors Seminar (1:0:0). Prerequisite: by invitation to qualified Honors students. This seminar is designed for maximum exposure to art world professionals and experiences, aligning activities with the New York ARTS Bus program, by means of field trips, research and creative assignments that may also include Washington, D.C. area galleries, artist studios, gallery talks, art events, and public art presentations. Course work will focus on yearly themes that are current in the art world. Selected students will be invited to work toward achieving credit to graduate with honors in Art and Visual Technology. Repeatable for up to 8 credits.

395 Writing for Artists (3:3:0). Critical writing-intensive class designed to enable students to write about their own work, and the work of practicing artists, clearly, stylishly, and in ways that are both critically and creatively well-informed. This course fulfills the writing intensive requirement by assigning multiple substantial essays and reviews.

399 Special Topics in Art and Visual Technology (1-6:1-6:0-6). Exploration of topical studies in Art and Visual Technology including both the theoretical and critical aspects of art or studio production. Topics and credit vary with instructor. May be repeated for up to 12 credits taken under different topics.

414 Graphic Information Design IV (4:2:4). Prerequisite: AVT 31, or permission of instructor. An advanced graphic design course with an emphasis on corporate 2D, 3D, and web graphic information design systems. Students will develop professional corporate design products and become
knowledgeable about the profession’s resources and range of products. May be repeated for a maximum of 12 credits.

422, 423 Drawing III, IV (4:2:4), (4:2:4). Prerequisite: AVT 323, or permission of instructor for 422; AVT 422, or permission of instructor for 423. Intermediate to advanced drawing skills and techniques with an emphasis on individual exploration and expressive techniques. Along with rigorous observational study, students will work from a variety of sources to develop a broad understanding of visual responses and solutions within contemporary art practice. AVT 423 may be repeated for a maximum of 12 credits.

432, 433 Painting III, IV (4:2:4), (4:2:4). Prerequisite: AVT 333, or permission of instructor for 432; AVT 432, or permission of instructor for 433. Students are expected to have strong foundations in the principles and techniques of the medium, as well as some familiarity with the issues and practices of contemporary painting. Emphasis is on further development of content and personal vision, and formal methods and techniques relevant to their expression. AVT 433 may be repeated for a maximum of 12 credits.

442 Printmaking III (4:2:4). Prerequisite: AVT 34, or permission of instructor. An advanced print media course in intaglio printmaking. Students will explore traditional metal engraving and etching, as well as new related printmaking techniques in toray and sintra plate printing. Hand drawn, digital and photo-based imagery will be developed in a series of related prints. This course includes the study of historical antecedents and their relevancy to contemporary printmaking. May be repeated for a maximum of 12 credits.

443 Printmaking IV (4:2:4). Prerequisite: AVT 442, or permission of instructor. An advanced print media course incorporating three dimensional applications of hand printing. Students will develop concepts in digital printmaking, bookmaking, sculptural prints, and installation works focused on specific individualized themes. Issues in contemporary printmaking will also be explored through critical discussions, reading and writing assignments. May be repeated for a maximum of 12 credits.

452 Photography III (4:2:4). Prerequisite: AVT 353, or permission of instructor. An advanced darkroom course with emphasis on the fine art photographic print and the development of a personal portfolio.

453 Photography IV (4:2:4). Prerequisite: AVT 452, or permission of instructor. An advanced photography course with emphasis on technique, content, photographic criticism, contemporary trends, and portfolio development. May be repeated for a maximum of 12 credits.

454 Photo Imaging (4:2:4). Prerequisite: AVT 353, or permission of instructor. Introduction to 19th century and alternative photographic printing processes, including cyanotype, van dyke, gum bichromate, liquid emulsion, and image transfer. Exploration of photography’s influence and use in other mediums will also be examined.

455 Advanced Digital Darkroom (4:2:4). Prerequisite: AVT 354, or permission of instructor. An advanced digital imaging course with further exploration of digital photo techniques and personal expression. Emphasis is placed on developing technical proficiency and furthering one’s personal aesthetics. The semester will be spent creating digital negatives to develop a digital portfolio based on an awareness of photography’s changing role as an image-making tool.

462, 463 Sculpture III, IV (4:2:4), (4:2:4). Prerequisite: AVT 363, or permission of instructor for 462; AVT 462, or permission of instructor for 463. An intensive studio course for advanced students to further their individual, conceptual, and critical development. Students will be expected to produce a body of work through self-expression, based upon technical exploration, critical discussion, reading, and writing components. AVT 463 may be repeated for a maximum of 12 credits.

472 Critical Theory in the Visual Arts (3:2:1). Prerequisite: ARTH 374 or permission of instructor. An in-depth examination of the theory and criticism that has formed the theoretical and philosophical underpinnings of contemporary practice and critical analysis in the visual arts. Emphasis will be on modernist and postmodernist practices as influenced by science, philosophy, politics, and literary theory (particularly structuralist and poststructuralist theories).

473 InterArts III: Advanced Performance Studio (4:2:4). Prerequisite: AVT 373 or permission of instructor. Advanced laboratory for creation and production of performance art. Emphasizes include new technologies, live art, performance writing, time-based art, and audio-visual theater. Research, writing projects, screenings, guest artists, multimedia presentations, and brainstorming complement studio work. May be repeated for a maximum of 12 credits.

480 Advanced Animation Arts (4:2:4). Prerequisite: AVT 382 or permission of instructor. An in-depth look at digital animation techniques. Camera movement, roto-scoping, mixing animation with live action and digital cell animation, 3D animation, texture mapping, surface lighting, and motion path control will be introduced as students plan and produce a digital film. Emphasizes the integration of traditional techniques with recent software applications.

483 Internet Multimedia Art (4:2:4). Prerequisite: AVT 382 or permission of instructor. Course will investigate and present current internet developments with a special attention and focus on its artistic applications. Intermediate and advanced principles of form, content design, site mapping, aesthetic languages will be explored through the use of HTML editing, layout, and web animation applications.

489 Field Experience in the Arts (1-6:0:0). Prerequisite: Junior standing and permission of instructor. Apprenticeship, internship, or project with an organization in the arts or with an individual in the arts, providing an introductory working and learning experience in the field. Must be pre-arranged with the division director prior to enrollment. May be repeated for a maximum of 6 credits.

491, 492 Independent Study in Art and Visual Technology (1-6:0:0), (1-6:0:0). Prerequisite: 60 credits, permission of instructor, and permission of chair. Study proposal submitted prior to registration. Opportunity for development of advanced skills and concepts in drawing, painting, sculpture, and other media. May be repeated for a maximum of 12 credits.

495 Portfolio Preparation (4:2:4). Combination lecture and studio production course that addresses the nature of a professional portfolio in terms of career development and self marketing including visual presentation of a body of work, the preparation of professional written materials, and the public/verbal presentation of one’s work.
497 Senior Project (4:2:2). Prerequisite: senior Art and Visual Technology major. Students participate in all aspects of the development and presentation of a cohesive and mature body of work. Students will be required to develop and present written materials and documentation related to the presentation of their work, as well as participate in formal oral critiques with critics and Art and Visual Technology faculty members.

522, 523 Drawing V, VI (4:2:4), (4:2:4). Prerequisite: Admission to the AVT graduate program or permission of instructor for AVT 522; AVT 522 or permission of instructor for 523. Drawing on an advanced level. Emphasis on individual decision making and personal initiative.

596 Independent Study (1-6:1-6:0). Prerequisite: B.A. or equivalent, or permission of instructor. Independent reading and research on a specific project under the direction of a department faculty member. Written reports required. May be repeated for credit.

599 Special Topics in Art and Visual Technology (1-6: 1-3:0-6). Prerequisite: Admission to the AVT graduate program or permission of instructor. Exploration of topical studies in Art and Visual Technology, including both the theoretical and critical aspects of art or studio production. Topics and credit vary with instructor. May be repeated when taken under different topics.

600 Research Methodologies (3:3:0). Prerequisite: Admission to the AVT graduate program, or permission of instructor. Explores traditional methods of examining and interpreting works of art as well as new ways of looking at art. Artworks are examined through visual observation, critical readings of texts and in-class discussions. Focus is on understanding context and content. Both oral and written reports are required for this course.

610 Graduate Seminar (1:0:0). Prerequisite: Admission to the AVT graduate program or permission of the instructor. Seminar course required of all AVT graduate students four times during their course of study. Students present their work and/or the work of contemporary artists for discussion and peer/faculty critiques. Special focus will be given to developing public communication and presentation skills on contemporary issues in the arts. Repeatable for four credits.

613 Graphic Design (3:0:6). Prerequisite: Admission to the AVT graduate program or permission of instructor. Combined lecture and studio course covering concepts in graphic design, digital typography, and HTML layout. Intended for students whose area of concentration is other than graphic design, use this course to increase the scope of their technical expertise while developing their studio work.


616 Internet Multimedia Art (5:2:6). Prerequisite: Admission to the AVT Graduate Program or permission of instructor. Combined lecture and studio course in HTML layout and animation. Perceptual problems in designing the presentation of visual and textual information for electronic display. Exploration of how design considerations are affected by changes in media and society.

618 Problems in Graphic Design (5:2:6). Prerequisite: Admission to the AVT Graduate Program or permission of instructor. Application of advanced technological design and production methods to complex graphic design problems. Students consider the social and cultural implications of their aesthetic choices. Taught as a series of studio problems.

620 Philosophy, Theory, and Criticism (3:3:0). Prerequisite: Admission to the AVT graduate program or permission of instructor. Basic problems that arise from an inquiry into the meaning and value of art and our response to it. Students write a substantial paper and design an individualized project.

622 Advanced Drawing (4:2:4). Prerequisite: Admission to the AVT graduate program, or permission of instructor. Advanced directed research in drawing with continued development of individual aesthetic. Study of the historical and philosophical precedents is integral to the course.

632 Graduate Painting I (5:2:6). Prerequisite: Admission to the AVT graduate program, or permission of instructor. Entering students are expected to be competent painters, with technical proficiency, a disciplined process, and a directed personal vision. Students work rigorously and independently toward the understanding and mastery of techniques, methods, and concepts relevant to the formal expression of a personal content. Students are expected to participate in critical discourse with supervising faculty. Achievement is measured by a faculty review board at mid-semester and at term's end.

633 Graduate Painting II (5:2:6). Prerequisite: AVT 632, or permission of instructor. Building on research and practices established in Graduate Painting I, students continue to develop strategies for the expression of a personal vision and style. Progress is tracked and assessed through periodic one-on-one critical discussions with supervising faculty. Achievement is measured by a faculty review board at mid-semester and at term's end.

634 Advanced Graduate Painting (5:2:6). Prerequisite: AVT 633, or permission of instructor. Working independently on a cohesive body of work, students must demonstrate a thorough understanding and mastery of techniques, methods, and concepts relevant to their own practices, and be able to discuss their own work within the context of historical and contemporary art practices. Progress is tracked and assessed through periodic one-on-one critical discussions with supervising faculty. Achievement is measured by a faculty review board at mid-semester and at term's end.

642, 643 Graduate Printmaking I, II (5:2:6), (5:2:6). Prerequisite: Admission to the AVT graduate program, or permission of instructor. Directed research and practice in printmaking focuses on the individualized development of content and technique. Emphasis is placed on exploration and growth in the intellectual and expressive aspects of the printmaking process.

644 Advanced Graduate Printmaking (5:2:6). Prerequisite: AVT 643 or permission of the instructor. An intensive course of creative exploration in print media that furthers students' independence through the production of an indi-
visualized body of work that reflects their specific interests within the broader contexts of contemporary social, technological, and cultural issues. Students will also engage in collaborative studio practices to enable the integration of many visual technologies in their work. These may include, digital imaging, drawing, graphic design, painting, performance, photography, and sculpture. Repeatable for ten credits.

652 Graduate Photography I (5:2:6). Prerequisite: Admission to AVT graduate program or permission of instructor. Critical theory and directed practice in photography which focuses on the development of a personal voice and working method through intellectual activity and creative work. Emphasis is placed on the ability to explore concepts, develop skills, and to evolve as both a communicator of ideas and as a photographic artist.

653 Graduate Photography II (5:2:6). Prerequisite: Admission to AVT graduate program or permission of instructor. A continuum of Graduate Photography I, this course is an intensive critique class that concentrates on the development of the student’s creative work with emphasis on articulating responses to others’ work, the cultural climate we inhabit and the issues involved in one’s own work as it progresses. Weekly classes will share equal time with critical theory and hands-on studio work. Readings, visiting artists and lecturers, and field trips will serve to provide a variety of viewpoints as well as encourage discourse during the semester.

654 Advanced Graduate Photography (5:2:6). Prerequisite: AVT 653 or permission of the instructor. An advanced graduate photography course. It is designed as an intensive critique class that concentrates on the development of the student's creative work with emphasis on articulating responses to others’ work, the cultural climate we inhabit and the issues involved in one’s own work as it progresses. Weekly classes will share equal time with critical theory and hands-on studio work. Readings, visiting artists and lecturers, and field trips will serve to provide a variety of viewpoints as well as encourage discourse during the semester. Repeatable for ten credits.

662 Graduate Sculpture I (5:2:6). Prerequisite: Admission to AVT graduate program or permission of instructor. An intensive studio course that furthers student independence through production of a body of work which reflects their specific interests, including a broader context of social, cultural, and contemporary issues. Emphasis will be placed on self-evaluation, critical discussion, reading, and writing components.

663 Graduate Sculpture II (5:2:6). Prerequisite: AVT 662 or permission of instructor. An intensive studio course that furthers student independence through production of a body of work which reflects their specific interests, including a broader context of social, cultural, and contemporary issues. Emphasis will be placed on self-evaluation, critical discussion, reading, and writing components.

664 Advanced Graduate Sculpture (5:2:6). Prerequisite: AVT 663 or permission of the instructor. Course places emphasis on individual creative production and development, with periodic exposure of the student’s work and ideas to the critical attention of the AVT teaching faculty and other graduate students. Writing and reading components. Repeatable for ten credits.

670 Teaching Practicum (3:3:0 or 6:6:0). Prerequisite: Admission to the AVT graduate program or permission of instructor. Supervised classroom teaching practicum in the undergraduate program at George Mason or in a community college program. May be repeated for a total of six credits.

672 InterArts I: History and Theory of Performance Art (5:6:2). Prerequisite: Admission to AVT graduate program or permission of instructor. Studio seminar on the history and theory of performance art, with readings, slide lectures, video screenings, demonstrations, discussion, writing assignments, guest artists, field trips, and research projects. Major projects focus on experimental multimedia performance archiving.

673 InterArts II: Performance Art Studio (5:2:6). Prerequisite: AVT 672 or permission of instructor. In-depth studio course in the practice of performance art. Detailed analysis of creation and production processes, in conjunction with practical training in solo and collaborative forms of live art, stage and multimedia technologies, body art, time-based art, and theater of images.

674 Advanced InterArts Topics (5:6:2). Prerequisite: AVT 673 or permission of instructor. Opportunity for advanced study in interdisciplinary arts topics including: African American Experience in the Performing Arts, Cyberpunk, Global Motion, InterArts Figures, Live Movies, Performance Studio, and Writing and Performance. May be repeated for credit under different topics. Repeatable up to ten credits.

676 Sound and Music for Video and Animation (5:2:6). Prerequisite: Admission to the AVT graduate program or permission of instructor. Combined lecture and studio course that focuses on the selection, editing, processing, and integration of sound and music (postproduction) into video and animation. Time, frequency, and amplitude domains and processing, are studied. Students postproduce sound and music for a 15-minute film or animation that is due at the end of the semester.

678 Interface and CD-ROM Design (5:2:6). Prerequisite: Admission to the AVT graduate program or permission of instructor. Combined lecture and studio course in multimedia interface and CD-ROM design. Special focus is given to the exportation of the traditional visual and auditory aesthetic to the computer environment within a multimedia context. Assigned readings in the class are augmented and supported by presentations of various digital interfaces and CD-ROM examples. Commercial, entertainment, and educational titles, as well as CD-ROM experimental art works, are studied and discussed. Studio time is divided between the AVT labs and area multimedia facilities. Students conceive, design, and develop a two-CD-ROM and/or Kiosk Interfaces that are due at midterm, and complete a dual platform CD-ROM project that is due at the end of the semester.

684 Two-Dimensional Digital Art (5:2:6). Prerequisite: Admission to the AVT graduate program or permission of instructor. Overview of 2D computer imaging applications in the arts, including painting, printmaking, mixed media, illustration, video, animation, and others. Lectures combine technical and aesthetic material, including image processing for artists and color reproduction. Emphasis on developing an advanced studio portfolio.
686 Three-Dimensional Digital Art (5:2:6). Prerequisite: Admission to the AVT graduate program or permission of instructor. Students will learn how to create realistic, three-dimensional scenes with scaled objects, surface textures, lights, and shadows. Emphasis will be placed on idea generation, concept development, visual aesthetics and technical abilities. Students are required to render a portfolio of high resolution images.

688 Digital Animation (5:2:6). Prerequisite: Admission to the AVT graduate program or permission of instructor. Students will study digital 2D and 3D animation practices. Lighting, camera movement, object motion, timing, and texture mapping will be introduced as students plan and produce a short animation. Emphasis will be placed on idea generation, concept development, visual aesthetics, and technical abilities.

693 Apprenticeship (3:3:0 or 6:6:0). Prerequisite: Admission to the AVT graduate program or permission of instructor. AVT students apprentice at a local business that conforms to their interest in visual information technologies. May be repeated for a total of six credits.

796, 798, 799 Directed Project, Directed Reading, Thesis (1-9:0:0), (3:9:0), (3:9:0). Prerequisite: Admission to the AVT graduate program or permission of instructor. Three courses comprising the M.F.A. comprehensive experience for AVT students. Involves a study of the historical basis for a studio project, an independent creative production suitable for public viewing, and a written thesis documenting the evolution of the creative problem and exploring the intention, purpose, and relative success of the finished production.

Astronomy (ASTR)

Physics and Astronomy

103 Astronomy (3:3:0). Not for physics majors. Introduction to origin of life, Earth, planets and sun, stars, galaxies, quasars, nature of space radiation, and general theory of relativity.

111 Introduction to Modern Astronomy I (3:3:0). ASTR 111, 112, 113, 114 can be used to fulfill the eight-hour lab science requirement; not for physics majors. Topics include history of astronomy from prehistory to the present, evolution of the solar system, properties of the planets, scientific method, critical thinking, the nature of light, and the principles of telescope design.

112 Introduction to Modern Astronomy Lab I (1:0:3). Corequisite: ASTR 111. Laboratory portion of two-semester introductory astronomy sequence.

113 Introduction to Modern Astronomy II (3:3:0). Topics include electromagnetic radiation, stellar evolution, the interstellar medium, galaxies, cosmology, the scientific method, and critical thinking.

114 Introduction to Modern Astronomy Lab II (1:0:3). Corequisite: ASTR 113. Laboratory portion of two-semester introductory astronomy sequence.

201 Astrobiology (3:3:0). Prerequisites: MATH 113 and PHYS 160. Provides a physical science perspective on the origin and evolution of life on Earth and how life, in turn, has significantly influenced the evolution of Earth. Topics include the origin of Earth, mechanisms and sites for the origin of life, the co-evolution of life and Earth’s atmosphere, habitability of planets, and the search for extraterrestrial life.

228 Foundations of Cosmological Thought (3:3:0). Examines the scientific, historical, and philosophical foundations and development of cosmological thought from antiquity to the present. Emphasizes a qualitative understanding of the development of cosmology concluding with the present concept of the origin and evolution of the universe. No advanced background in mathematics or the natural sciences is required.

328/PHYS 328 Introduction to Astrophysics (3:3:0). Prerequisites: PHYS 303, 305, 308, and MATH 214. Topics include physical concepts, magnitudes of stars, Hertzsprung-Russell diagram, stellar radiation, interstellar matter, dust and molecules, and others.

390 Topics in Astronomy (1-4:1-4:0). Selected topics in astronomy not covered in fixed content courses. May not be included for credit by physics majors within the 45 hours of physics courses required for the B.S. degree or within the 31 hours of physics courses required for the B.A. degree.

401 Computer Simulation in Astronomy (3:3:0). Prerequisites: MATH 213 and ASTR 328. Techniques and methods used to simulate astronomical phenomena using a computer. Examples taken from a wide variety of astronomical phenomena, including radiation transfer in astrophysical objects, self-gravitating systems, hydrodynamics, and stellar models. Emphasis on hands-on projects.

403 Planetary Sciences (3:3:0). Prerequisites: MATH 213 and PHYS 160. Introduction to the physics and chemistry of planets and their natural satellites, asteroids, and comets. Topics include the history of the solar system; the origin and evolution of the planets, their internal structure, their atmospheres; and analytical techniques used in their remote and in situ study.

404 Galactic Astronomy (3:3:0). Prerequisites: MATH 214 and ASTR 328. Comprehensive introduction to the observational and theoretical aspects of the study of galaxies. Topics include our own galaxy, normal galaxies and their hierarchical structures (groups and clusters), star forming and active galaxies, and colliding galaxies.

408 Senior Research (3:3:0). Prerequisites: 15 credits of ASTR courses. A student may receive no more than 6 credits of ASTR 408 and 409. Independent work under the guidance of a faculty member on a research project in experimental, observational, or theoretical astronomy. A written report on the project is required. May be taken twice with permission of the department.

409 Astronomy Internship (3:3:0). Prerequisites: 75 credits, 15 ASTR credits, and permission of department. See department for other requirements and application procedure prior to enrollment. A student may receive no more than 6 credits of ASTR 408 and 409. On-the-job experience for astronomy majors in industry or government laboratories, including summer research programs. Students work in the areas of observational, experimental, or theoretical astronomy and prepare a written report at the end of the internship.
Astronomy (ASTR) • Bachelor of Arts in Interdisciplinary Studies (BAIS) 279

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Prerequisites</th>
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<tbody>
<tr>
<td>428/PHYS 428</td>
<td>Relativity and Cosmology (3:3:0).</td>
<td>Pre-requisite: MATH 214 or 306; PHYS 303, 305, and 262; or permission of instructor. Special relativity; four-dimensional space-time; general relativity; non-Euclidean geometries, geodesics, and field equations; tests of general theory of relativity; black holes; cosmology; models of the universe; remnant blackbody radiation; big bang cosmology; thermodynamics; and the universe.</td>
</tr>
<tr>
<td>490 Astronomy Capstone (3:3:0).</td>
<td>Prerequisites: Completion of ASTR core courses or concurrent enrollment in final core courses. Capstone course designed to provide students with a learning experience, integrating what they have learned in their previous astronomy courses with selected readings from current scientific papers and with an opportunity to effectively present that synthesis. Emphasis on student participation and student-led class discussions. Required of all astronomy majors.</td>
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<tr>
<td>530/CSI 661</td>
<td>Astrophysics (3:3:0).</td>
<td>Prerequisites: PHYS 303, 305, 308; MATH 214. Survey of contemporary astrophysics. Topics include physical concepts, stellar spectra, Hertzsprung-Russell diagram, stellar atmospheres, stellar structure, interstellar matter, stellar evolution, high-energy phenomena, hydrodynamical processes in astrophysics, accretion disk formation, and shock formation.</td>
</tr>
<tr>
<td>535/CSI 660</td>
<td>Space Instrumentation and Exploration (3:3:0).</td>
<td>Prerequisites: PHYS 262 and MATH 213. Survey of the instruments, devices, and methods used for space and planetary exploration. Remote sensing of Earth and other solar system bodies. Planned manned and unmanned missions by the United States and other countries.</td>
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<tr>
<td>761/CSI 761</td>
<td>N-Body Methods and Particle Simulations (3:3:0).</td>
<td>Prerequisites: PHYS 613 and CSI 717. Study of particle methods as a tool in solving a variety of physical systems. Study and development of the numerical results and visualization of these results in complex physical systems are emphasized. Applications and projects include star and galaxy dynamics, smoothed particle hydrodynamics, plasma simulations, and semiconductor device theory. Algorithms on parallel and vectorized systems are included.</td>
</tr>
<tr>
<td>764/CSI 764</td>
<td>Computational Astrophysics (3:3:0).</td>
<td>Prerequisite: ASTR 530 or permission of instructor. Study of statistical mechanics concepts important in astrophysics. Presentation of unified approach to particle acceleration and interaction theory based on analytical and numerical analysis of Boltzmann and Liouville equations. Discussion of computational methods relevant for particle transport problems, with emphasis on Fokker-Planck and Monte-Carlo solution techniques. Applications from space sciences include studies of cosmic ray acceleration, photon comptonization, particle transport in the near-earth environment, energy transport in stellar atmospheres, and self-gravitating system dynamics.</td>
</tr>
<tr>
<td>765/CSI 765</td>
<td>High-Energy and Accretion Astrophysics (3:3:0).</td>
<td>Prerequisites: PHYS 502, 513, ASTR 530, or permission of instructor. Overview of the field of atomic and nuclear physics, including nuclear reactions of use to high-energy astrophysics. Radiation processes in cosmic plasmas emphasizing quantum mechanical calculations; stellar evolution and nucleosynthesis; computational models of stellar evolution; binary stars and accretion disks; numerical models of the structure of accretion disks; compact stars, white dwarfs, neutron stars, and black holes; acceleration processes and cosmic rays; interstellar medium and propagation of cosmic rays; high-energy processes in the center of galaxies; and ground- and space-based techniques and observations are discussed.</td>
</tr>
<tr>
<td>766/CSI 766</td>
<td>Relativity and Cosmology (3:3:0).</td>
<td>Formerly PHYS 531. Prerequisites: ASTR 530 and MATH 314, or permission of instructor. Special relativity, four-dimensional space-time, general relativity, non-Euclidean geometries, geodesic and field equations, test of general relativity theory, black holes, cosmic background radiation, thermodynamic considerations in cosmology, and cosmological models.</td>
</tr>
<tr>
<td>769/CSI 769</td>
<td>Topics in Space Sciences (3:3:0).</td>
<td>Prerequisite: Permission of instructor. Selected topics in space sciences not covered in fixed-content space sciences courses. May be repeated for credit as needed.</td>
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</tbody>
</table>

Bachelor of Arts in Interdisciplinary Studies (BAIS)

New Century College

300 Understanding Multidisciplinary Studies (3:3:0). Prerequisite: Open only to pre-BAIS students and BAIS majors. Focuses on literature and issues relevant to interdisciplinary and multidisciplinary studies and the BAIS program. Students explore selected topics, develop and gather feedback on individualized core concentration proposals, and review BAIS issues and requirements.

390 The Research Process (3:3:0). Prerequisite: BAIS 300. Open only to pre-BAIS students and BAIS majors. Focuses on the skills needed to develop a topic, find and organize relevant information, examine and critique evidence, establish thesis criteria, and create a plan to complete a senior thesis. Should be taken at least one semester prior to BAIS 489.

489 Directed Readings and Research (3:0:0). Prerequisite: BAIS 390. Open only to BAIS majors. Individualized sections by arrangement. Readings and research on a topic directly relevant to the student’s core concentration. Guided by the student’s primary faculty advisor. Topics must be approved by the instructor and BAIS director prior to enrollment.

490 Senior Thesis Project (3:0:0). Prerequisite: BAIS 489; corequisite: BAIS 491. Open only to BAIS majors. Individualized sections by arrangement. Capstone course in the BAIS core concentration. Thesis/research paper on a topic directly relevant to the student’s core concentration. Guided by the student’s faculty advisor. Topics must be approved by the student’s faculty advisory committee and the BAIS director prior to enrollment. A grade of C or better is required to graduate with a BAIS degree.

491 Senior Project Exhibition (1:1:0). Prerequisite: BAIS 489; corequisite: BAIS 490. Open only to BAIS majors. Focuses on the preparation and delivery of a formal presentation of the student’s BAIS 490 thesis. Includes a review of basic presentation techniques.
Bachelor of Individualized Study (BIS) • Bioinformatics (BINF)

New Century College

300 Understanding Multidisciplinary Studies (3:3:0). Prerequisite: Open only to pre-BIS students and BIS majors. Focuses on literature and issues relevant to multidisciplinary and multidisciplinary studies and the BIS program. Students explore selected topics, develop and gather feedback on individualized core concentration proposals, and review issues and program requirements.

390 The Research Process (3:3:0). Prerequisite: BIS 300. Open only to pre-BIS students and BIS majors. Focuses on the skills needed to develop a topic, find and organize relevant information, examine and critique evidence, establish project criteria, and create a plan to complete a senior thesis or project.

489 Directed Readings and Research (1-3:0:0). Prerequisite: Open only to pre-BIS students and BIS majors. Individualized sections by arrangement. Readings and research on a topic directly relevant to the student’s core concentration. Guided by an instructor with expertise in the topic. Topics must be approved by the instructor and BIS director prior to enrollment.

490 Bachelor of Individualized Study Project (3:0:0). Prerequisite: BIS 390; corequisite: BIS 491. Open only to BIS majors. Individualized sections by arrangement. Capstone course in the BIS core concentration. Project, thesis, or internship on a topic directly relevant to the student’s core concentration. Guided by the student’s faculty advisor. Topics must be approved by the faculty advisor and the BIS director prior to enrollment. A grade of C or better is required to graduate with a BIS degree.

491 Senior Project Presentation (1:1:0). Prerequisite: BIS 390; corequisite: BIS 490. Open only to BIS majors. Focuses on the preparation and delivery of a formal presentation of the student’s BIS 490 project. Includes a review of basic presentation techniques.

Bioinformatics (BINF)

School of Computational Sciences

701/BIOS 701 Biochemical Systematics (Biochemistry) Core for Doctoral Studies in Biosciences and Bioinformatics (3:3:0). Prerequisite: Admission to the Ph.D. program in biosciences or bioinformatics, CHEM 663 or equivalent. The course introduces students to the biochemical systems now in use to investigate complex, multi-component, dynamic functions of cellular systems. Such studies employ an array of conceptual and technical approaches in their application. Articles from the current literature highlight this aspect of research in the molecular biosciences and are used as the basis of this course offering. The application of molecular techniques within bio-sciences is now universal. The cell: What is its structure and how does it function? This is the underlying question that a student should keep in mind as the course proceeds.

702/BIOS 702 Research Methods (3:3:0). Prerequisite: Admission to the Ph.D. program in bioinformatics or biosciences. This course trains students in research methodologies for the life sciences. The course will cover the three phases of biological research projects: experimental design, data collection, and data analysis.

703 Bioinformatics Lab Rotation (1:0:1). Prerequisite: Permission of instructor. Short-term introductory research on a specific topic in computational sciences and informatics under the direction of a faculty member. May be repeated as necessary.

704/CSI 898 Seminar in Bioinformatics (1:1:0). Prerequisite: Graduate standing. Seminar presentations in a variety of areas of bioinformatics and computational biology by School of Computational Sciences faculty, staff, advanced Ph.D. students, and professional visitors. May be repeated for credit.

705 Research Ethics (1:1:0). Prerequisite: Permission of instructor. An examination of ethical issues in scientific research. The course begins with a reflection on the purpose of scientific research and a review of the foundational principles used for evaluating ethical issues. It provides skills for survival in scientific research through training in moral reasoning and teaching of responsible conduct. Students learn to apply critical thinking skills to the design, execution, and analysis of experiments and to the analysis of current ethical issues in research. Such issues include the use of animals and humans in research, ethical standards in the computer community, and research fraud. In addition, currently accepted guidelines for behavior in areas such as data ownership, manuscript preparation, and conduct of persons in authority may be presented and discussed in terms of relevant ethical issues.

730/CSI 730 Biological Sequence Analysis (3:3:0). Prerequisites: Permission of instructor, ability to program in a high-level language, and a course in molecular biology; some background in probability will also be helpful. Fundamental methods for the analysis of nucleic acid and protein sequences, including pairwise alignment, multiple alignment, database search methods, profile searches, and phylogenetic inference. Development of probabilistic tools, including hidden Markov models and optimization algorithms. Survey of current software tools.

731/CSI 731 Protein Structure Analysis (3:3:0). Prerequisite: Permission of instructor, or coursework in molecular biology, biochemistry, and introduction to computer programming. Computational methods for the analysis, classification and prediction of three-dimensional protein structures. The course covers theoretical approaches, techniques, and computational tools for protein structure analysis.

732/CSI 732 Genomics (3:3:0). Prerequisites: General biology, programming experience, CSI 700 or equivalent, CSI 731, or permission of instructor. A survey of computational tools and techniques used to study whole genomes. The biological basis of genome analysis algorithms will be explored. Lecture topics include genome mapping, comparative genomics, and functional genomics.

733 Gene Expression Analysis (3:3:0). Prerequisites: Permission of instructor, ability to program in a high-level language, and a course in molecular biology; S-Plus or Matlab experience may also be helpful. This course will focus on the analysis of gene expression data. Particular topics include: cluster analysis and visualization of expression data; inference of genetic regulatory networks; and theoretical models of genetic networks.

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Bioinformatics (BINF) • Biology (BIOL) 281

739 Topics in Bioinformatics (3:3:0). Prerequisite: Permission of instructor. Selected topics in bioinformatics not covered in fixed-content bioinformatics courses. May be repeated for credit as needed.

796/CSI 796 Directed Reading and Research (3:3:0). Reading and research on a specific topic in computational sciences and informatics under the direction of a faculty member. May be repeated as necessary.

996/CSI 996 Doctoral Reading and Research (1-12:0:0). Prerequisites: Admission to doctoral program and permission of instructor. Reading and research on a specific topic in computational sciences and informatics under the direction of a faculty member. May be repeated as needed.

998/CSI 998 Doctoral Dissertation Proposal (1-12:0:0). Prerequisite: Permission of advisor. Covers development of a research proposal, which forms the basis for a doctoral dissertation under the guidance of a dissertation director and the doctoral committee. May be repeated as needed; however, no more than 12 credits of BINF 998 may be applied toward satisfying doctoral degree requirements.

999/CSI 999 Doctoral Dissertation (1-12:0:0). Prerequisite: Permission of dissertation director. Reading and research under the direction of the dissertation director. May be repeated as needed; however, no more than a total of 24 credits in BINF 998 and 999 may be applied toward satisfying doctoral degree requirements.

Biology (BIOL)

103 Introductory Biology I (4:3:3). Survey course suitable for any major. Topics include the chemistry of life, cell structure and function, heredity, evolution, and diversity of life and animal systems. Students who have already received 4 credits of biology are not eligible to take this course. f,s,summer

104 Introductory Biology II (4:3:3). Prerequisite: BIOL 103. Topics include human structure, function and homeostatic mechanisms, animal systems, behavior, plants, major ecosystems, and ecological problems. Students who have already received 8 credits of biology are not eligible to take this course. s,summer

124, 125 Human Anatomy and Physiology (4:3:3). Must be taken in sequence. Does not satisfy the natural science requirement for the B.A. in the College of Arts and Sciences. Not available for biology major credit. Students may not receive credit for BIOL 124 or 125. Introduction to structure and function of major organ systems of the body. f,s,summer

213 Cell Structure and Function (4:3:3). For science majors and preprofessionals in the life sciences. Introduction to the chemistry, metabolism, genetics, and evolution of cells. f,s,summer

225 Human Reproduction and Sexuality (3:3:0). Not available for biology major credit. Examination of the anatomy and physiology of human reproductive systems, physiology of sexual intercourse, normal pregnancy, birth, congenital conditions, sex determination and its expression, diseases of the reproductive organs, and technical developments related to reproduction. f

246 Introductory Microbiology (3:3:0). Prerequisite: C or better in BIOL 124 and 125 or one year of general biology or permission of instructor. Corequisite: BIOL 306. Not available for biology major credit. Not available to students who have taken BIOL 213, 302, or 418. Introduction to microbial cell structure, physiology, and pathogenicity. Emphasis on control of microorganisms, host-parasite interactions including immunology and viral and bacterial pathogens. f,s

301 Biology and Society (3:3:0). Prerequisites: BIOL 103 and 60 credits or permission of instructor. For nonscience majors. Not available for biology major credit. Biological problems facing society, such as pollution, cloning, emerging diseases, global warming, and overpopulation. See the current Schedule of Classes for the current topic. May be repeated if the topic is different.

303 Animal Biology (4:3:3). Prerequisite: C or better in BIOL 213 or permission of instructor. Emphasizes structure and function of vertebrates, but surveys all animal groups and protozoa. Also covers evolutionary theory and evolutionary history of major animal groups. f,s,summer

304 Plant Biology (4:3:3). Prerequisite: C or better in BIOL 213 or permission of instructor. Introduction to the study of plants, their structure, development, nutrition, and ecology. Emphasizes flowering plants, but surveys all groups and their phylogenetic relationships. f,s,summer

305 Biology of Microorganisms (3:3:0). Prerequisite: C or better in BIOL 213, or permission of instructor. Corequisite: BIOL 306. Morphology, physiology, and pathogenicity of certain groups of bacteria, fungi, and viruses. Host-parasite interactions are stressed. f,s,summer

306 Biology of Microorganisms Laboratory (1:0:3). Corequisite: BIOL 246 or 305. Laboratory techniques in culturing, staining, and identifying microorganisms. f,s,summer

307 Ecology (4:3:3). Prerequisites: BIOL 303 and 304, or permission of instructor. Physical environment, energy flow, structure and function of populations, the dynamics of communities, and succession. f,s,summer

309/GEOL 309 Introduction to Oceanography (3:3:0). Prerequisites: GEOL 101 and BIOL 103 or 213, or permission of instructor. Introduction to chemical, biological, and geological aspects of the oceanic environment. f

311 General Genetics (4:3:3). Prerequisites: BIOL 213, 303, 304, 305–306 all completed with no more than one D; or permission of instructor. Basic principles of heredity and modern developments in this field. f,s,summer

312 Biostatistics (4:3:2). Prerequisites: BIOL 303 and 304, or permission of instructor. Use of probability and descriptive and inferential statistical techniques in the interpretation of biological data. f

313 Human Genetics for the Social Sciences (3:3:0). Prerequisite: One year of biology or permission of instructor. Not available for biology credit. Emphasizes topics of interest to students in the social sciences but open to any non-biology major. Topics include the human genome and its inheritance; nature versus nurture; genetic disease; the genetics of sex-determination, intelligence, personality, and mental illness; genetic differences within and between populations; and evolution of human beings. s,odd
320 Comparative Chordate Anatomy (4:2:6). Prerequisite: BIOL 303 or permission of instructor. Comparison of anatomy and morphology of major chordate groups. Lab emphasizes shark, mudpuppy, cat, and rabbit. AF

322 Developmental Biology (4:3:3). Prerequisites: BIOL 303 and 311, or permission of instructor. Principles of embryonic development and differentiation in animal species at the cellular, molecular, tissue, and whole organism levels. F

326 Animal Physiology (3:3:0). Prerequisites: BIOL 213, 303, and 60 credits. General consideration of invertebrate and vertebrate function emphasizing common life problems and a variety of methods for solving them. Topics include electrolyte balance, excretion, respiration, metabolism, thermoregulation, neuroendocrine control, and physiological rhythms. F

327 Animal Physiology Laboratory (2:1:3). Prerequisites or corequisites: BIOL 326 and permission of instructor. Investigation of invertebrate and vertebrate physiology. Emphasis on responses to environmental changes. F

331 Invertebrate Zoology (4:3:3). Prerequisite: BIOL 303 or permission of instructor. Survey of the invertebrate phyla, excluding insects, showing the morphology, phylogeny, and general biology of these groups. F

332 Insect Biology (4:3:3). Prerequisite: BIOL 303 or permission of instructor. Survey of insects including taxonomy, morphology, physiology, behavior, ecology, and economic importance. sum

333 Vertebrate Zoology (4:2:6). Prerequisite: BIOL 303 or permission of instructor. Phylogeny and systems of major vertebrate groups. Emphasis on ecological adaptation. Lab includes field studies of local fauna. S

342 Plant Morphology (4:3:3). Prerequisite: BIOL 304 or permission of instructor. Origin and development of organs, tissue systems, and life cycles of green plants, with phylogenetic comparisons from algae to angiosperms. F

344 Taxonomy of Flowering Plants (4:3:3). Prerequisite: BIOL 304 or permission of instructor. Study of terminology and identification of flowering plants with emphasis on local flora. S

345 Plant Communities (4:3:3). Prerequisite: BIOL 304 or permission of instructor. Plant associations and formations and their succeesions in North America. Three Saturday or Sunday field trips required. F

371 Animal Distributions (3:3:0). Prerequisites: BIOL 303 and 304, or permission of instructor. Relations of the North and South American faunas with other regions in the light of continental drift. Emphasis on vertebrates. S

377 Applied Ecology (3:3:0). Prerequisite: 8 credits of biology, geology, or chemistry; 60 credits; or permission of instructor. Introduction to ecosystem concepts and their applications to natural and managed ecosystems. F

385 Biotechnology and Genetic Engineering (3:3:0). Prerequisites: BIOL 311, CHEM 211, 212, MATH 110 or 113. Theory and applications are emphasized, including significance and societal implications of biotechnology applied to medicine, agriculture, and the environment. F

401 Microbial Diversity: An Organismal Approach (3:3:0). Prerequisites: BIOL 305, 306, or permission of instructor. Study of the nonpathogenic microbial world, emphasizing detection, enumeration, and classification of microorganisms, their physiological and evolutionary relationships, and biotechnological applications. F

402 Applied and Industrial Microbiology (3:3:0). Prerequisites: BIOL 213, 305, 306; CHEM 211, 212; or permission of instructor. Biology of microorganisms of ecological and industrial significance. Includes food production, spoilage and preservation, fermentation technology, waste disposal, water purification, biodeterioration, and decomposition. F

403 Techniques in Applied and Industrial Microbiology (1:0:3). Prerequisites: BIOL 213, 305, 306; CHEM 211, 212. Prerequisite or corequisite: BIOL 402 or permission of instructor. Laboratory exercises illustrate basic and applied methodologies, including isolation of commercially useful strains. Production and purification of industrial products are discussed. F

404 Medical Microbiology (3:3:0). Prerequisites: BIOL 305 and 306. Basic principles of infectious diseases caused by bacteria and viruses. The genetics and molecular mechanisms of pathogenicity are discussed. F

411 Advanced General Genetics (3:3:0). Prerequisites: 2.0 or better in BIOL 311 or permission of instructor. Topics include quantitative genetics, extrachromosomal inheritance and special techniques such as mutation screening, developmental genetics, cancer genetics, behavior genetics, evolutionary genetics, and the ethics of genetic technology. F

413 Human Genetics for Biologists (3:3:0). Prerequisites: BIOL 311 and permission of instructor. May not be combined with BIOL 572 for credit. Emphasizes topics of interest to students in the social sciences but open to any nonbiology major. Topics include the human genome and its inheritance; nature versus nurture; generic disease; the genetics of sex-determination, intelligence, personality, and mental illness; genetic differences within and between populations; and evolution of human beings. S

418 Current Topics in Microbiology (3:3:0). Prerequisites: BIOL 305 and 306. Study of current topics in microbiology. Topics vary. May be repeated for credit. F

425 Human Physiology (3:3:0). Prerequisite: BIOL 213, 303, or permission of instructor. Organ system approach to the study of homeostasis, including cardiovascular, respiratory, renal, digestive, endocrine, and nervous system functions. S

433 Selected Topics in Plant Biology (1-4:1-4:0-6). Prerequisite: BIOL 304 or permission of instructor. Lecture or field course in botany. Topic varies with instructor's specialty. F

440 Field Biology (4:2:6). Prerequisites: BIOL 303, 304, and 60 credits; or permission of instructor. Directed field studies emphasizing ecology and behavior. Topics vary but include design of field manipulations, data collection and analysis, and an introduction to organisms of study site. Students bear the cost of required field trip(s). May be repeated once with permission of department chair. Total limit for 440, 495, and 497 is 6 credits toward the 44 credits required for the B.S. and only 4 credits toward the 32 credits for the B.A., not to exceed 4 credits in any one semester.
446 Environmental Physiology (3:3:0). **Prerequisite:** BIOL 326 or permission of instructor. Physiological responses of animals to environmental and/or biotic factors. Emphasis on vertebrates.

449 Marine Ecology (3:3:0). **Prerequisite:** BIOL 307 or permission of instructor. Plants and animals of marine environments and physical and chemical conditions that affect their existence.

451 Mushrooms, Molds, and Molecules (4:3:3). **Prerequisites:** BIOL 304, 305, 306, or permission of instructor. Study of fungal biology emphasizing those aspects having medical, environmental, economic, and biotechnological impacts. Laboratory emphasizes techniques for the experimental design and analysis of data.

452 Immunology (3:3:0). **Prerequisites:** BIOL 213 and 305, 306, 311, or permission of instructor. Topics include structure and function of immunoglobulins, role of cell-mediated immunity, protective role of the immune system, and disease and injury related to malfunctions of the immune system.

453 Immunology Laboratory (1:0:3). **Prerequisite or corequisite:** BIOL 452. Techniques relevant to BIOL 452, including enzyme-linked immunosorbant assay, immunodiffusion, protein electrophoresis, and immune fixation.

465 Histology (4:3:3). **Prerequisites:** BIOL 303 and 60 credits, or permission of instructor. Microscopic structure of animal tissues and organs with emphasis on vertebrates.

471 Evolution (3:3:0). **Prerequisite:** BIOL 311 or permission of instructor. Process of evolution with emphasis on the role of genetics, the properties of populations, and population differentiation.

472 Introductory Animal Behavior (3:3:0). **Prerequisites:** BIOL 213, 303, or permission of instructor and 60 credits. **Corequisite:** BIOL 473. Study of the mechanisms, functions, and evolution of behavior.

473 Introductory Laboratory in Animal Behavior (1:0:3). **Corequisite:** BIOL 472. Field and/or laboratory study in animal behavior with emphasis on mechanisms, functions, and evolution of behavior. Stress is placed on experimental design and analysis of data. Writing-intensive lab.

482 Introduction to Molecular Genetics (3:3:0). **Prerequisites:** BIOL 213 and BIOL 305, 306, or permission of instructor. Basic concepts of the structure and function of genetic material at the molecular level.

483 General Biochemistry (4:4:0). **Prerequisites:** BIOL 213, CHEM 313, 314, or permission of instructor. Structure and function of proteins, carbohydrates, lipids, enzymes, and metabolism and its control. Chemistry of nitrogen compounds is emphasized.

484 Eukaryotic Cell Biology (3:3:0). **Prerequisites:** BIOL 311, 483, MATH 110 or 113, or permission of instructor. Structure and function of cell membranes and organelles with regard to cellular transport, sorting, compartmentalization, signaling, motility, and cell division.

485 Eukaryotic Cell Biology Laboratory (1:0:1). **Corequisite:** BIOL 484 or permission of instructor. Laboratory experiments utilizing cell biology techniques, including microscopy, spectrophotometry, centrifugation, chromatography, and electrophoresis.

492 Senior Seminar (1:1:0). **Prerequisites:** BIOL 307, BIOL 311, and 90 credits. Capstone course required of all biology majors for graduation.

494 Honors Seminar in Biology (1:1:0). **Prerequisites:** Admission to Biology Department Honors Program and permission of instructor. Weekly seminar course dealing with recent advances in the field of biology. Topics are selected from recent publications in the field. May be repeated for credit six times.

495 Directed Studies in Biology (1-2:0:0). **Prerequisite:** Permission of instructor and department chair. Study of a topic not otherwise available to the student. May involve any combination of reading assignments, tutorials, lectures, papers, presentations, or field or lab study, determined in consultation with the instructor. May be taken for 1 to 2 credits and repeated once for a total of 2 credits. Total limit for 440, 495, and 497 is 6 credits toward the 44 credits required for the B.S. and only 4 credits toward the 32 credits for the B.A., not to exceed 4 credits in any one semester.

497 Special Problems in Biology (1-4:0:0). **Prerequisite:** 60 credits and permission of instructor and department chair. Lab or field project leading to a written report of research. Research and paper are completed under the instructor's guidance. Total limit for 440, 495, and 497 is 6 credits toward the 44 credits required for the B.S. and only 4 credits toward the 32 credits for the B.A., not to exceed 4 credits in any one semester.

501 Microbial Diversity: An Organismal Approach (3:0:0). **Prerequisite:** Undergraduate course in microbiology or permission of the instructor. An in-depth study of the nonpathogenic microbial world, emphasizing the detection, enumeration, and classification of microorganisms and their physiological and evolutionary relationships and biotechnological applications.

506 Selected Topics in Microbiology (1-4:1-3:0-6). **Prerequisites:** BIOL 305, 306, or permission of instructor. Topic depends on instructor's specialty. May be repeated only with permission of department chair.

507 Selected Topics in Ecology (1-4:1-3:0-6). **Prerequisite:** Course in ecology or permission of instructor. Topic depends on instructor's specialty. May be repeated only with permission of department chair.

508 Selected Topics in Animal Biology (1-4:1-3:0-6). **Prerequisite:** BIOL 303 or permission of instructor. Topic depends on instructor's specialty. May be repeated only with permission of department chair.

515 Introduction to Neurobiology (2:2:0). **Prerequisite:** Completion of 60 credits, including PSYC 372; or BIOL 213 and BIOL 303. Introduction to neurobiology with an overview of the embryological development of the nervous system in an evolutionary context. Regional and systems neuroanatomy is introduced by study of the mammalian visual system with a comparative perspective.

516 Mammalian Neurobiology (3:2:3). **Prerequisite:** BIOL 515 Functional anatomy of the brains of mammals, with emphasis on regional and systems neuroanatomy of humans. Anatomy is correlated with material from clinical...
neurology where possible. Laboratory component includes brain dissections and clinical correlations.

518 Conservation Biology (3:3:0). Prerequisite: BIOL 307, 311, or equivalent. Introduction to the science used to identify species in need of conservation and the techniques currently employed to manage and protect organisms.

520 Systematics in Complex Angiosperm Families (3:1:6). Prerequisite: BIOL 344 or 534 or permission of instructor. Morphology and speciation of the more complex families such as Poaceae, Cyperaceae, and Asteraceae. Lab emphasizes identification of specimens and acquaintance with taxonomic literature.

532 Animal Behavior (3:3:0). Prerequisite: Permission of instructor. Ecological aspects of animal behavior.

533 Selected Topics in Plant Biology (1-4:1-3:0-6). Prerequisite: BIOL 304 or permission of instructor. Topic depends on instructor's specialty. May be repeated only with permission of department chair.

534 Advanced Plant Taxonomy (3:1:6). Prerequisite: Course in plant taxonomy or permission of instructor. Laboratories consist of field trips and collection and identification of specimens.

535 Ancient Plants and their Environment (3:3:0). Prerequisite: BIOL 304, a course in paleontology, or permission of instructor. Study of factors involved in the origin, history, and extinction of fossil plants, including adaptations, paleoecology, and major geological events.

536 Ichthyology (4:3:3). Prerequisite: Course in ecology or permission of instructor. Study of the systematics, evolution, physiology, ecology, and behavior of fish.

537 Ornithology (4:2:6). Prerequisite: Course in ecology or permission of instructor. Study of the evolution, systematics, physiology, ecology, and behavior of birds, emphasizing field work. as

538 Mammalogy (4:2:6). Prerequisite: Course in ecology or permission of instructor. Study of the evolution, systematics, physiology, ecology, and behavior of mammals, emphasizing field work. af

539 Herpetology (4:2:6). Prerequisite: Course in ecology or permission of instructor. Study of the evolution, systematics, physiology, ecology, and behavior of amphibians and reptiles, emphasizing field work. as

543 Tropical Ecosystems (4:3:3). Prerequisite: Course in ecology or permission of instructor. Terrestrial, aquatic, and marine ecosystems in the tropics, emphasizing plant communities, plant-animal interactions, and the role of humans in the tropics. Field trip to the tropics is required as part of lab.

546 Estuarine and Coastal Ecology (4:3:3). Prerequisite: Course in ecology and permission of instructor. Emphasizes marine biology of estuarine and coastal habitats of the Chesapeake Bay region and factors affecting distribution and abundance of organisms. Lab provides training in field measurement of physical and chemical parameters and collection and identification of local organisms. Extended field trips made to mid-Atlantic sites. sum

547 Terrestrial Plant Ecology (4:3:3). Prerequisite: Course in ecology. Consideration of community organization, development, productivity, and mineral cycling; interactions between plants and competitors; herbivores; and various environmental factors, especially light, water, and soil. Field work and lab emphasize data collection and statistical analysis.

551 Mushrooms, Molds, and Molecules (4:3:3). Prerequisites: BIOL 304, 305, or permission of instructor. Study of fungal biology emphasizing those aspects having medical, environmental, economic, and biotechnological impact. Laboratory emphasizes techniques for the experimental manipulation of fungi.

553 Advanced Topics in Immunology (3:3:0). Prerequisite: BIOL 452 or permission of instructor. Comprehensive study of immunologic mechanisms as they pertain to immunologic diseases and transplantation.

556 Microbial Physiology and Metabolism (3:3:0). Prerequisite: BIOL 305, 306, or permission of instructor. Comprehensive study of microorganisms covering aspects of growth, nutrition, transport, autotrophic and heterotrophic metabolism, regulation, and differentiation.

561 Comparative Animal Physiology (3:3:0). Prerequisite: BIOL 326 or permission of instructor. Detailed study of selected physiological systems of invertebrates and vertebrates, emphasizing current research.

563 Virology (3:3:0). Prerequisite: BIOL 482 or permission of instructor. Fundamental concepts of the nature of viruses, virus classification, cultivation, and biochemistry. Bacteriophage and animal viruses emphasized.

568 Advanced Topics in Molecular Genetics (3:3:0). Prerequisite: BIOL 482 or permission of instructor. Comprehensive study of regulatory mechanisms controlling gene expression in viruses, prokaryotes, and eukaryotes, emphasizing current research.

572 Human Genetics (3:3:0). Prerequisite: BIOL 311 or permission of instructor. Inheritance of humans, emphasizing current problems, including genetic control of metabolic diseases, effects of radiation and chemical agents in the environment, and directed genetic change.

573 Developmental Genetics (3:3:0). Prerequisite: BIOL 311 or permission of instructor. Genetic approaches to the problem of eukaryotic development, emphasizing current research on the regulation of gene enzyme systems.

574 Population Genetics (3:3:0). Prerequisites: BIOL 307 and 311, or permission of instructor. Genetic structure and dynamics of populations, both real and ideal.

575 Selected Topics in Genetics (1-4:1-3:0-6). Prerequisite: BIOL 311 or permission of instructor. Different topics in different years. Topics include molecular, developmental, physiological, and classical genetics, emphasizing current problems and research. May be repeated once with permission of department chair.

576 Microbial Ecology of Soils (3:3:0). Prerequisites: BIOL 305, 306, or permission of instructor. The detection, identification, and physiological role of microorganisms in soils from the root zone to the deep subsurface. Emphasis on the interactions of the microorganisms (viruses through protists) and their functions in soil.

577 Biogeochemistry: A Global Perspective (3:3:0). Prerequisites: Introductory courses in ecology and chemistry, or permission of instructor. Structure and function of eco-
systems, their interactions as components of landscapes, and their contributions to the global environment. Course emphasizes biogeochemical cycles of natural, disturbed, and managed ecosystems, and their integration at the landscape and global level as related to current ecological problems such as transfer of nonpoint source pollutants, atmospheric deposition, stratospheric ozone depletion, and global change.

578 Mutation, DNA Repair, and Environmental Contamination (3:3:0). Prerequisites: BIOL 307 and 311. Overview of the relationship between environmental contamination and genetic damage. Course covers the types of contamination that result in mutations and the molecular mechanisms of DNA damage and repair.

579 Molecular Evolution and Conservation Genetics (3:3:0). Prerequisite: BIOL 311. Corequisite: BIOL 471 or permission of instructor. Evolution of genes and gene families at the molecular level, including gene duplication and divergence, positive and negative selection, genetic drift, and molecular clocks. Also includes selected applications in conservation genetics, such as molecular phylogenetics and estimates of population size.

580 Computer Applications for the Life Sciences (3:3:0). Prerequisites: 12 credits of biology and one year of college mathematics or permission of instructor. Study of the uses of computers in the biological sciences. Lectures are combined with supervised exercises on mainframe and microcomputers. Each student presents a seminar on an advanced application and does a project using a computer to fulfill a major assignment associated with another course or with employment.

583 General Biochemistry (4:4:0). Prerequisites: BIOL 213, CHEM 313, 314, or permission of instructor. Structure and function of proteins, carbohydrates and lipids, enzymeology, and metabolism and its controls. Chemistry of nitrogen compounds is emphasized.

584 Eukaryotic Cell Biology (3:3:0). Prerequisites: BIOL 311, 483, MATH 110 or 113, or permission of instructor. Structure and function of cell membranes and organelles with regard to cellular transport, sorting, and compartmentalization, signaling, motility, and cell division.

585 Eukaryotic Cell Biology Laboratory (1:0:1). Corequisite: BIOL 584 or permission of instructor.

587 Soil Ecology (3:3:0). Prerequisite: Introductory course in general ecology or environmental science or permission of instructor. Introduction to the physical, chemical, and biological processes that govern the development of soils and their ecological functions. Emphasizes the central role that plants, microbes, and animals play in soil processes. Some training provided in the system of soil classification and the current methods used to study soils.

588 Global Changes in Climate and Ecology (3:3:0). Prerequisites: Introductory courses in general ecology or environmental science or permission of instructor. Focus on global-level changes that influence the ecology of our planet. Introduction to the climate system—past, present, and future. Emphasizes links between ecological systems and changes in climate, land use, and element cycling. Topics include the responses of forests and oceans to climate change, effects of elevated carbon dioxide on plants, effects of ultraviolet radiation on aquatic systems, salt marsh responses to sea level rise, global eutrophication, desertification, carbon sequestration, and public policy implications of the global change science.

589 Teaching Practicum (1:0:3). Prerequisites: Permission of instructor, chair, and course coordinator (if any). Experience teaching biology in the laboratory or in the field under the supervision of a faculty member. Undergraduate assists the instructor. May be repeated once.

608 Topics in Biology (1-4:1-4:0-9). Prerequisite: Employment or anticipated employment as a science teacher. Not available for credit toward the M.S. in Biology or the Ph.D. in Environmental Science and Public Policy. An inservice course designed to strengthen and update a teacher's knowledge of biology. Topics include organismal biology, cell biology, ecology, microbiology, or genetics. May be repeated for credit with permission of department chair.

610 Bioremediation: Theory and Applications (3:3:0). Prerequisites: Course in microbiology and either organic chemistry or biochemistry, or permission of instructor. Provides the basis for understanding the proper application of bioremedial technologies to treatment of hazardous wastes. Includes evaluation of data to determine successful treatment.

611 Techniques in Environmental Microbiology (2:0:4). Prerequisite: Laboratory course in experimental microbiology or permission of the instructor. Open first to those enrolled in BIOL 610. Laboratory exercises illustrate techniques used to demonstrate microbial degradation, detection of microbes, isolation, and evaluation of their physiological and genetic characteristics.

622 Methods and Principles of Animal Taxonomy (3:1:6). Prerequisite: Course in evolution or permission of instructor. Theoretical basis of techniques used in animal classification with emphasis on their practical application to a lab problem dealing with a particular animal group.

640 Environmental Biology (3:3:0). Prerequisite: Course in ecology or permission of instructor. Patterns of climate and weather, tectonics, soil formation, and surface water and groundwater movements.

643 Microbial Ecology (4:3:3). Prerequisite: Course in microbiology or permission of instructor. Study of relationships between microorganisms and their natural environment, and methodology for observing their natural environment and biochemical activities in that environment.

648 Population Ecology (3:3:0). Prerequisite: Course in ecology or permission of instructor. Survey of ecological models and theory. Topics include population growth and regulation, competition, predator-prey relationships, and models of community structure.

649 Biological Resource Management (3:3:0). Prerequisite: Course in ecology or permission of instructor. Modern ecological theories and methods applied to biological resource management in developing and developed countries. Problems in achieving optimum productivity of specific resources and application of systems analysis.

665 Environmental Hazards to Human Health (3:3:0). Prerequisites: Courses in animal physiology and organic chemistry, or permission of instructor. Health effects of chemical contaminants of air, water, and food resulting from
industrialized society. Includes identifying, evaluating, and controlling hazards.

668 Advanced Techniques in Molecular Biology (4:2:6). Prerequisite: BIOL 568 or permission of instructor. Experimental studies using current methods for purification and characterization of biologically important compounds. Designed to provide training for research in molecular biology.


670 Environmental Law for Biologists (3:3:0). Prerequisite: Course in ecology, environmental biology, or permission of instructor. Study of environmental laws such as the National Environmental Policy Act and regulatory issues such as the Clean Water and Clean Air acts. Emphasis on critical evaluation of alternatives to unresolved issues in environmental policies.

680 Experimental Design and Analysis for the Life Sciences (4:3:3). Prerequisite: Course in biostatistics or permission of instructor. Advanced course in application of probability and statistics to research in the life sciences. Examples drawn from environmental, medical, physiological, genetic, and chemical biology.

690 Introduction to Graduate Studies in Biology (1:1:0). Required of all new M.S. students in biology.

691 Current Topics in Biology (1-4:1-3:0-6). May be repeated for credit.

692 Seminar in Biology (1:1:0). Topics vary. May be repeated for credit.

693 Directed Studies in Biology (1-8:0:0). Prerequisites: Permission of instructor, chair, and student's graduate committee. May not be used to fulfill explicit undergraduate prerequisites for graduate work. Study of topic not otherwise available in graduate program. May involve any combination of reading assignments, tutorials, lectures, papers, presentations, or lab or field study, determined in consultation with instructor.

695 Seminar in Molecular, Microbial, and Cellular Biology (1:1:0). Review and discussion of recent literature in a specialized area. Includes student presentations. May be repeated for credit.

745 Environmental Toxicology (3:3:0). Prerequisites: Courses in ecology and physiology, or permission of instructor. Study of nature, distribution, and interaction of toxic chemicals released into the environment. Emphasizes effects on nonhuman biota, detection and fate of chemicals, and implications for government regulation.

793 Research in Biology (1-3:0:0). Prerequisites: 8 graduate credits in BIOL and permission of instructor and chair. Library, lab, or field investigation under supervisor's guidance. May be repeated for a total of 3 credits.

798 Master's Research Project (1-3:0:0). Prerequisites: Permission of instructor and department chair. Students who take BIOL 793 may receive no more than a total of 6 credits for both BIOL 793 and 798. Experimental or theoretical research project chosen and completed under the guidance of a graduate faculty member. Comprehensive report acceptable to the student's advisory committee is required.

799 Thesis (1-6:0:0). Prerequisites: 8 graduate credits in BIOL and permission of instructor and department chair. Students who take BIOL 793 may receive no more than a total of 6 credits for both BIOL 793 and BIOL 799. Thesis research under direction of supervisor. Graded S/NC.

800 Studies for the Doctor of Philosophy in Education (variable credit). Prerequisite: Admission to the Ph.D. in Education program to study in biology. Program of studies designed by the student's discipline director and approved by student's doctoral committee, which brings the student to participate in research of discipline director and results in a paper reporting the original contributions of the student. Paper is presented in a subsequent Ph.D. summer seminar. Enrollment may be repeated.

See EVPP, Environmental Science and Public Policy, for additional related course work.

Biosciences (BIOS)

701 Biochemical Systematics (3:0:0). Prerequisites: General biochemistry. Introduces students to the biochemical systems now in use to investigate complex, multicomponent, dynamic functions of cellular systems. Readings include articles from the current literature in the molecular biosciences. The application of molecular techniques within biosciences is now universal, and the underlying questions of the course are what is the structure of a cell and how does it function.

702 Research Methods (3:0:0). Prerequisite: Admission to the Ph.D. program in biosciences. Trains students in research methodologies, techniques, and data analysis in life sciences. The course is divided into three modules, which introduce separate but equally significant components of any research project. The first focuses on parameters required to outlining and synthesizing a problem, the second covers techniques of measurement and analysis used by life scientists, and the third covers approaches used for data analysis and interpretations.

703 Laboratory Rotation (1:0:4). Prerequisite: Admission to the Ph.D. program in biosciences. Intensive introduction to a research laboratory in the biosciences. Students read background material pertinent to the problem under study, learn and practice research methods of the laboratory, and formulate a short final project, which may be a proposal or an actual project, demonstrating some mastery of the techniques and approaches employed.

704 Topics in Biosciences (1:1:0). Prerequisite: Admission to the Ph.D. program in biosciences. Required of all students during each semester prior to advancement to candidacy. Combines invited seminars from faculty (both internal and external) with graduate student seminars. Presentation at a seminar is a requirement for advancement to candidacy, generally given in the last semester before candidacy. Includes a discussion section lead by the course coordinator.

710 Planetary Sciences for Astrobiologists (3:3:0). Covers the processes and events that have played a central role in the origin and evolution of the solar system with special
emphasize on the terrestrial planets, the unique history of earth, and how it has evolved into a habitable world.

711 Biology for Astrobiologists (3:3:0). Introductory course to astrobiology designed to provide students in the concentration with a common understanding of the principles of biology and microbiology, an overview of microbial survival and physiological adaptations, and how these relate to the search for life on other planets.

713 Seminar in Astrobiology and Ethics (1:1:0). Required of all students in the astrobiology concentration in the Ph.D. in biosciences. Guides students to consider and evaluate the ethical questions involved in the search for life on other planets, what it means to life on Earth, and what it means to them personally.

715 Astrochemistry (3:3:0). Prerequisite: BIOS 710 and 711. Introduces students to the unique aspects of the chemistry of interstellar space, proto-stellar nebulae, and primitive solar system objects. Emphasizes on identifying the physical conditions in various objects, time scales for physical and chemical change, chemical processes leading to change, observational constraints and models that attempt to describe the chemical state, and history of astronomical objects in the early solar system.

719 Extremophiles (5:3:2). An in-depth study of microorganisms, their survival and adaptation mechanisms, physiology, and genetics in environments usually considered extreme. Environments to be studied include high-pressure, hypersaline waters, thermophilic and hyperthermophilic temperatures, extreme dry and psychrophilic conditions. Includes a laboratory in which the students isolate and identify extremophiles from selected environments.

721 Cellular Neuroscience (3:3:0). Prerequisite: Admission to the Ph.D. program in biosciences or permission of instructor. Detailed overview of the functioning and interactions of the cellular elements of the central nervous system. Topics include structure and function relationships, the chemical and physical and electrical basis of neural signaling, local versus long-distance signaling, functional consequences of variations in the typical action potential, and essentials of synaptic conduction.

723 Developmental Neurobiology (3:3:0). Prerequisite: Admission to the Ph.D. program in biosciences or permission of instructor. Detailed summary of the development of the mammalian central nervous system. Topics include genetic determinants of expression; growth processes and stages of growth of individual neurons; chemical and tactile trophic cues; controls over patterning of CNS growth, formation, and maintenance of connections; molecular controls for elaboration of cell processes; activity-dependent growth and connectivity; the role of regressive events such as cell death; hormonal influences on development; developmental plasticity, actions and mechanisms of CNS mutations; developmental anomalies underlying pathological states; and the aging brain. Students develop a thorough knowledge of current literature.

740 Laboratory Methods in Functional Genomics and Biotechnology (3:1:6). Prerequisite: Admission to the Ph.D. program in biosciences or permission of instructor. Current laboratory techniques in molecular biology and genomics, including nucleic acid isolation, gene cloning and sequencing, gel blot analysis, PCR, in vitro mutagenesis, theory and practice of DNA microarray analysis of gene expression. Topics may vary from year to year depending on advances in the field.

741 Genomics (3:3:0). Prerequisite: At least one undergraduate course in genetics and in molecular biology, or permission of instructor. Genetic structure and function at the whole genome level. Includes some sequence analysis, comparative genomics, classical genetics, and developmental genetics, as well as analysis of synteny groups, isochores, gene families, genetic complexity, the C-value paradox, directed discovery of gene functions, and animal models of human disease. Readings are taken both from recent texts and from the primary research literature. Students are expected to give one or two oral presentations of primary research papers, as well as completing midterm and final examinations.

742 Biotechnology (3:0:0). Prerequisite: Undergraduate course work in genetics and molecular biology. Theory and applications of biotechnology. Includes promoter design, gene fusions, protein targeting, techniques of protein purification, construction of transgenic organisms, cloning of animals and plants, ethical and legal issues. This is a relatively new area of study that is rapidly changing, and the course strives to keep students abreast of the current literature.

744 Molecular Genetics (3:3:0). Prerequisite: Undergraduate course work including BIOL 311, CHEM 313, 314, 315 and 318 (or equivalents), or permission of instructor. Students are expected to develop an understanding of the principles of modern molecular genetics and methods of investigation of genomes of pro- and eukaryotes, including an understanding of the types of genetic manipulations that are carried out in research laboratories today.

780 Bioethics Foundations I (3:3:0). This foundations course is designed for students without prior background in ethics and intends to ground students in fundamental ethical theory and reasoning using lecture and case study format. Involves an interplay between theory and cases, drawing on classical and emergent theories of ethics, religious and international perspectives, and contemporary application.

781 Bioethics Foundations II: Management and Policy (3:3:0). Prerequisite: BIOS 780. Overview of legislative, organizational, and legal frameworks within which bioethics takes place. The goal is to improve effectiveness within the legal and organizational setting and covers three modules: the health care system, the legislative process, and management. Includes theories of decision making, negotiation, leadership, and managerial skill building. Seminar format requiring a research project.

782 Interdisciplinary Issues in Bioethics: Law and Policy (3:3:0). Brings together diverse participants in the bioethics arena from biocommerce, law, policy, science, and medicine. In a format designed to provide discussion and speakers, debated are such legal issues as personhood, ownership of genomic information and privacy; policy concerns germane to genomics; business issues such as venture capital and biocommerce management. Lecture discussion with guest speakers.

783 Interdisciplinary Research Methods in Bioethics (3:3:0). Prerequisite: BIOS 780 and 781, or permission of instructor. Provides analysis of research methodology used in bioethics to advance students' research and analytical skills. Covers pertinent quantitative and qualitative meth-
288 Biosciences (BIOS) • Chemistry (CHEM)

ods, legal research methods, and policy analysis. Aims to teach students the logic used by bioethics participants and to discern between good and faulty research methods. Lecture and discussion. Research project required.

880 Capstone Seminar in Bioethics (3:3:0). Prerequisite: BIOS 780, 781 and 783 or permission of instructor. Student-led seminars in selected topic areas, providing students with an in-class laboratory for presenting bioethics issues. Students will research a topic, select and provide substantial readings for the class, present and discuss the topic using a variety of media and pedagogical tools. Serves to provide an experience in both teaching and debate. Students are peer-reviewed and graded on the basis of efforts, legal research methods, and policy analysis. Aims to teach students the logic used by bioethics participants and to discern between good and faulty research methods. Lecture and discussion. Research project required.

899 Directed Research in Biosciences (1-12:0:0). Prerequisite: Permission of research advisor. Studies of specialized topics in biosciences. Specific arrangements for designing the scope and area of study to be determined in consultation with the instructor. May involve literature searches and review, workshops, or tutorials.

998 Doctoral Dissertation Proposal (1-6:0:0). Prerequisite: Permission of research advisor. Research and writing of a research proposal for the doctoral dissertation. Graded S/NC.

999 Doctoral Dissertation Research (1-24:0:0). Prerequisite: Approved dissertation proposal. Research in the concentration pertinent to students' program of study. A maximum of 24 credits can be applied toward their degree. Graded S/NC.

Business Legal Studies (BULE)
School of Management

If a student takes noncore, upper-level business courses before acceptance to the School of Management, those courses will not count on an undergraduate degree application for any major in the school (except as general elective credit). A grade of C or higher must be presented on the graduation application for each upper-level course in the major. Course prerequisites are strictly enforced. Degree status is defined as formal admission to the School of Management.

302 Legal Environment of Business (3:3:0). Prerequisite: Completion of at least 48 credits. Exposure to general legal environment of business with particular emphasis on the government regulatory process, business ethics, and social responsibility. Regulatory topics include torts and crimes, product liability, intellectual property and cyberlaw, contracts, and issues related to employment, competition, and investor protection. Lecture, discussion, cases.

402 Commercial Law (3:3:0). Prerequisites: BULE 302; degree status. Survey of commercial law. Emphasis on topics of interest to accounting professionals including: contracts; commercial paper; secured transactions; debtor-creditor rights; agency; business organizations; federal securities regulation; and accountant's legal responsibilities. Lecture, discussion, cases.

Chemistry (CHEM)

Chemistry

CHEM 211, 212 is a prerequisite to all other undergraduate CHEM courses numbered 301 or above.

101 Introduction to Modern Chemistry (3:3:0). Fundamental principles of chemistry. Physical and chemical discoveries and properties of matter are presented along with their application and their impact on our way of life. Topics include atomic and molecular structure, nuclear chemistry, chemistry in the earth and atmosphere. No previous knowledge of chemistry is assumed or required. Course is not open to students majoring in chemistry. Credit will not be given for both this course and CHEM 103.

102 Introduction to Organic and Biological Chemistry (3:3:0). Prerequisite: CHEM 101 or 103 or 211. Structure and properties of the major classes of organic compounds with particular reference to organic molecules and their relationship to polymers, both manmade and biopolymers such as carbohydrates, lipids, proteins, and nucleic acids. Course is primarily intended for those who are interested in the application of the principles of organic chemistry and biochemistry to related areas of science such as genetics, microbiology, physiology, and nutrition. Not open to students majoring in chemistry. Course cannot be used in place of CHEM 313 or 314. Credit will not be given for both this course and CHEM 104.

103, 104 Chemical Science in a Modern Society (4:3:3). Terminal course in chemistry for nonscience and nursing majors. Principles and application of chemistry. Topics are those described for CHEM 101 and 102 but with a lab to enhance the scientific experience. Credit will not be given for both this course and for CHEM 211, 212. Not open to students majoring in chemistry.

201 Introductory Chemistry I (3:3:0). General chemistry course for students with interests in science, engineering, mathematics, or computer science who do not require a lab. Fundamental principles of atomic and molecular structure, chemical bonding, basic concepts of chemical reactions and thermochemistry, and properties of gases, liquids, and solids. Does not fulfill degree requirements for a laboratory science course. Credit will not be given for both this course and CHEM 211 or CHEM 103.

202 Introductory Chemistry II (3:3:0). Prerequisite: CHEM 201 or CHEM 211. Second-semester general chemistry course for students with interests in science, engineering, mathematics, or computer science who do not require a lab. Fundamentals of reaction rates and equilibrium. Topics include kinetics, properties of solutions, ionic equilibrium, chemical thermodynamics, electrochemistry, and nuclear chemistry. Does not fulfill degree requirements for a laboratory science course. Credit will not be given for both this course and CHEM 212 or CHEM 104.

211, 212 General Chemistry (4:3:3), (4:3:3). CHEM 211 is prerequisite to CHEM 212. Basic facts and principles of chemistry, including atomic and molecular structure, gas laws, kinetics, equilibrium, electrochemistry, nuclear chemistry, and the properties and uses of the more important
elements and their compounds. Students majoring in science, engineering, or mathematics should choose this course. Credit will not be given for both this course and CHEM 103, 104.

251 General Chemistry for Engineers (4:3:3). Fundamental principles of chemical structure and reactivity including atomic and molecular structure, chemical bonding, structures of ionic, covalent, and metallic lattices, oxidation-reduction, electrochemistry, chemistry of metals, and introduction to organic chemistry and polymers. Enrollment restricted to students intending to major in engineering. Students who need two semesters of chemistry should enroll in CHEM 211. Credit will not be given for both this course and CHEM 211.

300 Chemistry of Semiconductor Processing (3:3:0). Prerequisite: Completion of 30 credits or permission of instructor. Chemical aspects of the manufacture of semiconductor devices. Topics include oxidation of silicon, photoresists, plasma etching, removal of metal contaminants by acid etching, and analysis of semiconductor thin films. Cannot be used as a chemistry elective toward a B.A. or B.S. or minor in Chemistry and does not fulfill premedical requirements. Does not satisfy the chemistry course requirements for a B.S. in Biology.


321 Elementary Quantitative Analysis (4:2:6). Principles of chemical analysis with emphasis on ionic equilibria. Lab consists of gravimetric, volumetric, and instrumental methods illustrating the principal types of quantitative determinations.

322 General and Biochemical Equilibrium (2:2:0). Prerequisite: CS 103, 112, or 161. Study of general and biochemical equilibria in gas-phase, ionic, and heterogeneous systems. Topics include gas reactions, polyfunctional acids and bases, complex formation, solubility, and free energy relationships, and the use of computer algorithms to solve equilibrium problems.

331, 332 Physical Chemistry I, II (3:3:0). Prerequisite: MATH 113, 114. Prerequisite or corequisite: PHYS 341 or 160. CHEM 331 is prerequisite to 332. Yearlong survey covering topics including thermodynamics, equilibria, kinetics, solution properties, elementary quantum theory, electrochemistry, atomic and molecular structure, and nuclear chemistry.

333, 334 Physical Chemistry for the Life Sciences I, II (3:3:0). Prerequisites: CHEM 211, 212 and MATH 113. CHEM 333 is prerequisite to CHEM 334. Corequisite or prerequisite: MATH 114. Yearlong survey of the principles of physical chemistry with emphasis on their application in the biological sciences. Topics include the first and second laws of thermodynamics, free energy and chemical equilibria, kinetics, transport properties, molecular interactions, molecular structure, spectroscopy, statistical thermodynamics, and x-ray diffraction. Credit will not be given for both this course and CHEM 331, 332.


337 Physical Chemistry Lab II (2:1:3). Prerequisite or corequisite: CHEM 332. Continuation of CHEM 336. One-hour recitation.

341 Fundamental Inorganic Chemistry (3:3:0). Descriptive chemistry including chemical properties, reactions, and reaction mechanisms of inorganic elements and compounds. Topics include main group and transition elements, organometallic compounds, and bioinorganic chemistry.

350 Computer Techniques for Chemistry (3:3:0). Prerequisite: CHEM 314. Introduction to computer software, both commercial and online, with an emphasis on applicability to chemistry topics. Techniques include spreadsheet programming, graphing and statistics, molecular modeling, and chemical information search and retrieval.

422 Instrumental Analysis (3:3:0). Prerequisites: CHEM 314, 321, and 331. Introduction to the theories of analysis by instrumental methods. Basic electronics are applied to chemical measurements. Topics include an introduction to the theory of spectroscopy—ultraviolet, visible, infrared, and others—and electrochemical methods of analysis; the theory of Fourier transform techniques—FT-IR and FTMNR—and the theory of advanced pulse techniques.

423 Instrumental Analysis Laboratory (2:0:6). Prerequisite: CHEM 422. Laboratory-based introduction to the quantitative analysis of organic and inorganic substances by the use of modern analytical instrumentation. Laboratory highlights the practice of atomic and molecular spectroscopy, spectrophotometry, chromatography, voltammetry, and potentiometry in relation to chemical experimentation.

441 Properties and Bonding of Inorganic Compounds (3:3:0). Prerequisites: CHEM 314 and 332. Interpretation of physical and chemical properties of inorganic compounds in terms of currently used bonding concepts. Topics include molecular symmetry and applications of symmetry, structure and bonding in ionic solids, and the stereochemical, electronic, and magnetic properties of transition metal complexes and metal atom cluster compounds.

445 Inorganic Preparations and Techniques (2:0:6). Prerequisites: CHEM 321 and 441. Application of techniques of inorganic chemistry to preparation, purification, and spectroscopic characterization of selected substances.

446 Bioinorganic Chemistry (3:3:0). Prerequisite: CHEM 314. Application of inorganic coordination chemistry and physical methods in the study of structure and function of metal ion sites in biomolecules. Properties of transition metal ions, ligand field theory. Topics include iron cytochromes, zinc and copper enzymes, cobalamins, iron sulfur proteins, oxygen transport, iron storage, electron transfer, inorganic model compounds, metals in medicine, and toxicity of inorganic species.
500 Selected Topics in Modern Chemistry (3:3:0). Topics of interest in analytical, biological, environmental, geo-
logical, geochemical, inorganic, organic, and physical chemistry. May be repeated for credit with different topics.
Credit is not allowed toward a major in chemistry.

505 Hazardous Materials Waste Management (1-3:1-3:0). Prerequisite: CHEM 313 or permission of instructor.
Comprehensive review of those subjects most frequently encountered in hazardous chemicals management.

513 Synthetic and Mechanistic Organic Chemistry (3:3:0). Prerequisites: CHEM 313 and 314. General re-
view of synthetic pathways and application of this background to new topics emphasizing applications to fused ring aromatics, heterocycles, natural products, and biologically active compounds. Relationship of applied organic chemistry to consumer products, including drugs and agricultural chemicals, is also included. Organic core course.

521 Theory of Analytical Processes (3:3:0). Prerequisite: CHEM 422 or permission of instructor. Theory of sig-
nal and noise, mass transport phenomena, thermodynamics, and ions in analytical chemistry. Applications are made to Fourier transform techniques (FT-IR, FT-NMR), convolution and correlation spectroscopy, chemical sensors, chromatography, flow injection analysis, ion transport in membrane, and interpretation of analytical signals. Analytical core course.

529 Instrumental Techniques of Analysis (2:0:6). Prerequisites: CHEM 321 and 422 or 521 or permission of department. Principles and operation of modern instrumentation with emphasis on applications to the analysis of chemical, biological, and environmental samples. Methods include combined capillary column gas chromatography/mass spectrometry, high-performance liquid chromatography, opti-
cal methods, surface analysis methods, magnetic resonance spectroscopy, atomic emission and absorption spectrom-
etry, and electroanalytical methods. The student, with approval of his or her research committee, is free to choose the methods studied.

531 Elements of Physical Chemistry (3:3:0). Prerequisite: CHEM 211, 212 (general chemistry), CHEM 313, 314 (organic chemistry), PHYS 243, 245 (college physics), MATH 113 (calculus), or permission of instructor. Intensive overview of the concepts, techniques, and models of physical chemistry as they apply in many branches of chemistry and allied sciences. Topics include properties of gases, first and second laws of thermodynamics, phase and chemical equilibrium, chemical kinetics, atomic and molecular structure, and spectroscopy. Emphasis on developing practical skill in using the conceptual tools of physical chemistry. Extensive use of spreadsheet models to investigate chemical and physical systems.

554 Geochemistry of Environmental Hazards (3:2:3). Prerequisite: CHEM 314 or permission of instructor. Intro-
duction to the origins and reactions of hazardous substances in air, water, and soil environments. Covers movement of trace organic and inorganic substances in the geochemical cycle, with particular reference to transport processes that influence air and water quality.

579 Special Topics (1-6:1-6:0). Prerequisites: CHEM 313 and 314 or permission of instructor. Current topics in chem-
istry. Topic depends on the specialty of the instructor. May be repeated with different topics with approval of the department.

613 Modern Polymer Chemistry (3:3:0). Prerequisite: CHEM 513 or permission of instructor. Synthetic and ana-
alitical chemistry of synthetic macromolecules. Topics include polymer solutions, molecular weight determination, spectroscopy, thermal analysis, x-ray crystallography, crystallinity, types of polymerization, commercial polymers, and electroactive polymers.

614 Physical Organic Chemistry (3:3:0). Prerequisite: CHEM 314 or permission of instructor. Principles under-
lying molecular structure, reactivity, and reaction mecha-
nisms. Topics include valence-bond and molecular-orbital theory, the electronic interpretation of organic reactions, stereoochemistry, conformational analysis, the kinetics and thermodynamics of organic reactions, and photochemistry.
Organic core course.

617 Organic Structural Spectroscopy, (3:3:0). Prerequisite: CHEM 314 or equivalent. Spectroscopic determina-
tion of organic molecular structure using $^1H$, $^3H$, $^13C$, and $^31P$ nuclear magnetic resonance spectroscopy, infrared spec-
troscopy, mass spectroscopy, ultraviolet/visible spectroscopy, and Raman spectroscopy.

620/PHYS 533 Modern Instrumentation (3:2:2). Prerequisite: CHEM 422 or permission of instructor. Meth-
ods of sensing and measurement of radiation, particles, pressure, concentrations of specific elements and com-
pounds. Topics include basic operational amplifier circuits for analog signals, digitizing devices and computerized data collection, noise and noise-reduction methods, and specialized instrumentation systems for various areas of chemistry and physics.

624 Principles of Chemical Separation (3:3:0). Prerequisite: CHEM 422 or 521, or permission of instructor. Theo-
ries and models of separation with applications to the
analyses of a wide range of chemical, biological, and environmental samples. Topics include high-resolution gas chromatography and high-performance liquid chromatography. Emphasis is on the theory of reverse-phase, normal-phase, ion-exchange, size-exclusion, and affinity-based separations. Instrumentation such as detectors, pumps, and columns, and data acquisition and analysis are also presented. Analytical core course.

625 Electroanalytical Chemistry (3:3:0). Prerequisites: CHEM 321 and 331. Review of basic electrochemistry. Applications of modern electrochemical techniques such as chronamperometry, cyclic voltammetry, pulse polarography, stripping voltammetry, AC voltammetry, coulometry, electrochemical sensors, and instrumentation are presented with emphasis on their use in analysis and research.


646 Bioinorganic Chemistry (3:3:0). Prerequisite: CHEM 441 or permission of instructor. Application of inorganic coordination chemistry and physical methods in understanding the structure and function of metal ion sites in biomolecules. Biochemical roles of metal centers in oxygen transport, metalloenzymes, and electron transfer. Topics include iron cytochromes, zinc and copper enzymes, cobalamin, iron sulfur proteins, inorganic model compounds, and metals in medicine. Inorganic core course.

651 Environmental Chemistry of Organic Chemicals (3:3:0). Prerequisite: One semester of physical chemistry or permission of instructor. Study of the principles governing the multimedia distribution and fate of organic chemicals in the environment. Overview of the origin and occurrence of major classes of natural and anthropogenic organic chemicals in the environment. Environmental core course.

663, 664 Biochemistry (3:3:0), (3:3:0). Prerequisites: CHEM 313 and 314. CHEM 663 is prerequisite to CHEM 664. Important biological compounds, including proteins, carbohydrates, lipids, and nucleic acids, and their interrelations. Previous course in biology is recommended but not required. CHEM 663 is the biochemistry core course.

670 Teaching Practicum (1-2:0:0). Prerequisites: Enrollment in the graduate program and a demonstrated proficiency in the English language. Lecture and laboratory experience teaching chemistry in the laboratory. Student works closely with a faculty member and is responsible for all aspects of teaching undergraduate laboratory techniques.

690 Graduate Seminar (1:1:0). Prerequisite: Attendance at a minimum of 70 percent of departmental seminars in semester preceding each enrollment. Selected topics from recent chemical theory and applications, designed to inform students about current developments in the chemical sciences. Seminar presentation on the student's own research or another topic acceptable to the department is required in the student's last semester. Three credits of CHEM 690 are required for the M.S. degree; an additional 3 credits are required after admission to a Ph.D. program.

728/CSI 712 Introduction to Solid Surfaces (3:3:0). Prerequisite: CHEM 422 or equivalent. Introduction to the properties of solid surfaces. Topics include gas adsorption isotherms, surface area measurement techniques, real and clean surfaces, physiosorption and chemisorption, methods of gas adsorption and desorption, measurement of heats of adsorption, desorption kinetics, electron spectroscopies and their surface sensitivities, instrumentation needed, and principles of vacuum technology.

730/CSI 782/PHYS 711 Statistical Mechanics (3:3:0). Prerequisite: Permission of instructor. Statistical methods, systems of particles, thermodynamics, macroscopic parameters, the ideal gas, kinetic theory, quantum statistics, and transport processes.

732/CSI 713 Quantum Chemistry (3:3:0). Prerequisite: CHEM 332. Illustration of the fundamental concepts of quantum mechanics with applications to chemical systems, including atomic and molecular electronic structure and properties, molecular symmetry, and intermolecular forces. Physical core course.

733 Polymer Physical Chemistry (3:3:0). Prerequisite: CHEM 332 or permission of instructor. Physical chemistry of macromolecules including molecular weight, conformation, configuration, characteristics of the glassy state, methods for studying polymer morphology (XRD, SEM, TEM, optical microscopy), electronic structure and behavior, band theory, conduction mechanisms, intrinsically conductive polymers, polarization, dielectric behavior, triboelectric behavior, piezo/pyroelectric behavior, and nonlinear optical properties.

736/CSI 783/PHYS 736 Computational Quantum Mechanics (3:3:0). Prerequisite: PHYS 502, 510, or permission of instructor. Study of the fundamental concepts of quantum mechanics from a computational point of view, review of systems with spherically symmetric potentials, electron atom solutions to Schroedinger's equation, electron spin in many electron systems, atomic structure calculations, algebra of many electron calculations, Hartree-Fock, self-consistent field method, molecular structure calculations, scattering theory computations, and solid-state computations.

798 Research Project (3-6:0:0). Prerequisite: Permission of department. Experimental or theoretical research project chosen and completed under the guidance of a graduate faculty member. Comprehensive report acceptable to the student's advisory committee and a final oral examination on that report are required. Six credits of either CHEM 798 or 799 are required, but credit will not be given for both.

799 Master's Thesis (1-6:0:0). Prerequisite: Permission of department. Laboratory thesis research and writing under the direction of a supervisor. Minimum of 3 credit hours can be taken for this course the first two enrollment periods. Graded S/NC.

Chinese (CHIN)

Modern and Classical Languages

101 Elementary Chinese (3:3:1). Introduction to Mandarin, including basic grammar, oral expression, listening comprehension, reading, and writing. Language lab is an integral part of the course.

102 Elementary Chinese (3:3:1). Prerequisite: CHIN 101. Continuation of CHIN 101. Lab work required.
Chinese (CHIN) • Civil & Infrastructure Engineering (CEIE)

201 Intermediate Chinese I (3:3:1). Prerequisite: CHIN 102 or equivalent. Further development of skills acquired in CHIN 101 and 102, including grammar, oral expression, listening comprehension, reading, and writing. Three classroom hours and one laboratory hour per week. CHIN 201 and 202 must be taken in sequence. Lab work required.

202 Intermediate Chinese II (3:3:1). Prerequisite: CHIN 201 or equivalent. Continuation of CHIN 201. Lab work required.

300 Reading Skills Development (3:3:0). Prerequisite: CHIN 202, appropriate placement score, or permission of instructor. Development of reading proficiency, with emphasis on vocabulary and grammar of standard written Chinese. Introduction to discourse structure, sociolinguistic/cultural knowledge, and strategies for reading Chinese at an advanced level.

301 Advanced Grammar and Syntax (3:3:0). Prerequisite: CHIN 300, appropriate placement score, or permission of instructor. In-depth review of Chinese grammar and syntax. Provides extensive practice in controlled and free writing with emphasis on the fundamental difficulties and points of interference that exist between English and Chinese.

310 Survey of Chinese Literature (3:3:0). Prerequisites: ENGL 101 or permission of instructor. Introduction of the outlines of Chinese literature from the beginning to the 19th century, presented through literary sources arranged in roughly chronological order. Readings include poetry, fiction, and personal essays as well as documents of philosophy, history, religion, and transcribed oral records. Knowledge of Chinese language helpful but not required. May be repeated for credit once when course content is different with permission of department.

311 Modern Chinese Literature in Translation (3:3:0). Prerequisite: ENGL 101 or permission of instructor. Introduction of the outlines of modern Chinese literature from the early 20th century to the post-Mao era, presented through literary sources arranged in roughly chronological order. Readings include poetry, fiction, as well as personal essays. Knowledge of Chinese language helpful but not required. May be repeated for credit once when course content is different with approval of the department.

Civil and Infrastructure Engineering (CEIE)

Civil, Environmental, and Infrastructure Engineering (CEIE; formerly USE)

100 Environmental Engineering around the World (3:3:0). Introduction to environmental engineering as practiced in different societies around the world. Environmental engineering is broadly defined as the organizational and physical infrastructure employed to manage natural resources. A society's awareness, valuation, and management of the environment vary widely throughout the world; and are related directly to the economic, cultural, political, historical, physical, and educational conditions in a region. The focus will be on how different societies respond to environmental challenges, specifically as they relate to environmental opportunities. Examples of issues discussed are construction of large dams to manage river systems; use of forecast climate/weather data to improve agriculture, emergency response, or water supply; collection and treatment of wastewater; public health and pollution control; disposal of waste nuclear materials; and management of significantly polluted sites.

197, 297, 397 Industrial Internship I-A, II-A, III-A (0:0:0). Prerequisite: Civil and infrastructure engineering majors only. Preparation for summer work experience in civil and infrastructure engineering positions with land development, architecture/engineering, and construction firms or government.

198, 298, 398 Industrial Internship I-B, II-B, III-B (0:0:0). Prerequisites: CEIE 197, 297, 397. Civil and infrastructure engineering majors only. Supervised 10-week summer work experience in civil and infrastructure engineering positions with land development, architecture/engineering, and construction firms or government. Written report and presentation are required.

230 Hydraulics (3:3:0). Prerequisite: PHYS 160. Principles of fluids in equilibrium and in motion. Topics include hydrostatic pressure; continuity, Bernoulli, and momentum equations; viscosity flow problems; measuring instruments; and applications to closed conduits and open channels.

290 Engineering Computation and Design (3:2:3). Prerequisite: ENGR 183. Introduction to the civil engineering design process. Methods and technologies for spatial data acquisition and specification are introduced, with special emphasis on land measurements, mapping, and surveying. Processing of field data for incorporation into computer aided design systems; conversion of raw data into finished design documents, including schematic layouts, digital terrain models, preliminary plans, topographic maps, detailed design plans, cut sheets, cross-sections, profiles, etc.; 2D and 3D computer aided design techniques; and application of digital computer are also covered. Design projects are included.

301 Engineering and Economic Models in Civil Engineering (3:3:0). Prerequisites: STAT 344 and basic spreadsheet knowledge or permission of the instructor. Study of planning, analysis, control, and engineering economic models applied to the life cycle of physical infrastructure. Introduces the infrastructure design process and the application of quantitative and probabilistic models. Presents applications of model building for engineering economics; decision making; forecasting; resource scheduling and allocation; estimating; work measurement and materials; and quality and process control in water, transportation, environmental, energy, and telecommunications infrastructure systems and the built environment.

305 Soil Mechanics (3:3:0). Formulation and engineering characteristics of soils. Strength and deformation characteristics of soils, consolidation and bearing capacities, and corrective measures are also covered. Foundation design fundamentals are introduced.

311 Structural Analysis (3:3:0). Prerequisite: ENGR 310. Basic concepts and assumptions of structural analysis. Static and geometric redundancy and the related degrees of redundancy. Analysis by integration of the deformations of

340 Water Resource Engineering (3:2:3). Prerequisite: CEIE 230. Introduction to the principles and practice of water resources engineering. Analytic methods and computer models for the design and evaluation of water resources projects such as flood control and river basin development. Topics include: hydrology, governing principles, common models, and typical applications for water resource systems; and design of storm water management systems, and sanitary sewers. Laboratory and field work are required on selected topics.

360 Introduction to Transportation Engineering (3:2:3). Prerequisites: PHYS 160, CEIE 290. Introduction to transportation systems and the factors that influence their planning, design, and operation. Topics include fundamentals of urban travel, travel demand forecasting, and traffic flow; principles of highway design; highway capacity and level of services; introduction to traffic control; traffic signal control systems; intersection design; speed zoning and control; and an introduction to Intelligent Transportation Systems and travel demand management. Laboratory and field work are required on selected topics. Fulfills the writing-intensive requirement for the civil and infrastructure engineering major.

367 Behavior of Concrete and Steel Structures (3:3:0). Prerequisite: CEIE 311. Structural design process. Analysis and design of simple steel structural members, including tension members, beams, and columns. Analysis and design of bolted and welded connections in steel structures. Concrete and its structural characteristics. Analysis and design of simple reinforced concrete members, including beams and columns. Use of computer programs for the analysis, design, and optimization of complex structural systems.

400 Civil Engineering Planning and Management (3:3:0). Prerequisites: ENGL 302, CEIE 301 and 360 or 365; corequisites: CEIE 440 and 455. Quantitative and qualitative analysis in planning, design, construction, and management of engineering systems and facilities. Introduces the policies, programs, and regulations that influence land development, history-enabling legislation, governing and regulating bodies, control of the site plan development, and approval process. Examines the structure, function, and purpose of urban systems and ways in which urban systems design can be achieved. Other topics include impact assessment and cost benefit/effectiveness analysis, contemporary theories of urban design; physical relationships between development, land use, transportation, energy, communications, and water; politics of systems management and development; and evolution and development of housing, transportation, and taxing policies. Students study the public-private sector urban development industry, including terminology, analytical techniques, evaluation techniques, and information sources at each phase. Overview of U.S. competitiveness in domestic and international urban systems markets is given. Policy- and decision-making process in urban infrastructure, issues and challenges associated with innovation and competition on the basis of new technology, and environmental issues in land use are discussed. Design projects are required.

410 Geographic Information Systems in Engineering (3:2:3). Credit is not given for both CEIE 410 and 510. Introduction to geographic information systems (GIS) and their application in environmental, transportation, land use planning, and other engineering-related decision situations. Introduction to methods and technologies for spatial data acquisition, specification, storage, manipulation, query, thematic analysis, presentation, and application in the design process. Introduction to relationships/integration of GIS with computer aided design (CAD) and the global positioning system (GPS). Hands-on projects.

411 Introduction to Design and Inventive Engineering (3:3:0). Basic outline of the design and inventive engineering. Design process and its major stages. Conceptual versus detailed design. Design theories, including the axiomatic design theory and the inferential design theory. Proactive design: its basic assumptions and industrial applications. Evaluation in design, including the multi-attribute utility models. Network computing in design. Inventive problem solving methods, including brainstorming, Synectics, TRIZ, and morphological analysis. Computer tools to support design creativity. Collaborative design: fundamentals and group projects dealing with the actual civil engineering problems provided by industry.

440 Water Supply and Distribution (3:2:3). Prerequisite: CEIE 230. Introduction to the analysis and design of public water supplies. Topics include supply evaluation, water quality and quantity requirements, treatment requirements and methods; hydraulic analysis of water distribution systems including line sizing, fire protection, pumps, valves, and storage; environmental impact assessments; and federal, state, and local government laws and regulations related to public water systems. Laboratory and field work are required on selected topics.

450 Environmental Engineering Systems (3:3:0). Prerequisite: CEIE 455. Credit is not given for both CEIE 450 and 550. Introduction to systems analysis in environmental engineering. Applications of linear and dynamic programming, computer modeling, and other systems analysis methodologies to the solution of environmental engineering problems related to air, soil, and water pollution are presented. Experimental design approaches for the characterization of environmental sites are reviewed.

452 Wastewater Management (3:3:0). Prerequisite: CEIE 455. Credit is not given for both CEIE 452 and 552. Exploration of the design fundamentals for the treatment of wastewater. Topics include environmental regulations pertaining to wastewater, wastewater characterization, pretreatment systems; biological, physical, and chemical treatment of wastewater; treatment and disposal of wastewater sludge; financing; and management. Tangible and intangible consequences of environmental policies; environmental impact assessments; and federal, state, and local government laws and regulations related to wastewater collection, treatment, and disposal are also covered. Even years

455 Introduction to Environmental Engineering (3:3:0). Prerequisite: Three credits of chemistry. Credit is not given for both CEIE 455 and 555. Introduction to the principles
of environmental engineering management and design pertaining to water supply and treatment, wastewater treatment, solid waste management, air pollution control, noise pollution measurement and control, and environmental impact assessment.

456 Environmental Law (3:3:0). Credit is not given for both CEIE 456 and 556. Introductory course in the study of environmental laws as they pertain to urban systems infrastructure management. Reviews the National Environmental Policy Act (NEPA), Clean Air Act (CAA), Clean Water Act (CWA), Safe Drinking Water Act (SDWA), Resource Conservation and Recovery Act (RCRA), Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), and other environmentally related legislation. Also reviews laws for allocation of surface and groundwater supplies and reviews environmental law databases.

460 Public Transportation Systems (3:3:0). Prerequisite: CEIE 360 or 365. Credit is not given for both CEIE 460 and 560. Analysis of public transportation systems in terms of their role in urban transportation. Topics covered include the history of public transportation in the United States, quantitative performance attributes of different modes, analytical techniques for planning and operation, and management and administrative concepts.

461 Traffic Engineering (3:3:0) Prerequisite: CEIE 360 or 365. Credit is not given for both CEIE 461 and 561. Elements of traffic engineering analysis; system components of traffic operations: the driver, vehicle, and roadway; traffic flow design elements including volume, density, and speed; intersection design elements including traffic control device warrants, signal timing, delay, capacity, and accident countermeasures; and terminal design elements including inflow, outflow, and circulation.

462 Urban Transportation Planning (3:3:0) Prerequisite: CEIE 360 or 365. Credit is not given for both CEIE 462 and 562. Technical and qualitative aspects of the urban transportation planning process. Topics include urban travel characteristics and data collection methods; the urban transportation modeling system, including land use, trip generation, trip distribution, mode choice, and trip assignment models; site traffic impact studies; environmental impacts; project and plan evaluation; and technology options for urban transport.

463 Construction Systems (3:3:0). Prerequisite: CEIE 301. Overview of the urban construction industry, including its organizations and interactions. Topics include project and construction management for operations, tactical, and strategic planning and decision making; cost estimation and scheduling, accounting, estimating, resource planning, and structuring of urban systems construction projects; legal theories and relationships between parties in the construction process, including the role of the design professional and manager. Value engineering is introduced.

490 Senior Design Project (3:3:0). Prerequisite: CEIE 400. Capstone design experience. Integrates all design fundamentals employed by a typical civil engineering design team. Major team efforts include land use, transportation, water and sewerage, stormwater, site analyses, economic considerations, regulatory considerations, sectioning, grading, and siting. Students focus on teamwork, interdisciplinary interaction, and tradeoff decision making. A design team analyzes all aspects of a major urban project, develops solutions to design problems, and produces a project report and oral presentation. The design effort proposed is completed and a report is prepared, presented, and evaluated. Primary goal of the course is to produce a design for a contemporary civil infrastructure project.

498 Independent Study in Civil Engineering (1-3:0). Prerequisite: 60 credits; must be arranged with an instructor and approved by department chair before registering. Directed self-study of special topics of current interest in CEIE. May be repeated for a maximum of six credits if the topics are substantially different.

499 Special Topics in Civil Engineering (3:3:0). Prerequisites: 60 credits and permission of instructor; specific prerequisites vary with nature of topic. Topics of special interest to undergraduates. May be repeated for a maximum of six credits if the topics are substantially different.

500 Land Development Engineering (3:3:0). Prerequisite: graduate standing in CEIE. Credit is not given for both CEIE 400 and 500. Quantitative and qualitative analysis in planning, design, construction, and management of engineering systems and facilities. Introduces the policies, programs, and regulations that influence land development, history-enabling legislation, governing and regulating bodies, control of the site plan development, and approval process. Examines the structure, function, and purpose of infrastructure systems and ways in which infrastructure systems design can be achieved.

510 Geographic Information Systems in Engineering (3:2:3). Credit is not given for both CEIE 410 and 510. Introduction to geographic information systems (GIS) and their application in environmental, transportation, land use planning, and other engineering-related decision situations. Introduction to methods and technologies for spatial data acquisition, specification, storage, manipulation, query, thematic analysis, presentation, and application in the design process. Introduction to relationships/integration of GIS with computer aided design (CAD) and the global positioning system (GPS). Hands-on projects.


516 Engineering Law and Ethics (3:3:0). Prerequisite: CEIE 400. Overview of the body of law surrounding design, construction, and facilities maintenance and operations. Tort law and its relationship to design and construction contracting are introduced. Contract form, general and special conditions, ethics, contract administration, claims, dispute resolution, arbitration, and the appeals process are studied through case studies.

530 Water Resource Systems Analysis (3:3:0). Prerequisite: CEIE 601 or equivalent. Introduction to the concepts, applications, and tools of systems analysis for the problems of water resources planning, management, and design. Problems including river basin planning, real-time hydrosystem operations, water quality management, capacity expansion, urban drainage network design, and san-
550 Environmental Engineering Systems (3:3:0). Prerequisite: CEIE 455. Credit is not given for both CEIE 450 and 550. Introduction to systems analysis in environmental engineering. Applications of linear and dynamic programming, computer modeling, and other systems methodologies to the solution of environmental engineering problems related to air, soil, and water pollution are presented. Reviews experimental design approaches for the characterization of environmental systems. s, odd years

552 Wastewater Engineering (3:3:0). Prerequisite: CEIE 455 or 555. Credit is not given for both CEIE 452 and 552. Exploration of the design fundamentals for the treatment of wastewater. Topics include environmental regulations pertaining to wastewater, wastewater characterization, pretreatment systems; biological, physical, and chemical treatment of wastewater; treatment and disposal of wastewater sludge; financing; and management. Tangible and intangible consequences of environmental policies; environmental impact assessments; and federal, state, and local government laws and regulations related to wastewater collection, treatment, and disposal are also included. s, even years

555 Introduction to Environmental Engineering (3:3:0). Credit is not given for both CEIE 453 and 555. Introduction to the principles of environmental engineering management and design pertaining to water supply and treatment, wastewater treatment, solid waste management, air pollution control, noise pollution measurement and control, and environmental impact assessment. f

556 Environmental Law (3:3:0). Formerly USE 650. Credit is not given for both CEIE 456 and 556. Introductory course in the study of environmental laws as they pertain to urban systems infrastructure management. Reviews the National Environmental Policy Act (NEPA), Clean Air Act (CAA), Clean Water Act (CWA), Safe Drinking Water Act (SDWA), Resource Conservation and Recovery Act (RCRA), Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), and other environmentally related legislation. Also reviews laws for allocation of surface and groundwater supplies and reviews environmental law databases. s

560 Public Transportation Systems (3:3:0). Prerequisite: CEIE 360 or 365. Credit is not given for both CEIE 460 and 560. Analysis of public transportation systems in terms of their role in urban transportation. Topics covered include the history of public transportation in the United States, quantitative performance attributes of different modes, analytical techniques for planning and operation, and management and administrative concepts.

561 Traffic Engineering (3:3:0). Prerequisite: CEIE 360 or 365 or equivalent. Credit is not given for both CEIE 461 and 561. Covers elements of traffic engineering analysis; system components of traffic operations: the driver, vehicle, and roadway; traffic flow design elements including volume, density, and speed; intersection design elements including traffic control devices, traffic signals, time delay, capacity, and accident countermeasures; and terminal design elements including inflow, outflow, and circulation.

562 Urban Transportation Planning (3:3:0). Prerequisite: CEIE 360 or 365 or equivalent. Credit is not given for both CEIE 462 and 562. Covers technical and qualitative aspects of the urban transportation planning process. Topics include urban travel characteristics and data collection methods; the urban transportation modeling system, including land use, trip generation, trip distribution, mode choice, and trip assignment models; site traffic impact studies; environmental impacts; project and plan evaluation; and technology options for urban transport. s

600 Civil Engineering Infrastructure Planning and Management (3:3:0). Study of planning and management practices applicable to the life cycle of the physical urban infrastructure (e.g., roads, sewers, water distribution and other pipelines, telecommunications, and energy distribution systems). Includes the study of the relationship of urban growth and infrastructure reinvestment; mechanisms of deterioration; direct and indirect methods of assessment and degradation models; capital finance, budgeting, and programming; planning integration and coordination; quantitative applications in planning; uncertainty and reliability; public-private partnerships; operation and maintenance strategies; and future issues. f

601 Infrastructure Modeling (3:3:0). Prerequisite: CEIE 605. Concepts of modeling for infrastructure engineering. Covers modeling, simulation, optimization, deterministic and stochastic models, and limitations of modeling approaches. Also included are multiple objective, multiple decision maker problems, and case studies in areas such as transportation, water resources, the environment, energy, telecommunications, and construction. s

605 Infrastructure Systems Analysis (3:3:0). Prerequisite: STAT 344. Probability and statistics topics for analysis of infrastructure systems; Bayesian decision theory, decision trees; Monte Carlo analysis and stochastic models. Economic analysis of infrastructure projects and systems, including life-cycle costing concepts, utility theory, and multiattribute utility analysis. f

610 Construction Systems and Management (3:3:0). Prerequisite: Permission of Instructor. Study of applications of construction management concepts and techniques to the production of durable constructed systems. The construction industry and the environment are explored through study of the project cycle design and construction phases with emphasis on estimating, planning, scheduling, and controlling labor, money, materials, machines, time, and information. Popular scheduling software is used with class projects and a case study. s, even years

632 Groundwater Systems Modeling (3:3:0). Prerequisite: CEIE 601. Introduction to groundwater hydrology and modeling, including quantity and quality aspects. Topics include characterization of the subsurface regime; well hydraulics; consideration of two-dimensional steady and unsteady state flows; exploration of the range of modeling approaches; simulation and optimization modeling; contaminant transport; parameter estimation; and design of systems to control groundwater quantity and quality. f, even years

660 Urban Transportation Planning (3:3:0). Prerequisite: CEIE 601. Quantitative and qualitative techniques in urban transportation planning. Topics include different levels of urban transportation planning; the technical transportation planning process, including travel demand estimation, establishment of transportation strategies, and utility analysis; and activity center planning including onsite ve-
hicle and pedestrian circulation, transportation interface, environmental planning, and planning administration.

670 Civil Engineering Decision Methods and Tools (3:3:0). Prerequisite: CEIE 605. Principles of decision making and of knowledge acquisition in the context of building knowledge-based decision support tools for civil, environmental, and infrastructure engineering. Includes solving complex problems from several areas of urban systems engineering, including construction, environmental, and transportation engineering; and using various decision support tools, based on the Bayesian decision theory and on the principles of artificial intelligence, including knowledge-based systems and learning systems.

685 Civil Engineering Information Management (3:3:0). Advanced course in information resources management as applied to civil, environmental, and infrastructure engineering problems and microcomputer data management. Covers all phases of the information management life cycle from the conceptual design and data collection phases, through systems development, archiving and disposal. Software engineering (structured analysis, rapid prototyping, object-oriented analysis, etc.) as applied to urban systems infrastructure problem solving is covered. Reviews civil engineering applications of database technology, spreadsheets, communications software, customized applications software, groupware, and graphics software (including computer aided design and geographic information systems). Covers the selection and use of appropriate software to match specific engineering problems related to the design, construction, and management of civil engineering infrastructure (transportation, water resources, environment, facilities, etc.). Includes the design and development of a system for an engineering application.

690 Topics in Civil Engineering (3:3:0). Prerequisite: Determined by topic. Topics not covered in the regular civil engineering offerings. Course content may vary each semester. Course may be repeated with a change in topic.

795 Civil and Infrastructure Engineering Seminar (0:1:0). Prerequisite: Graduate standing. Presentations on current topics and research in civil, environmental, and infrastructure engineering, by invited speakers, faculty, and CEIE graduate students. Partial fulfillment of the M.S. in Civil and Infrastructure Engineering seminar requirement, and required for master's candidates during the semester in which they complete their research project or thesis.

796 Directed Reading (1-3:0:0). Prerequisites: Graduate standing and permission of instructor. Reading on a specific topic in civil, environmental, and infrastructure engineering under the direction of a faculty member. May be repeated with a change in topic.

798 Research Project in Civil Engineering (3:0:0). Prerequisite: Permission of instructor; coprerequisite: CEIE 795. Analysis and investigation of a contemporary problem in civil, environmental, and infrastructure engineering. Prior approval by a faculty member who supervises the student work is required. Written report is also required.

799 Master's Thesis (1-6:0:0). Prerequisites: 18 credits of graduate-level course work and permission of instructor. Research project chosen and completed under the guidance of a graduate faculty member, which results in a technical report acceptable to a three-faculty-member committee, and an oral defense.

Classical Studies (CLAS)

Modern and Classical Languages

150 Introduction to Classical Greek (3:3:0). Prerequisite: ENGL 101 or equivalent, or permission of instructor. Studies the formation of English vocabulary derived from Greek and Latin prefixes, stems, and suffixes to increase students' word power in English (vocabulary, style). Special emphasis on bioscientific, medical, and legal terminology. Intended for both native and non-native speakers of English. Word analyses and vocabulary uses will be illustrated by literary texts.

240 Greek and Latin Elements in English (3:3:0). Prerequisite: ENGL 101 or equivalent, or permission of instructor. Studies the formation of English vocabulary derived from Greek and Latin prefixes, stems, and suffixes to increase students' word power in English (vocabulary, style). Special emphasis on bioscientific, medical, and legal terminology. Intended for both native and non-native speakers of English. Word analyses and vocabulary uses will be illustrated by literary texts.

250 Classical Mythology (3:3:0). Prerequisite: ENGL 101 or equivalent, or permission of instructor. Classical myths with illustration of their role in classical and modern literature and art. Course work in English.

260 The Legacy of Greece and Rome (3:3:0). Prerequisite: ENGL 101 or equivalent, or permission of instructor. Introduction to the history, culture, and literature of Greece and Rome through close readings of a number of central passages from classical literature dealing with some of the most important aspects of human existence (e.g., the individual and society, divine justice, war and peace). Illustrates the importance of classical antiquity for the Western tradition. Course work in English.

340 Greek and Roman Epic (3:3:0). Prerequisite: ENGL 101 or equivalent, or permission of instructor. Examines the development of classical epic as a genre from its beginnings with Homer to its transformations in the works of later Greek and Roman authors (e.g., Apollonius of Rhodes and Virgil). Course work in English.

350 Greek and Roman Tragedy (3:3:0). Prerequisite: ENGL 101 or equivalent, or permission of instructor. Follows the development of tragedy from its origins to the works of Aeschylus, Sophocles, and Euripides, and its reappearance in the Roman world in the tragedies of Seneca. Considers the influence of Greek tragedy on later cultures. Course work in English.

360 Greek and Roman Comedy (3:3:0). Prerequisite: ENGL 101 or equivalent, or permission of instructor. Studies the forms, contexts, and developments of comedy as a dramatic form in the Greco-Roman world. Traces the development of New Comedy in the Hellenistic age and the translation and adaptation of New Comedy by the Roman dramatists Plautus and Terence. Course work in English.

370 Greek and Roman Historians (3:3:0). Prerequisite: ENGL 101 or equivalent, or permission of instructor. Examines the writings of the major Greek and Roman historians, including Herodotus, Thucydides, Sallust, Livy, and Tacitus; their interpretations of the past; and their influence. Course work in English.

380 Greek and Roman Novels (3:3:0). Prerequisite: ENGL 101 or equivalent, or permission of instructor. Examines the different kinds of novels written in antiquity and their
influences on postclassical and modern literature. Special emphasis is given to the works of Longus, Heliodorus, Petronius, and Apuleius. Course work in English.

390 Topics in Classical Literature and Culture (3:3:0). Prerequisite: ENGL 101 or equivalent, or permission of instructor. Certain topics may have other CLAS courses as prerequisites. Studies the forms, contexts, and developments of a distinctive literary genre or cultural phenomenon in the Greco-Roman world. Course work in English. May be repeated once for credit.

499 Senior Seminar in Classical Studies (3:3:0). Prerequisites: Modern and classical languages majors concentrating in classical studies with 90 credits and permission of instructor. Individual research on a specialized topic culminating in a seminar paper. Fulfills the writing-intensive requirement. Subject of seminar determined by instructor in consultation with student. Permission must be obtained in advance. A student may present no more than 3 credits for graduation.

College of Arts and Sciences (CAS)

101 Presenting and Processing Information Using Technology (1-3:0-3:0-3). Prerequisite: Varies with topic. Special topics course that presents practical experience in computer applications. Topics vary; most topics require laboratory work. May be repeated for credit when course content is different.

390 Peer Tutoring in Writing across the Disciplines (1:0:0). Prerequisites: A grade of A in ENGL 302, 60 credits, overall GPA of 3.000 or higher with a GPA of 3.500 or higher in the student's major. Experiential learning course in the teaching of writing across the disciplines. Students receive Writing Center training in theory and techniques of tutoring writing and work a minimum of three hours per week in the Writing Center. Focus is on practical application of writing theory and pedagogy from course readings, development of tutoring skills, and self-reflection through journals and a final paper. May be repeated up to three times. Student must submit two faculty recommendations and a sample of recent academic writing and complete an interview with the director of the Writing Center.

395 Technology Apprenticeship (3:1:0). Prerequisites: 30 credits; GPA of 2.500 or higher; ability to use an Internet browser; and keyboarding, data entry, and word-processing skills. Experiential learning course in using technology in instruction. Students receive up to 45 hours of instruction and work 90 hours with faculty members, assisting them with a technology project (e.g., developing a course web site, designing templates for technology-related assignments, or serving as technology assistants in the classroom). Students submit a faculty recommendation and an application to the technology apprenticeship coordinator. May be repeated once for credit.

480 Internship in Information Technology (1-3:0:0). Prerequisites: Permission of the information technology minor advisor. Students, under the supervision of the information technology minor advisor, work with a site supervisor in a setting that provides substantial experience in information technology work. For 3 credits, students work 120 hours on site and produce two pieces of written work (approximately 2,500 words) as specified in the contract. Does not count toward course work in the information technology minor. May be repeated for up to 6 credits with permission of the information technology minor advisor.

490 Faculty-Student Research Apprenticeship (3:0:0). Prerequisites: 60 credits and permission of instructor. Open only to recipients of the provost's Faculty-Student Apprenticeship Award. Introduces students to scholarship in action in their major field of study. Complements and enriches required course material and provides undergraduates with the unique opportunity to work collaboratively with faculty on research projects.

College Teaching (CTCH)

College of Arts and Sciences

601 The Community College (3:3:0). Studies the institutional character of the community college including a review of its history, purpose, clientele, organization, finance, and social function. Attention is given to issues currently faced by community colleges.

602 College Teaching (3:3:0). Familiarizes students with issues that affect teaching and learning and provides basic tools to use in the college classroom. Students learn how to plan a course and develop a syllabus, how to promote learning among a diversity of students, and how to implement a variety of classroom assessment techniques.

603 Teaching with Technology (3:3:0). Prerequisites: Basic familiarity with computer operations, Basic skills in word processing, spreadsheets, and electronic presentation software applications. Basic Internet and electronic database research skills. Provides students with an overview of and hands-on experience with technology tools available to enhance classroom and online learning. Examines issues related to the use of technology in teaching and learning and guides students in the development of effective technology-enhanced learning activities for undergraduate students.

604 The Scholarship of Teaching and Learning (3:3:0). Provides students with an overview of the movement in higher education in the scholarship of teaching and learning. Focus on ways that students learn, how learning can be improved, and different methods of conducting research into teaching and learning.

605 Curriculum and Program Design and Assessment (3:3:0). Prerequisites: CTCH 601 or 602, and 603. Prepares students to design, implement, and assess new courses, curricula, and programs. The relationships of courses and curricula to larger programs and institutional goals are examined. Explores issues of program planning and implementation, such as documenting need, generating cost estimates, and assembling a strong case for new programs.

College Teaching (CTCH) • Communication (COMM)

607 Communication Skills for Teaching (3:3:0). Prerequisite: Admission to certificate or doctoral program. Studies principles and practices underlying effective lecturing and leading of instructional discussions. Application of the student's field of study is encouraged as a way of establishing the teaching environment.

885 Internship in Community College Teaching (3:01:0). Prerequisites: Admission to the certificate or doctoral program; approval of advisor and internship coordinator; CTCH 601 or 602; 6 additional credits of core requirements and 3 in the knowledge area. Students must contact the program at least one semester prior to enrolling. Supervised internship at a community college or a nonteaching higher education setting such as a government agency or administrative office in higher education. Purpose is to develop skills applicable to college-based teaching or higher education administration or policy. A minimum of 200 hours of work and participation in an internship seminar.

892 Special Topics in Community College Education (3:3:0). Prerequisite: Admission to the doctoral program of permission of instructor. Covers a variety of current issues in teaching and learning in higher education. May be repeated for credit when topic is different.

897 Directed Readings in Community College Education (1-6:0:0). Prerequisite: Admission to the doctoral program and permission of program. Independent reading on a topic agreed on by the student and instructor.

998 Doctoral Dissertation Proposal (1-3:0:0). Prerequisite: Completion of at least one internship and all other course work and qualifying exams. Contact program for permission to register. Work on a research proposal that forms the basis for the doctoral dissertation. Graded S/NC.

999 Doctoral Dissertation (1-12:0:0). Prerequisite: CTCH 998, two internships, and an appointed dissertation committee. Doctoral dissertation research and writing under the direction of a dissertation committee.

College of Visual and Performing Arts (CVPA)

College of Visual and Performing Arts

101 Arts Pass (2:2:0). Introduction to appreciation of the arts through lecture-demonstration in visual art, music, dance, and theater. Emphasis on aesthetic principles in modern society. Students attend performances and exhibits and develop analytical skills through written journal and discussion. May be repeated for a total of four credits.

102 Experiencing the Arts (3:1:2). Course reserved for high school students who are enrolled in the Institute of the Arts Summer Academy. Introduction to collaborative and interdisciplinary arts experiences in visual art, music, dance, theater, film, and media through daily intensive immersion in the arts for two and one half weeks. Not repeatable. Satisfactory/no credit.

305 Seminar in Arts Management (3:3:0). Prerequisite: Junior standing, admission to the arts administration minor, or permission of instructor. Seminar course that involves the planning, programming, presentation, funding, and communications involved in managing the visual and performing arts. Course includes guest speakers, case analyses, and semester-long individual and group projects.

308 Cross-Cultural Arts Appreciation (3:3:0). Gives students a cumulative arts experience by tying the subject matter of the course to one of the major cultural productions of the Center for the Arts. Subject matter varies with each offering. May be repeated for a maximum of 12 credits when taken under different topics.

399 Special Topics in the Arts (3-6:3-6:0). In-depth presentation and exploration of topical studies on the arts. Subject matter varies. May be repeated for a maximum of 6 credits when taken under different topics.

489 Field Experience in the Arts (3-6:0:0). Prerequisite: Junior standing and completion of six credits in CVPA courses in the area of residency, CVPA 305, or permission of instructor. An apprenticeship, internship, or project with an organization in the arts or with an individual in the arts, providing an introductory working and learning experience in the field. Must be prearranged with the division director prior to enrollment. May be repeated for a maximum of 6 credits.

499 Research/Performance/Topics in the Arts (3-6:0:0). Advanced research, performance, or exploration of topical studies in the arts. May be repeated for a maximum of 6 credits.

592 Special Topics in Interdisciplinary Arts Studies (1-3:3:0). Prerequisite: Undergraduate degree or equivalent, or permission of instructor. Topics in interdisciplinary arts. May be repeated for a maximum of 12 credits.

599 Independent Study (1-6:1-6:0). Prerequisite: Undergraduate degree or equivalent, or permission of instructor. Independent reading, performance, and/or research on a specific project under the direction of a selected faculty member. May include attendance in a parallel undergraduate course. May be repeated for a total of twelve credits.

Communication (COMM)

Communication

100 Oral Communication (3:3:0). Principles underlying effective oral presentations and development of effective presentations for public and professional settings. Emphasis on analyzing an audience; composing meaningful, coherent messages; conducting responsible research; developing effective arguments; and improving delivery skills to strengthen confidence and credibility.

101 Interpersonal and Group Interaction (3:3:0). Principles underlying effective interpersonal and group interaction and development of appropriate and effective communication strategies in one-to-one and small group communication settings. Emphasis on analyzing and assessing the communication skills necessary to create and sustain effective communication in personal and professional relationships.

102 Introduction to Media Literacy (3:3:0). Principles and practices of media literacy. Emphasis on critical viewing/listening/reading media skills and media effects on the consumer.

104 Presenting with Technology (3:3:0). Principles underlying effective oral presentations and development of effective presentations for public and professional settings while integrating appropriate technologies. Emphasis on analyzing an audience; composing meaningful, coherent
messages; conducting responsible research; developing effective arguments, and improving delivery skills to strengthen confidence and credibility. In addition, students gain a deeper understanding of appropriate uses of technology as it is integrated into public presentations.

140 Forensics Seminar in Creative Arts (1:0:6). Prerequisite: Audition. Intensive work in creative forensics events, including rhetorical criticism and informative, persuasive, extemporaneous, after-dinner, and impromptu speaking. May be taken four times.

141 Forensics Seminar in Recreational Arts (1:0:6). Prerequisite: Audition. Intensive work in recreational forensics events, including dramatic duo, program interpretation, poetry interpretation, dramatic interpretation, and prose interpretation. May be taken four times.

142 Forensics Seminar in Debate: Affirmative Strategies (1:0:6). Work in affirmative research, case construction, and oral presentation, directed toward affirmative analysis of the intercollegiate debate proposition. May be taken four times.

143 Forensics Seminar in Debate: Negative Strategies (1:0:6). Work in negative research, case attacks, and oral presentation directed toward negative analysis of the intercollegiate debate proposition. May be taken four times.

145 Newspaper Workshop I (1:1:2). Practical experience in writing, editing, or business aspects of newspaper production at Broadside or other papers. Coordinated by the newspaper faculty advisor. May be repeated for a total of three credits.

148 Radio Workshop I (1:1:3). Prerequisite: 100-level COMM course or permission of instructor. Practical experience in production, news writing, gymnastics, advertising, public relations, programming, or newscasting for the student radio station, WGMU. May be taken three times.

150 Communication Skills for International Students (3:3:0). Prerequisite: International student in first year of study in the United States or permission of instructor. Introduction to speaking, listening, and nonverbal skills required to communicate appropriately in university study.

157 Video Workshop I (1:1:2). Practical experience in learning the basics of video production (camera, video, and lighting). May be taken three times.

201 Small Group Communication (3:3:0). Prerequisite: COMM 101 or equivalent course. Principles of communicating effectively in small group situations. Emphasis on problem-solving group communication. Practice in working cooperatively with others to complete projects using systematic approach to problem solving.

202 Mass Media and Communication Systems (3:3:0). Study of the development of various telecommunications and media systems in the United States, including print media, motion pictures, the recording industry, telegraphy and telephony, broadcasting and cable, and the new communications technologies.

203 Introduction to Journalism (3:3:0). American journalism including components of journalism history and the First Amendment; the role of the professional journalist, print, broadcast, and computer-assisted news operations; the economics of publishing; and the effect of new technologies. Serves as a starting point for those interested in journalism careers and an orientation for the news consumer interested in learning more about news business operations.


230 Case Studies in Persuasion (3:3:0). Case study applications of common persuasive message strategies and approaches. Basic principles of the persuasive process. Case studies include advertisements, speeches, and persuasive activities from all segments of society.

250 Introduction to Communication Research (3:3:0). Introduction to the various types of research in the field of communication, with an emphasis on developing library skills and generating research questions and hypotheses. Basic procedures for research and writing about communication are covered.


261 Theories of Argumentation (3:3:0). Critical analysis of argument within communicative settings with emphasis on deductive and inductive forms of reasoning, fallacies in reasoning, tests of evidence, and the models for such analysis.

299 Research Practicum in Communication (1:3:0). Introduction to research methods in communication in the context of assisting with faculty research. Individualized sections taught by arrangement with full-time faculty. Methods taught vary, but generally include data collection, data analysis, and report construction.

300 Foundations of Public Communication (3:3:0). Prerequisite: Three credits of 100- or 200-level COMM courses, or 60 credits. Prerequisite or corequisite: COMM 250. Theories and principles of public communication with emphasis on methods of persuasion, critical analysis, speaker/listener alignments in the public setting, and measurements of effective public communication.

301 Foundations of Interpersonal Communication (3:3:0). Prerequisite: Three credits of 100- or 200-level COMM courses, or 60 credits. Prerequisite or corequisite: COMM 250. Theories and principles of interpersonal communication with emphasis on models of communication, verbal and nonverbal message systems, and analysis of communicative relationships.

302 Foundations of Mass Communication (3:3:0). Prerequisite: Three credits of 100- or 200-level COMM courses or 60 credits. Prerequisite or corequisite: COMM 250. Theories and principles of mass communication with emphasis on effects, the media as institution, and role of society.

303 Writing across the Media (3:3:0). Prerequisites: 30 credits and ENGL 302. Introductory course that focuses on writing for newspaper stories (hard news and feature), press releases, computer-assisted reporting, writing for broadcast, and advertising. Lab work required. This course is a prerequisite for all communication media writing courses.

305 Foundations of Intercultural Communication (3:3:0). Prerequisite: Three COMM credits or permission of instructor. Analysis of communication variables as they

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relate to intercultural encounters. Emphasis is on the influence of culture on the communication process, specifically with respect to the influence of verbal and nonverbal communication on how the message is interpreted.

306 Issues in Intercultural Communication (3:3:0). Prerequisite: COMM 305 or permission of instructor. Continuation of COMM 305. Basic principles of intercultural communication applied to the analysis of specific situations involving communication and cultural differences.

307 Field Study in Intercultural Communication (3:3:0). Prerequisite: COMM 305 or permission of instructor. Structured communication learning experience centered on one to three weeks of travel in a foreign environment involving another country or a relevant subcultural group in the United States. Students must complete readings relevant to communication in the host society, laboratory assignments that require the student to make observations about intercultural communication, and a personal learning paper in which the student integrates learning from observation and interactions during the travel. Students must also attend seminar sessions and lectures. Intercultural communication concepts and principles are used to analyze the students' observations and communication experiences.


320 Business and Professional Communication (3:3:0). Study of basic theories and skills of communication in a variety of professional contexts, including interviewing, relationship maintenance, small group teams, and public presentations. Emphasis on the development of practical and critical thinking skills.

326 Rhetoric of Social Movements and Political Controversy (3:3:0). Prerequisite: Three COMM credits. Social and political forces of the contemporary era from a communication perspective with emphasis on political leadership, pressures for social/political change, and transformations in the communicative environment.

330 Principles of Public Relations (3:3:0). Prerequisites: Three COMM credits and 60 credits, or permission of instructor. Survey of the nature, history, scope, and practice of public relations in business, trade associations, nonprofit organizations, educational and government institutions. Principles and practice of public relations, including topics such as media relations, issues management, and public service announcements; marketing and research; planning and publicity for special events; house publications; and institutional advertising.

332 Nonverbal Communication (3:3:0). Prerequisite: Three COMM credits. Theory, principles, and methods of analysis of nonverbal communication. Emphasis on physical behavior, facial expression, personal space and territoriality, physical appearance, vocal cues, and environment.

335 Organizational Communication (3:3:0). Prerequisite: COMM 100, 101, or 301, or permission of instructor. Theory, practice, and methods of analysis of communication within organizations. Emphasis on the process and structure, interaction formats, mechanisms for modification, and career paths in organizational communication.

340 Forensics Seminar in Creative Arts (1:0:6). Prerequisites: Four credits of COMM 140 or 60 credits and audition. Intensive work in various types of creative forensics events, including rhetorical criticism and informative, persuasive, extemporaneous, after-dinner, and impromptu speaking. May be taken four times.

341 Forensics Seminar in Recreational Arts (1:0:6). Prerequisites: Four credits of COMM 141 or 60 credits and audition. Intensive work in various types of recreational forensics events, including dramatic duet, program interpretation, poetry interpretation, dramatic interpretation, and prose interpretation. May be taken four times.

342 Forensics Seminar in Debate: Affirmative Strategies (1:0:6). Prerequisites: Four hours of COMM 142 or 60 credits and audition. Work in affirmative research, case construction, and oral presentation directed toward affirmative analysis of the intercollegiate debate proposition. May be taken four times.

343 Forensics Seminar in Debate: Negative Strategies (1:0:6). Prerequisites: Four credits of COMM 143 or 60 credits and audition. Work in negative research, case attacks, and oral presentation directed toward negative analysis of the intercollegiate debate proposition. May be taken four times.

344 Parliamentary Procedure (1:1:0). Prerequisite: 60 credits or permission of instructor. Procedures of parliamentary law as practiced in voluntary organizations. Practice in leading groups that conduct business according to Roberts Rules of Order, Newly Revised. Brief review of other parliamentary manuals.

345 Newspaper Workshop II (1:1:2). Prerequisite or corequisite: Three credits of COMM 143, COMM 351, or permission of instructor. Practical experience in writing and editing for the student newspaper or other papers. May be taken three times.

346 Yearbook Workshop (1:1:2). Practical experience in promotion, marketing, and sales of a video yearbook and/or practical experience working on Senior Expressions, a print supplement to the video yearbook. May be taken three times.

348 Radio Workshop II (1:1:3). Prerequisite: COMM 148 or permission of instructor. Intensive practical application of previously acquired skills in production, promotions, advertising, public relations, programming, or news writing for the student radio station, WGMU. May be taken three times.

349 Student Leadership Seminar (1:3:0). Prerequisite: 60 credits or permission of instructor. Introduction to leadership concepts. Experiential seminar focusing on practical application of leadership concepts in a student organization setting.

350 Mass Communication and Public Policy (3:3:0). Prerequisite: COMM 102, 202, or 302, or permission of instructor. Investigation of the manner in which matters of public importance are communicated via the various channels of mass communication. Emphasis on regulations designed to minimize the influence of media mass on public decision making, and manipulation of the media by pressure groups, politicians, and media gatekeepers.

351 News Writing and Reporting (3:3:0). Prerequisite: COMM 303. Experience in actual news gathering. Students are taught to write and report for print and online reporting.
Numerous in-class and out-of-class writing assignments train students in the unique styles of print and online journalism.

352 News Editing: Print and Beyond (3:3:0). Prerequisite: COMM 303. Copy preparation, headline writing, news judging, and layout for various forms of print and electronic formats. Introduction to working on news copy desks.

353 Broadcast Journalism (3:3:0). Prerequisites: COMM 303. Investigation of the unique writing style of journalists in the electronic media. Emphasis on concise, conversational, and timely news writing. Techniques of mixing the words of the report with the sights and/or sounds of the news story.

354 Radio Production (3:1:4). Prerequisite: COMM 302 or permission of instructor. Theory and practice of operational radio broadcasting. Topics include the programming, production, and promotion aspects of commercial and non-commercial radio.

355 Video I: Principles and Practices (3:3:2). Basic production techniques of video production. Emphasis on camera, audio, lighting, editing, and talent. Lab work required. Course is a prerequisite for all Video II level courses.

356 Video: Performance and Writing (3:3:0). Focus on writing for video, performance skills for on-air work, and interviewing.

358 Video II: Producing and Directing (3:2:4). Prerequisite: COMM 355 or portfolio assessment. Introduction to the techniques, theory, and practices in producing, directing, and distributing video productions.

359 Media Management (3:3:0). Principles and practices of the management of media (television, radio, multimedia, cable) from general management techniques to the operation of individual departments within a media organization.

360 Video III: Video Editing (3:2:3). Prerequisite: COMM 355 or portfolio assessment. Focus on advanced techniques in editing (both analog and digital), and the visual communication theories that underlie the practice of video editing.

361 Advanced News Writing and Research: Electronic Journalism (3:3:0). Prerequisite: COMM 303. Advanced reporting course that focuses on researching and writing stories for news media (television, radio, online, and computer assisted).

362 Argument and Public Policy (3:3:0). Development of argumentative skills while examining contemporary public policy. Several methods of argumentative analysis are applied to the design and implementation of public policy. Students learn by constructing, examining, and using public argument.

365 Women and Media (3:3:0). Prerequisite: COMM 302 or permission of instructor. Introduction to the concepts of the power and influence of mass media. Allows students to see themselves as products, as well as producers of media influence, and gives them a sense of women's roles as media professionals, as well as consumers.

366 Visual Communication (3:3:0). Prerequisites: IT 103 and COMM 355. Students learn about visual communication theories and apply the theories to the creation of videos, web pages, multimedia production, Computer Based Training (CBT) and other technologies. Covers the limits of visual communication in terms of perception, economics, and technology. A partial distance course that includes viewing of video modules and use of electronically mediated discussion.

375 Mass Communication Advertising and Promotions (3:3:0). Prerequisite: COMM 302 or permission of instructor. History, regulation, and ratings of advertising, as well as media buying, advertising campaigns, and the strengths and weaknesses of media vehicles used in advertising.

380 Media Criticism (3:3:0). Examination of the practical criticism of a wide variety of media texts including television programs, newspapers, articles, films, photographs, and advertisements. Introduction to the principles of major contemporary modes of analysis for systematically interpreting both visual and verbal forms of communication.

389 Association Communication (3:3:0). Prerequisite: 60 credits or 3 lower-division COMM credits. Principles of editing and journalism as applied to the publications, public relations, and advertising needs within a corporate environment. Job requirements of editorial positions in the fields of public relations, publications, and information as defined by trade associations, nonprofit organizations, and large corporations.

390 Case Studies in Public Relations (3:3:0). Prerequisite: COMM 330. Focuses on the study of public relations case studies to include corporate, government, and nonprofit public relations situations and solutions. Objective is to review and analyze a range of public relations situations in an effort to identify possible solutions and lesson learned.

391 Writing for Public Relations (3:3:0). Prerequisite: COMM 303. Focuses on public relations writing including news releases, client memos, materials for broadcasting, speeches, brochures, journals and advertisements. Includes public relations writing styles, formats, organization, and writing research.

399 Special Topics in Speech Communication (3:3:0). Prerequisite: Permission of instructor. Study of speech communication through topics such as African American rhetoric and communication reticence. Topics vary and some topics require laboratories. May be repeated.

400 Research Methods in Communication (3:3:0). Prerequisite: 60 credits or permission of instructor. Exploring applications for primary research methodologies used in communication. Critical and experimental-statistical methodologies.

401 Interpersonal Communication in the Workplace (3:3:0). Prerequisite: COMM 301 or permission of instructor. Comprehensive study of the theories and research associated with the dynamics of interpersonal relationships in the workplace. Emphasis on such topics as individual motivation, interpersonal needs, communication styles in the workplace, leadership, problem solving, decision making, diversity, interpersonal conflict, individual adaptation to organizational change, and the influence of technology on workplace relationships.

410 Readers Theater (3:3:0). Prerequisite: COMM 310. Development and current concepts of group communication of literary and/or popular material with practical application in direction and performance.

412 GOVT 412 Politics and the Mass Media (3:3:0). Prerequisite: GOVT 103 or permission of instructor. Re-
sponsibilities and freedoms of the mass media in a democracy. Influence of media on citizens’ opinions, elections, and decisions of public officials.

420 Senior Seminar in Theories of Communicative Interaction (3:3:0). Prerequisite: Minimum satisfactory grade in each of the following: COMM 250, 300, 301, and 302. Primary theories explaining human communicative behavior. Traditional rhetorical theory, contemporary social science theories, critical theories, and mass communication theories are examined.

430 Persuasion (3:3:0). Prerequisite: COMM 230 or permission of instructor. Theories of persuasive communication including traditional and contemporary attitudinal change theories; the relationship among speaker, message, and audience; and the relationship between attitudinal and behavioral change.

431 Information Technology and the Political Process (3:3:0). Prerequisite: 60 credits or permission of instructor. Study of the impact of the information network of wire and wireless communications and computers on the political process in advanced industrial countries.

432 Political Communication (3:3:0). Study of how political communication functions to shape the development of “political reality.” Interactions between media and politics examined with respect to the ways communication functions in political settings.

433 Environmental Communication (3:3:0). Rhetoric and persuasion about environmental issues in contemporary society. Investigation of case studies in corporate, institutional, and movement attempts to mobilize and cope with ecological concerns. Critical assessment of public communication is emphasized.

434 Interviewing (3:3:0). Prerequisite: 60 credits or permission of instructor. Theory, principles, and practical skills essential to the interview process. Emphasis on situations such as the information-gathering interview, the journalistic interview, the persuasive interview, the employment interview, and the performance-appraisal interview.

435 Computers and Communication (3:3:0). Prerequisite: 60 credits. Practical application, skill development, and theoretical/critical assessment of computer-mediated communication. Discussion centers around culture and language, functional and dysfunctional communication, social interaction, critical perspectives and ideology, freedom and responsibility, and images of the future. Students contract for course assignments within course categories.

450 Internship in Communication (3:1:10). Prerequisites: 75 credits, 15 credits in COMM, major in communication, and permission of department. See department for application procedures. On-the-job training in communication through approved field work study programs. Internships are arranged and supervised by the Department of Communication through an internship coordinator. Related class work in resume preparation and job interviewing.

451 Facilitating Communication Education (3:1:5). Theory and practice in facilitating the learning of communication principles and skills. Students work as instructor aides in lower division classes under the supervision of a faculty member. Activities include facilitating small group activities and individually critiquing oral performances. May be taken two times.

452 Media Production Practicum (3:1:0) Prerequisite: COMM 303, 348, or 355. Theory and practice in the creation, distribution, and response to media productions. Students do a minimum of 150 hours of work as assistants to engineers, producers, directors, and organizers of media production facilities on campus, under the supervision of faculty members. Activities include working on telecourses, public relations videos, and multimedia projects; aiding in the creation of in-house productions for departments; and working as a cable caster for Master Control operations on campus.

454 Free Speech and Ethics (3:3:0). Prerequisite: COMM 300, 302, or permission of instructor. Major issues surrounding the role of speech, press, and electronic media in society. Areas of study include the history of free speech/press issues in society, the role of the government in regulating the marketplace of ideas, and the responsibility of the individual in a free society.

455/HIST 455 History of Print Journalism (3:3:0). Prerequisite: Three COMM or HIST credits. Development of print journalism from its inception to the present, with emphasis on the interaction of technology, audience, and government intervention. Topics include birth of the press, development of the modern newspaper and American development including the Revolutionary and Civil wars, the rise of the independent press, and the Yellow Journalism period.

456 Comparative Mass Media (3:3:0). Prerequisite: COMM 302 or permission of instructor. Survey of the major foreign mass media systems as they compare with the American system. Focuses on the broad dimensions of international mass media and describes the issues facing global journalism and media systems. Provides students with a substantive framework for critical evaluation of various national media systems.

460 Advanced Rhetorical Criticism (3:3:0). Prerequisite: COMM 300 or permission of instructor. Analysis of religious, political, and social speaking from colonial times to the present. Such speakers as Susan B. Anthony, Frederick Douglass, FDR, and others are considered.

465 Topics in Communication and Gender (3:3:0). Exploration of selected topics involving gender and communication. Topics covered may include gender and culture, women as rhetors, male/female communication, and communication and gender roles. Specific interests are examined, ideally, in a seminar setting. Course may be repeated with approval of department.

475 Journalism Law (3:3:0). Prerequisite: 60 credits or permission of instructor. Law as it relates to the working journalist. Topics include libel, invasion of privacy, free press/fair trial, First Amendment, broadcast regulation, access to media, advertising, and the effect of new technologies on these issues. Extensive use of the “case approach” involving the study of leading court decisions in mass media law.

499 Independent Study in Communication (3:0:0). Prerequisite: 75 credits and permission of department. Study of a selected area in communication. Independent study application must be processed before the start of the semester in which the work is to take place. May be repeated. Communication courses at the 500 level are open to
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504 Communication and Interpersonal Conflict (3:3:0). Theoretical introduction and experiential learning in the role of communication in conflict management. Focus is on interpersonal interactions, including dyadic and small-group levels in various settings such as friendships, marriage, family, and the workplace. Examines the factors that generate conflicts and the communication strategies and skills that help shape conflict interaction toward productive ends.

506 Communication in International Organizations (3:3:0). Analysis of communication variables as they relate to organizational and managerial functions within international organizations. Topics include developing an understanding of how cultural differences influence managerial activities and on learning to deal effectively with these differences.

510 Studies in Oral Interpretation (3:3:0). Comprehensive examination of the role of the oral communicator in the selection, adaptation, and performance of literature. Seminar course topics vary depending on genre being considered. May be repeated three times for credit if each course is devoted to a different genre.

530 Theories of Small Group Communication (3:3:0). Advanced-level theory and practice of small group interaction. Examination of current research. Focus on learning applications of theories to relevant settings.

540 Directing Forensics Programs in Individual Events (3:3:0). Investigation of the role of the individual events forensics educator in developing a high school or college program, coaching and judging competitive original speaking and oral interpretation events, and managing tournaments.

542 Directing Debate Activities (3:3:0). Theory and practice of competitive debate. Emphasis on traditional and contemporary theories of debate, administrative activities related to the direction of a debate program, and methods of instruction in debate, including analysis of current debate topics. Designed for both novice and experienced debate coaches.

543 Advanced Debate Theory (3:3:0). Prerequisite: Prior debate and/or debate coaching experience or permission of instructor. Theoretical issues involved in the practice of debate. Critical examination of new issues in theory and discussion of theory revisions designed to enhance academic debate.

551 Developing Students’ Speaking and Listening Skills (3:3:0). Emphasis on development of assignments that directly and indirectly develop communication competence in children and adolescents. Five functions of communication and their development in the context of integrating basic skills at the elementary level and direct teaching at the secondary level, and philosophies of communication education and curriculum development, as well as competency assessment, are covered.

554 Telecommunications Policy and Regulation (3:3:0). Review of the history and principles of telecommunications regulation. Study of relevant policy-making and regulatory institutions and their roles in charting the course of telecommunications in the United States. Examination of the role of citizens and lobby groups in the regulatory process.

590 Seminar in Communication (3:3:0). Intensive study of specific topics communication. Specific content varies. May be repeated for credit.

601 Communication in Professional Relationships (3:3:0). Theoretical perspectives and relevant research related to communication strategies and skills useful in various professional roles and situations. Relates theoretical foundations to practice, allowing students to assess theories of communication and their applications in individual professional fields.

602 Theories and Research of Mass Communication (3:3:0). Theories of mass communication that have guided the development of mass media. Emphasis on the major scientific and humanistic approaches to the question of mass media effects.

605 Intercultural Communication (3:3:0). Analysis of communication variables as they relate to communication across cultures. Topics include nonverbal communication, time conceptualizations, perceptions and attitudes, values, social organization patterns, cultural norms, language, ethics, conflict across cultures, and research in intercultural communication.

631 Approaches to Group Facilitation (3:3:0). Introduction to various theoretical and practical approaches to group facilitation with in-depth focus and practice in one approach. Students participate in group sessions, analyze videotapes of decision-making groups, and practice methodologies for facilitating group interaction.

634 Theories of Interpersonal Communication (3:3:0). Prerequisite: COMM 301 or permission of instructor. Analysis of contemporary theories, concepts, and approaches to the improvement of interpersonal communication. Extensive examination of interpersonal communication research.

635 Organizational Communication (3:3:0). Analysis of communication systems and processes within organizations, both public and private. Specific topics include conflict management, group decision making, interviewing, technical presentations, and using various channels for improving internal and external communication for the organization.

636 Communication Consulting (3:3:0). Investigation of theories providing the foundation for communication consulting. Provides both the theoretical information and the mechanisms for application necessary to modify communicative behavior within organizations.

650 Research Methodologies in Communication (3:3:0). Prerequisite: Graduate standing. Introduces graduate students to various research methods used by communication professionals. Focus is to achieve an understanding and knowledge of social scientific research (both qualitative and quantitative) and critical analysis through their use and application.

651 Communication in the Classroom (3:3:0). Communication theories and skills needed to manage the communicative environment in the classroom. Nonverbal aspects of space, time, action, and form are considered as they affect teaching choices. Verbal patterns for skills of classroom management, including questioning skills, enhancement of students’ self-concept, systematic feedback, parental communication, and student development, are covered.

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653 Teaching the College Communication Course (3:3:0). Investigation of the theoretical and philosophical implications of communication instruction. Purpose is to expose graduate students to the principles and practices of teaching college communication courses at the upper and lower divisions.

655 Theories of Visual Communication in Telecommunications (3:3:0). Theories of visual communications and the way in which they are used in the creation of images for web sites, video productions, corporate presentations, virtual reality, computer graphics, etc. Explores the problems of fitting messages to the various telecommunications media, how the target audience perceives the visual image, and the aesthetic demands of products imposed by new technologies.

656 Global Communication (3:3:0). Study of global telecommunication channels and artifacts of international mass communication, with focus on discussion of problems of free flow of information, the roles of nations and international organizations in fostering global communication, and other technologies. Specific perspectives are developed as to worldwide social, political, educational, and economic development.

694 Communication Internship (3-6:1-2:0). Prerequisites: 18 graduate credits and permission of department. Students work in an approved, professional-level communication position, meeting regularly with an internship supervisor from the department. A paper and a journal are required, as well as a minimum of 60 hours work for each credit hour of enrollment. Normally, students enroll in internships at the end of their program of study.

696 Directed Readings and Research (1-3:0:0). Prerequisite: Permission of department. Reading and research on a specific topic under the direction of faculty member. Written report is required; an oral or written examination may be required. Course may be repeated for a maximum of six credits.

697 Independent Production (1-3:0:0). Prerequisite: Permission of department. Media or creative production activities under the direction of a faculty member. Completed production is required; a written report and an oral examination may be required. Course may be repeated for a maximum of six credits.

COMM 798 Communication Studies Project (3:0:0). Prerequisite: 24 graduate credits and approval of project proposal by faculty committee. Research project related to the student's area of study in communication under supervision of a faculty committee.

COMM 799 Master's Thesis (1-6:0:0). Prerequisite: 24 graduate credits and approval of thesis proposal by faculty committee. An original research endeavor related to the student's concentration in communication under supervision of a faculty committee. Graded S/NC.

800 Studies for the Doctor of Philosophy in Education (variable credit). Prerequisite: Admission to a doctoral program in communication. Program of studies designed by student's discipline director and approved by student's doctoral committee. Course work allows the student to participate in the research activity of the discipline director and results in a paper reporting original contributions of the student. May be repeated.

806 Seminar in Communication Skills for Teaching (3:3:0). Prerequisite: Admission to doctoral program or permission of instructor. Study of principles and practices underlying effective lecturing and in leading instructional discussion. Application to the student's field of study is encouraged as a way of establishing the teaching environment.

Comparative Literature (CL)

English/Modern and Classical Languages

300 Introduction to Comparative Literature (3:3:0). Prerequisite: 60 credits. Introduction to methods of comparative literature through study, in translation, of a selected theme or motif as it appears in various periods, genres, or national literatures. Readings drawn chiefly from English, American, or European literature; on occasion, non-Western literature is featured.

514 Theories of Comparative Literature (3:3:0). Prerequisites: CL 300 and 90 credits, or permission of instructor. Intensive study of the major theories of comparative literature with special emphasis on international movements and their characteristic themes. Students work with texts in the foreign language of their concentration; other texts are studied in translation.

Computational Sciences and Informatics (CSI)

School of Computational Sciences

600/SYST 500 Quantitative Foundations for Computational Sciences (3:3:0). Not applicable to the 48-hour course total for the CSI Ph.D. Prerequisites: MATH 213 and 214. Accelerated review of mathematical tools for scientific applications and analysis. Topics include vectors and matrices; differential and difference equations; linear systems; Fourier, Laplace, and Z-transforms and probability theory.

601 Computational Science Tools I (1:1:0). Not applicable to the 48-hour course total for the CSI Ph.D. Introduction to basic tools in computational science. Covers UNIX, editors, LaTeX, HTML, and graphics. Emphasizes application and use rather than theory. Substantial portion of instruction is delivered via a distance-learning web interface.

602 Computational Science Tools II (1:1:0). Not applicable to the 48-hour course total for the CSI Ph.D. Prerequisite: CSI 601 or permission of instructor. Introduction to basic tools in computational science. Covers MATLAB, MAPLE, and GNUPlot. Emphasizes application and use rather than theory. Substantial portion of instruction is delivered via a distance-learning web interface.

603 Introduction to Scientific Programming I (1:1:0). Not applicable to the 48-hour course total for the CSI Ph.D. Prerequisite: CSI 601 or permission of instructor. Introduction to programming in C or Fortran. Emphasizes application and languages rather than theory. Features a combination of lecture and lab. Assignments are completed via a distance-learning web interface.

604 Introduction to Scientific Programming II (1:1:0). Not applicable to the 48-hour course total for the CSI Ph.D. Prerequisites: CSI 601 and 603 or permission of instructor. Introduction to programming in an object-oriented
language such as C++. Features a combination of lecture and lab.

605 Software Construction Tools for Scientists (1:1:0). Not applicable to the 48-hour course total for the CSI Ph.D. Prerequisites: CSI 601, 603, 604 or programming experience with C, C++, or Fortran and familiarity with the UNIX operating system, or permission of instructor. Introduction to the tools commonly used for software construction and development. Covers revision control, debuggers, profilers, Makefiles, and regular expressions. Designed for students who wish to develop moderate to large software systems and need an introduction to the basic tools used in construction.

606 Scientific Graphics and Visualization Tools (1:1:0). Not applicable to the 48-hour course total for the CSI Ph.D. Prerequisite: CSI 601 or permission of instructor. Introduction to the use of scientific visualization tools for data analysis. Use of specific packages will be taught on a rotating basis. Packages include PV-WAVE, S-Plus, SV, XMGR, and the pnm tools.

607 Database Tools for Scientists (1:1:0). Not applicable to the 48-hour course total for the CSI Ph.D. Prerequisites: CSI 601 and 602 or permission of instructor. Introduction to database tools. Teaches the student how to deal with the relation model, on which database packages like Oracle are based. Under this language, database design concepts, table operations, triggers, sequences, and introduction to simple query language (SQL) will be covered.

610 Introduction to Computational Sciences (3:3:0). Not applicable to the 48-hour course total for the CSI Ph.D. Prerequisites: CSI 601, 602, 603, 604, 605, and 700 or permission of instructor. Covers advanced numerical methods, computer architecture, and scientific software development. Includes software design, construction, and validation techniques commonly used in industry. Also serves as an introduction to high-performance computing.

612 Physical Chemistry of Solids (3:3:0). Prerequisites: MATH 113, 114, 213, PHYS 260 or 266, CHEM 331 and 332. An advanced course of physical chemistry for first year graduate students with emphasis on solid-state materials. It covers advanced chemical thermodynamics, kinetics, diffusion, and solid-state reactions in different classes of materials, including metals, ionic crystals, and semiconductors. Computer applications to modeling solid-state reactions are also included.

630 Bioinformatics I (3:3:0). Prerequisites: General chemistry, general physics, organic chemistry, and calculus. Intensive review of those aspects of organic chemistry and biochemistry necessary to begin research in bioinformatics and to enter graduate courses in biology. Covers covalent bonding, quantum mechanical basis of bond formation, three-dimensional structure of molecules, reaction mechanisms, catalysis, polymers, enzymes, thermodynamic and kinetic foundations, metabolic pathways, and sequence and structure of macromolecules.

631 Bioinformatics II (3:3:0). Prerequisites: Bioinformatics I, general chemistry, general physics, organic chemistry, calculus, or permission of instructor. Intensive review of those aspects of biochemistry, molecular biology, and cell biology necessary to begin research in bioinformatics and to enter graduate courses in biology. Covers cell structure, intracellular sorting, cellular signaling (i.e., receptors), cytoskeleton, cell cycle, DNA replication, transcription, and translation.


639 Ethics in Scientific Research (3:3:0). An examination of ethical issues in scientific research. Begins with a reflection on the purpose of scientific research and review of the foundational principles used for evaluating ethical issues. The course will equip students with skills for survival in scientific research through training in moral reasoning and teaching of responsible conduct. Students will discuss current ethical issues in research and will learn to apply critical thinking skills to the design, execution, and analysis of experiments. Important issues include, for example, the use of animals and humans in research, ethical standards in the computer community, and research fraud. In addition, currently accepted guidelines for behavior in areas such as data ownership, manuscript preparation, and conduct of persons in authority may be presented and discussed in terms of relevant ethical issues.

654 Data and Data Systems in the Physical Sciences (3:3:0). Prerequisite: Competency in programming at the level of CSI 601-607 or permission of instructor. This course introduces the student to data issues associated with modern physical sciences. Specifically, it examines data access, formats, browsing, analysis, visualization and data information systems in federated environments. Illustrative examples are used from the physical sciences, including astronomy and space sciences; Earth sciences; Earth observing and other fields of physics; as well as model output data and associated special issues. The student is introduced to some mathematical techniques that are particularly important for large databases, including principal component analysis, dimensional reduction, etc.

655/PHYS 575 Introduction to Physics and Chemistry of the Atmosphere (3:3:0). Prerequisites: PHYS 305 and 262. Introduction to basic physical and chemical processes that operate in Earth's atmosphere. Emphasizes those concepts that provide a global description of the current atmospheric state and those processes that relate to global change and atmospheric evolution. Covers equilibrium structure, radiative transfer models, thermodynamics of various atmospheric layers, and the various processes defining these layers.

656/EVPP 652/EEG 570 The Hydrosphere (3:3:0). Prerequisites: Two semesters of calculus (partial differential equations recommended) or permission of instructor. The components and transfer processes within the hydrosphere. The hydrosphere consists of the aqueous envelope of Earth, including the oceans, lakes, rivers, snow, ice, glaciers, soil moisture, ground water, and atmospheric water vapor. Students get an understanding of the various components of the hydrosphere, their spatial and temporal distributions, the physics of the transfer processes for redistribution, and an appreciation of the role of water in sus-

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taining life and influencing the global and regional energy and mass balance.

657/GEOL 601/GEOG 671 The Lithosphere (3:3:0). Prerequisite: graduate standing. A global-scale overview of the lithosphere, the solid nonliving Earth, its materials, cycles, plate tectonic and geomorphic processes, and history, including interactions with and history of the hydrosphere, atmosphere, and biosphere, and methods of analysis. Students who have taken this course will be able to understand the materials, features, and landforms of solid Earth, and the processes by which they formed.

660/ASTR 535 Space Instrumentation and Exploration (3:3:0). Prerequisites: PHYS 262, MATH 213 or equivalent, or permission of instructor. Survey of the instruments, devices, and methods used for space and planetary exploration. Covers remote sensing of Earth and other solar system bodies. Planned manned and unmanned missions by the United States and other countries.

661/ASTR 530 Astrophysics (3:3:0). Prerequisites: PHYS 303, 305, 308; MATH 214. Survey of contemporary astrophysics. Topics include physical concepts, stellar spectra, Hertzsprung-Russell diagram, stellar atmospheres, stellar structure, interstellar matter, stellar evolution, high-energy phenomena, hydrodynamical processes in astrophysics, accretion disk formation, and shock formation.

685 Fundamentals of Materials Science (3:3:0). Prerequisite: Undergraduate degree in physics, chemistry, materials, electrical or mechanical engineering, or related sciences, or permission of instructor. Covers fundamental concepts, methods, and applications of materials science. Also covers structure of modern materials (metallic alloys and compounds, ceramic materials, semiconductors, polymers, and nanostructured materials), materials properties (mechanical, thermal, and electric), experimental methods of materials characterization, application of computers in materials science, and elements of materials design.

687/PHYS 512 Solid State Physics and Applications (3:3:0). Prerequisite: PHYS 502 or equivalent. Covers crystal structures, binding, lattice vibrations, the free electron model, metals, semiconductors and semiconductor devices, superconductivity, and magnetism.

700/MATH 685 Numerical Methods (3:3:0). Prerequisites: MATH 214, 203, and some programming experience. Covers computational techniques for the solution of problems arising in science and engineering. Algorithms are developed for the treatment of typical problems in applications, with special emphasis on the types of data encountered in practice. The course covers theoretical development, as well as implementation, efficiency, and accuracy issues in using algorithms and interpreting the results. When applicable, computer graphical techniques are used to enhance interpretation of results.

701 Foundations of Computational Science (3:3:0). Prerequisites: Competency in UNIX and programming at the level of CSI 601-604, CSI 700, or permission of instructor. Covers the mapping of mathematical models to computer software, including all aspects of the development of scientific software, such as architecture, data structures, advanced numerical algorithms, languages, documentation, optimization, validation, verification, and software reuse. Examples in bioinformatics, computational biology, computational physics, and global change demonstrate scientific advances enabled by computation. Class projects involve working in teams to develop software that implements mathematical models, using the software to address important scientific questions, and conducting computational experiments with it.

702 High-Performance Computing (3:3:0). Prerequisites: CSI 700 and CSI 701, or permission of instructor. Hardware and software associated with high-performance scientific computing. Computer architectures, processor design, programming paradigms, parallel and vector algorithms. Emphasis on the importance of software scalability in science problems.

703 Scientific and Statistical Visualization (3:3:0). Prerequisite: STAT 554 or CS 652, or permission of instructor. Covers visualization methods used to provide new insights and intuition concerning measurements of natural phenomena and scientific and mathematical models. Presents case study examples from a variety of disciplines to illustrate what can be done. Topics include human perception and cognition, an introduction to the graphics laboratory, elements of graphing data, representation of space-time and vector variables, representation of 3-D and higher dimensional data, dynamic graphical methods, and virtual reality. Students are required to work on a visualization project. Software tools on the Silicon Graphics workstation are emphasized, but other workstations and software may be used for the project.

709 Topics in Computational Sciences and Informatics (3:3:0). Prerequisites: Admission to Ph.D. program and permission of instructor. Covers selected topics in computational sciences and informatics not covered in fixed-content computational sciences and informatics courses. May be repeated for credit as needed.

710 Scientific Databases (3:3:0). Prerequisite: INF5 614 or equivalent, or permission of instructor. Study of database support for scientific data management. Covers requirements and properties of scientific databases, data models for statistical and scientific databases, semantic and object-oriented modeling of application domains, statistical database query languages and query optimization, advanced logic query languages, and case studies such as the human genome project and Earth-orbiting satellites.

711/CHEM 633 Chemical Thermodynamics and Kinetics (3:3:0). Prerequisites: CHEM 331 and 332. Advanced study of thermodynamics and kinetics. Covers application of kinetics to the elucidation of reaction mechanisms, and application of statistical thermodynamics to the theory of elementary reaction rates.

712/CHEM 728 Introduction to Solid Surfaces (3:3:0). Prerequisite: CHEM 422 or equivalent. Introduction to the properties of solid surfaces. Includes gas absorption isotherms, surface area measurement techniques, real and clean surfaces, physisorption and chemisorption, methods of gas absorption and desorption, measurement of heats of adsorption, desorption kinetics, electron spectroscopies and their surface sensitivities, instrumentation needed, and principles of vacuum technology.

713/CHEM 732 Quantum Chemistry (3:3:0). Prerequisite: CHEM 332. Illustration of the fundamental concepts of quantum mechanics with applications to chemical systems, including atomic and molecular electronic structure.
ture and properties, molecular symmetry, and intermolecular forces.

714 Spectroscopy and Structure (3:3:0). Prerequisite: CHEM 332. Covers quantum mechanics of the interaction of atoms and molecules with electromagnetic radiation. Also covers modern spectroscopic methods as applied to the elucidation of molecular structure and dynamics.

719 Topics in Computational Chemistry (3:3:0). Prerequisite: Permission of instructor. Covers selected topics in computational chemistry not covered in fixed-content computational chemistry courses. May be repeated for credit as needed.

720 Fluid Mechanics II (3:3:0). Prerequisites: CSI 700, 780, or permission of instructor. Covers basic and advanced fluid mechanics and the continuous hypothesis to define fluids. Introduces tensor analysis; Euclidean and Lagrangian representation of fluid flow; Navier-Stokes equations; the Bernoulli theorem and Crocco’s form of the equations; steady and unsteady flows; potential, incompressible, and compressible flows; gravity and sound waves; gas dynamics; and viscous flows.

721 Computational Fluid Dynamics I (3:3:0). Prerequisites: Course in partial differential equations such as MATH 678 or equivalent, knowledge of linear algebra at the level of MATH 603 or CSI 740/MATH 625, coding experience in FORTRAN or C, or permission of instructor. Covers fundamentals of computational fluid dynamics, including spatial and temporal approximation techniques for partial differential equations, solution of large systems of equations, data structures, solvers of the Laplace/full potential equation, and simple Euler solvers. Two major projects are included: a Laplace solver and a 2-D Euler solver on unstructured grids. Students are expected to write their own codes.

722 Computational Fluid Dynamics II (3:3:0). Prerequisite: CSI 721 or permission of instructor. Covers some of the more advanced topics in computational fluid dynamics, including high-resolution schemes for hyperbolic PDEs, advanced Euler solvers, Navier-Stokes solvers, grid generation, adaptive mesh refinement, efficient use of supercomputing hardware, and future trends. Projects include topics in grid generation and adaptive refinement. Students are expected to write their own codes.

723 Fluid Mechanics II (3:3:0). Prerequisites: CSI 720 or permission of instructor. Covers gas dynamics, shock waves, the method of characteristics, boundary layer flows, instabilities, and turbulence modeling. Special topics include biological, non-Newtonian, and free surface flows; aeroelasticity; and magneto-hydrodynamics.

729 Topics in Continuum Systems (3:3:0). Prerequisite: Permission of instructor. Covers selected topics in the computational aspects of continuum systems not covered in fixed-content courses in dynamical systems. May be repeated for credit as needed. Possible topics that may be considered are smooth-particle hydrodynamics, radiation hydrodynamics, algorithms for continuum systems, adaptive grids for continuum computations, spectral methods in computational fluid dynamics, algorithms for concurrent machines, formation of high-energy particle jets in astrophysical applications, application to Earth atmospheric problems, and flow considerations in molten materials.

730 Biological Sequence Analysis (3:3:0). Prerequisites: Competency in programming at the level of CSI 601-607, familiarity with molecular biology and cell biology at the level of CSI 631, or permission of instructor. Covers fundamental methods for the analysis of nucleic acid and protein sequences, including pairwise alignment, multiple alignment, database search methods, profile searches, and phylogenetic inference. Also covers probabilistic tools, including hidden Markov models and their associated optimization algorithms. Provides survey and analysis of current software tools.

731 Protein Structure Analysis (3:3:0). Prerequisites: Course work in molecular biology, biochemistry, and introductory computer programming, or permission of instructor. A survey of the computational methods for the analysis, classification, and prediction of three-dimensional protein structures. Covers theoretical approaches, techniques, and computational tools for protein structure analysis. Topics include protein geometry and topology, three-dimensional structure databases, protein modeling, and engineering.

732 Genomics (3:3:0). Prerequisites: General biology, programming experience, CSI 700 or equivalent, CSI 730, or permission of instructor. A survey of computational tools and techniques used to study whole genomes. Explores the biological basis of genome analysis algorithms. Lecture topics include genome mapping, comparative genomics, and functional genomics.

734 Computational Neurobiology (3:3:0). Prerequisites: CSI 631 or equivalent and ordinary differential equations, or permission of instructor. Intense review of neurobiology for graduate students interested in studying how nerve cells integrate and transmit signals, and how behavior emerges from the integrated actions of populations or circuits of nerve cells. Covers electrical and biochemical properties of single neurons, and electrical and chemical communication between neurons. Emphasis is on mathematical descriptions and computational techniques used to study and understand neurons and networks of neurons.

735 Computational Neuroscience Systems (3:3:0). Prerequisites: CSI 734 (previously or concurrently). CSI 630, CSI 631, or permission of instructor. Overview of the nervous system and biological neural networks. Includes learning and memory, sensory systems, and motor systems. Stresses design and application of computational models. Students are required to propose and design a computational model that addresses some open issue in neuroscience.

739 Topics in Bioinformatics (3:3:0). Prerequisite: Permission of instructor. Selected topics in bioinformatics not covered in fixed-content bioinformatics courses. May be repeated for credit as needed.

740/MATH 625 Numerical Linear Algebra (3:3:0). Prerequisites: MATH 203 and some programming experience. Covers computational methods for matrix systems; theory and development of numerical algorithms for the solution of linear systems of equations, including direct and iterative methods; analysis of sensitivity of system to computer round off; and solution of least squares problems using orthogonal matrices. Also covers computation of eigenvalues and eigenvectors, singular value decomposition, and applications.

741/ECE 721 Nonlinear Dynamical Systems (3:3:0). Prerequisites: Knowledge of linear algebra, advanced cal-

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### 308 Computational Sciences & Informatics (CSI)

**748/MATH 629 Symbolic Computation (3:3:0). Prerequisite:** Undergraduate degree in a scientific discipline, and a course in abstract algebra. Provides the mathematical and computational background for computational algebraic geometry and its applications. Includes notions of algebra, geometry, algorithms, the concept of Groebner bases, automatic theorem proving, and serial and parallel algorithms and their complexity. Topics are related to applications in engineering and computer science. Students are expected to complete projects.

**749 Topics in Computational Mathematics (3:3:0). Prerequisite:** Permission of instructor. Selected topics in computational mathematics not covered in fixed-content computational mathematics courses. May be repeated for credit as needed.

**750 Earth Systems and Global Changes (3:3:0). Prerequisite:** Course in ecology, environmental geology, atmospheric physics, or permission of instructor. Introduction to the global system interactions responsible for global environmental change. Discusses the natural causes of past and present global changes, how human activities affect these global system changes, and the ecological and human consequences of these global changes. Topics include climate and hydrological systems, global warming, deforestation, ozone depletion, ecological system dynamics, introduction to climate and global change monitoring, satellite instrumentation and calibration, and model predictions.

**751 Introduction to Physical Climate System (3:3:0). Prerequisite:** CSI 750 or permission of instructor. Provides the student with a modern understanding of the system of ocean, atmosphere, and land based on fundamental physical laws. Describes the current climate and its past changes, the physical processes by which climate is maintained, the sensitivity of climate, the mechanisms that have produced climate change, and possible mechanisms whereby humans will produce climate change.

**752 Physical and Dynamical Oceanography (3:3:0). Prerequisite:** CSI 751 or permission of instructor. Introduction to the climatology and dynamics of the oceans. Covers the nature of seawater, heat, and salt budgets; the general circulation of the ocean, including the Gulf Stream and thermohaline circulations; dynamics of wind-driven ocean circulation; and the processes influencing biological and chemical behavior.

**753 Observations of the Earth and its Climate (3:3:0). Prerequisite:** CSI 660 or an introductory remote sensing course; environmental science, space science, physics, or chemistry undergraduate background; or permission of instructor. Provides the requisite material to understand techniques of remote sensing and other observational methods as applicable to Earth science and global change. Surveys methodologies and their applications, including a systematic study of how each part of the electromagnetic spectrum is used to gather data about Earth. Describes limitations imposed by satellite engineering, sensor limitations on data gathering, and a survey of data reduction specific to remote sensing applications. Also covers current research issues, including examples pertaining to the atmosphere, land masses, and oceans. Includes discussions of current efforts by agencies such as NASA and NOAA to provide integrated data gathering and dissemination systems.

**754 Earth Observing/Remote Sensing Data and Data Systems (3:3:0). Prerequisite:** CSI 753 or permission of instructor. Covers how to access and apply Earth observations/remote sensing data for Earth system science research and applications. Major topics are data formats, analysis and visualization tools, and data applications. The course covers combining innovative information technology techniques and Earth science data to set up online data centers for web users to be able to access data through the web.

**755/PHYS 676 Introduction to Atmospheric Dynamics (3:3:0). Prerequisite:** M.S. in physics or mathematics, or
permission of instructor. Covers the basic conservation laws of mass, momentum, and energy, and a scaling analysis of the equation of motion and the thermodynamic equation. Balanced flows in the atmosphere (e.g., the geotropic wind and its vertical shear, and the thermal wind relationship) are discussed. Concepts of circulation and vorticity; the role of the atmospheric boundary layer in mass, momentum, and energy transfer; synoptic scale motions; and the role of gravity and Rossby waves in controlling the general circulation of the atmosphere are also discussed.

756 Ocean Dynamics and Ocean Modeling (3:3:0). Prerequisite: CSI 752, 755, or permission of instructor. The foundation and theory of computational methods for ocean modeling, especially the finite-difference method. Topics include accuracy, consistency, convergence, stability, and dispersion; time-stepping schemes; nonlinear computational stability and energy and enstrophy conserving schemes for solving the momentum equations; staggered and curvilinear grids; alternate vertical coordinate systems; implicit and split-explicit barotropic mode solution; pressure gradient errors and vorticity constraints; spectral methods for atmospheric models; and semi-Lagrangian methods.

757 Techniques and Algorithms in Earth Observing and Remote Sensing (3:3:0). Prerequisite: CSI 753 or permission of instructor. Covers retrieval, analysis, and application of geophysical parameters derived from remotely sensed data for Earth system research and applications. Includes theory of visible/infrared and microwave remote sensing, heritage sensors, sensor calibration, retrieval algorithms, validation, and error estimates.

758 Visualization and Modeling of Complex Systems (3:3:0). Prerequisite: Permission of instructor. Covers elements of modeling and analysis of Earth and space sciences data and systems. Concentrates on both sample projects and student-initiated projects as a means of using visualization and graphical analysis techniques as they apply to the modeling of complex data sets and systems. Several different analysis and visualization packages are used. Spacecraft data sets from the Naval Research Laboratory (NRL) Backgrounds Data Center and other NRL data sets are available for course projects. A perusal of data sets from the World Wide Web is also possible. Modeling and analysis are accompanied by appropriate readings from the current literature.

759 Topics in Earth Systems and Global Changes (3:3:0). Prerequisite: Permission of instructor. Covers selected topics in Earth systems and global changes not covered in fixed-content Earth systems/global changes courses. May be repeated for credit as needed.

761/ASTR 761 N-Body Methods and Particle Simulations (3:3:0). Prerequisites: PHYS 613/CSI 780 and CSI 700 or permission of instructor. Covers particle methods as a tool in solving a variety of physical systems. Emphasizes the study and development of the numerical results and visualization of these results in complex physical systems. Applications and projects include stellar and galaxy dynamics, smooth particle hydrodynamics, plasma simulations, and semiconductor device theory algorithms on parallel and vectorized systems.

763 Statistical Methods in Space Sciences (3:3:0). Prerequisite: ASTR 530 or permission of instructor. Covers statistical and data analysis methods applicable to problems in space science, remote sensing, and astrophysics. Includes parametric and nonparametric hypothesis testing, parameter estimation, correlation analysis, time series analysis, spatial analysis, and image reconstruction. Emphasizes the imperfect nature of actual data sets and hypothesis. Examples are drawn from current space science research.

764/ASTR 764 Computational Astrophysics (3:3:0). Prerequisite: ASTR 530. Covers statistical mechanics concepts important in astrophysics. Presents unified approach to particle acceleration and interaction theory based on analytical and numerical analysis of Boltzmann and Liouville equations. Discusses computational methods relevant to particle transport problems, with emphasis on Fokker-Planck and Monte Carlo solution techniques. Applications from space sciences include studies of cosmic ray acceleration, photon comptontization, particle transport in the near-Earth environment, energy transport in stellar atmospheres, and self-gravitating system dynamics.

765/ASTR 765 High-Energy and Accretion Astrophysics (3:3:0). Prerequisite: PHYS 502, ASTR 530, PHYS 613/CSI 780, or permission of instructor. Overview of the field of atomic and nuclear physics. Covers nuclear reactions of use to high-energy astrophysics; radiation processes in cosmic plasmas, emphasizing quantum mechanical calculations; stellar evolution and nucleosynthesis; computational models of stellar evolution; binary stars and accretion disks; numerical models of the structure of accretion disks; compact stars, white dwarfs, neutron stars, and black holes; acceleration processes and cosmic rays; interstellar medium and propagation of cosmic rays; high-energy processes in the center of galaxies; and ground- and space-based techniques and observations.

766/ASTR 766 Relativity and Cosmology (3:3:0). Prerequisites: ASTR 530 and MATH 314, or permission of instructor. Covers special relativity, four-dimensional space-time, general relativity, non-Euclidean geometries, geodesic and field equations, test of general relativity theory, black holes, cosmic background radiation, thermodynamic considerations in cosmology, and cosmological models.

769/ASTR 769 Topics in Space Sciences (3:3:0). Prerequisite: Permission of instructor. Selected topics in space sciences not covered in fixed-content space sciences courses. May be repeated for credit as needed.

771/STAT 751 Computational Statistics (3:3:0). Prerequisites: STAT 544, 554, and 652. Covers the basic computationally intensive statistical methods and related methods, which would not be feasible without modern computational resources. Covers nonparametric density estimation including kernel methods, orthogonal series methods and multivariate methods, recursive methods, cross-validation, nonparametric regression, penalized smoothing splines, the jackknife and bootstrapping, computational aspects of exploratory methods including the grand tour, projection pursuit, alternating conditional expectations, and inverse regression methods.

773/STAT 663 Statistical Graphics and Data Exploration (3:3:0). Prerequisite: Three hundred-level course in statistics; STAT 554 strongly recommended. Exploratory data analysis provides a reliable alternative to classical statistical techniques, which are designed to be the best possible when stringent assumptions apply. Topics include graphical techniques such as scatter plots, box plots, parallel
776/IT 776 Real Analysis and Statistics (3:3:0). Prerequisites: STAT 652; ECE 620, or 630; or permission of instructor. Introduction to modern theory of stochastic calculus. Covers stochastic integrals, martingales, counting processes, diffusion processes, and Ito-type processes in general. Applications of these methods to engineering, biology, and economics are considered in some detail.

784/PHYS 732 Quantum Mechanics (3:3:0). Prerequisite: PHYS 502 or permission of instructor. Study of the fundamental concepts of quantum mechanics, time evolution, Schroedinger and Heisenberg formalism, harmonic oscillators, propagators, Feynman path integrals, rotations and angular momentum, angular momentum eigenvalues and eigenstates, Bell's inequality, symmetries, conservation laws, degeneracy, perturbation theory, WKB methods, and scattering theory.

785/PHYS 722 Electromagnetic Theory (3:3:0). Prerequisites: PHYS 513 and PHYS 613/CSI 780, or permission of instructor. Advanced study of electric and magnetic fields. Topics include electrostatic fields, magnetostatic fields, boundary-value problems in field theory, multipole, simple radiating systems, relativistic electrodynamics, and radiation by moving charges.

786 Molecular Dynamics Modeling (3:3:0). Prerequisite: PHYS 613/CSI 780 or CHEM 633/CSI 711, or permission of instructor. Introduction to simulation methods used in the physical chemistry sciences. Covers computational approaches to modeling molecular and condensed matter systems, including interatomic and molecular potentials, molecular dynamics, time averages, ensemble distributions, numerical sampling, thermodynamic functions, response theory, transport coefficients, and dynamic structure. Includes stochastic simulations such as Brownian motion, Langevin dynamics, Monte Carlo methods and random walks, and an introduction to cellular automata.

787 Computational Materials Science (3:3:0). Prerequisites: PHYS 512/CSI 687 and PHYS 736/CSI 783, or permission of instructor. Covers selected topics in the computational aspects of condensed matter, such as methods of electronic structure calculations, surface science, molecular clusters, lattice dynamics, nanomaterials, semiconductors, superconductivity, quantum Hall effect, magnetism, Hubbard model, mesoscopic systems, and liquids.

788/PHYS 728 Simulation of Large-Scale Physical Systems (3:3:0). Prerequisites: PHYS 613/CSI 780 and CSI 700, or permission of instructor. Study of diverse large-scale physical systems, with emphasis on the modeling and simulation of these multifaceted systems. Several projects are undertaken, which are drawn from such areas as many-body dynamics, atmospheric structure and dynamics, high-temperature plasmas, stellar structure, hydro dynamical systems, galactic structure and interactions, and cosmology.

789/PHYS 780 Topics in Computational Physics (3:3:0). Prerequisite: Permission of instructor. Selected topics in computational physics not covered in fixed-content computational physics courses. May be repeated for credit as needed.

792/EVPP 792/GEOG 792 Seminar in Earth Systems Science (2:2:0). Prerequisites: Fifteen graduate credits including CSI 635, 656, and 657. A seminar for Earth systems science graduate students who have backgrounds in Earth's major systems. Intended to be a capstone experience. Seminars will be presented by faculty and students. Topics will vary from semester to semester.

796 Directed Reading and Research (3:3:0). Prerequisite: Permission of instructor. Reading and research on a specific topic in computational sciences and informatics under the direction of a faculty member. May be repeated as necessary.
798 Research Project (3:0:0). Prerequisite: Twelve graduate credits and permission of instructor. Project chosen and completed under the guidance of a graduate faculty member, resulting in an acceptable technical report.

799 Master’s Thesis (1:6:0:0). Prerequisite: Twelve graduate credits and permission of instructor. Project chosen and completed under the guidance of a graduate faculty member, resulting in an acceptable technical report (master’s thesis) and oral defense. Graded S/IP.

852 Geophysical Fluid Dynamics (3:3:0). Prerequisite: CSI 735 or permission of instructor. Introduction to geophysical fluid dynamics, the study of rotating stratified flows. Covers hydrostatics, the equations of motion, gravity wave dynamics and stratified flow, effects of rotation, mid-latitude dynamics, the Rossby number and quasi-geostrophic expansion, the beta plane approximation, and equatorial Kelvin and Rossby waves.

854 Computing and Communication Systems for Earth Observing (3:3:0). Prerequisite: CSI 754 or permission of instructor. In-depth study of computing and communications systems, with emphasis on performance issues and capacity for sustaining modern Earth observing systems. Covers functional breakdown of ground receiving stations, international communications standards for space data telemetry (such as CCSDS) and their impact on data fidelity and processing, and instrumentation for ground stations and trade-off between on-board versus ground station processing. Also discussed are computer system performance appreciation and computing systems limitations; implications of data product levels and standards for processing, input/output, and storage requirements, and applications of high performance computing, storage hierarchies, and parallel input/output concepts and systems for speeding data access and processing.

876/IT 876 Measure and Linear Spaces (3:3:0). Prerequisite: IT 776/CSI 778 or permission of instructor. Covers measure theory and integration, convergence theorems, and the theory of linear spaces and functional analysis, including normed linear spaces, inner product spaces, Banach and Hilbert spaces, Sobolev spaces, and reproducing kernels. Topics include wavelets, applications to stochastic processes, and nonparametric functional inference.

877/IT 877 Geometric Methods in Statistics (3:3:0). Prerequisite: STAT 751 or permission of instructor. Develops the foundations of geometric methods for statistics. Topics include n-dimension Euclidian geometry, projective geometry, differential geometry, including curves, surfaces, and n-dimensional differentiable manifolds, and computational geometry, including computation of convex hulls, tessellations of two-, three-, and n-dimensional spaces, and finite element grid generation. Examples include applications to scientific visualization.

888 Topics in Quantum Systems (3:3:0). Prerequisite: PHYS 736/CSI 783 or PHYS 732/CSI 784, or permission of instructor. Covers selected topics in quantum systems in physics and chemistry not covered in fixed-content courses in quantum mechanics. May be repeated for credit as needed. Possible topics are new spectroscopic methods, density functional theory, energy transfer and fluorescence, nuclear magnetic resonance, Mossbauer spectroscopy, advanced computational considerations in atomic and/or molecular structure, nuclear scattering theory, quantum considerations in condensed matter problems, and quantum gravity.

898 Research Colloquium in Computational Sciences and Informatics (1:1:0). Presentations in specific research areas in computational sciences and informatics by School of Computational Sciences faculty and staff members, and professional visitors. May be repeated for credit; however, a maximum of three credits of CSI 898, 899, and 991 may be applied toward the Ph.D.

899 Colloquium in Computational Sciences and Informatics (1:1:0). Presentations in a variety of areas of computational sciences and informatics by School of Computational Sciences faculty and staff members, and professional visitors. May be repeated for credit; however, a maximum of three credits of CSI 898, 899, and 991 may be applied toward the Ph.D.

909 Advanced Topics in Computational Sciences and Informatics (3:3:0). Prerequisite: Permission of instructor. Covers selected topics in computational sciences and informatics not covered in fixed-content courses. May be repeated for credit as necessary.

972/IT 972 Mathematical Statistics I (3:3:0). Prerequisite: STAT 632 or equivalent. Focuses on the theory of estimation. Principles of estimation are explored, including the method of moments, least squares, maximum likelihood, and maximum entropy methods. Methods of minimum variance unbiased estimation are covered in detail. Other topics include sufficiency and completeness of statistics, Fisher information, Cramer-Rao bounds, Bhattacharyya bounds, asymptotic consistency and distributions, statistical decision theory, minimax and Bayesian decision rules, and applications to engineering and scientific problems.

973/IT 973 Mathematical Statistics II (3:3:0). Prerequisite: CSI 972. Continuation of CSI 972. Concentrates on the theory of hypothesis testing. Topics include characterizing the decision process, simple versus simple hypothesis tests, Neyman Pearson Lemma, uniformly most powerful tests, unbiasedness of tests, invariance of tests, randomized tests, and sequential tests. Applications of the testing principles are made to situations in the normal distribution family and to other families of distributions.

976/IT 976 Statistical Inference for Stochastic Processes (3:3:0). Prerequisite: CSI 776 or permission of instructor. Covers the modern theory of parameter estimation and hypothesis testing for stochastic processes, counting processes with random intensities, and solutions to stochastic differential equations driven by martingales. Applications to engineering, biology, and economics are considered.

978/IT 978 Statistical Analysis of Signals (3:3:0). Prerequisites: STAT 544 and 658 or equivalent. Advanced course in the analysis of discrete- and continuous-time signals using methods of stochastic differential equation and time series. Familiarity with the methods of harmonic analysis and times series modeling is assumed. Topics include state-space modeling and eigen-value processing, nonlinear modeling of signals, non-Gaussian stochastic process structure, detection and estimation of vector-valued signals, robust signal detection, and array processing and target tracking.

979/IT 979 Advanced Topics in Computational Statistics (3:3:0). Prerequisite: Permission of instructor. Covers selected topics in computational statistics not covered in

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fixed-content computational statistics courses. May be repeated for credit as needed.

986 Advanced Topics in Large-Scale Physical Simulation (3:3:0). Prerequisite: Permission of instructor. Covers simulation of physical systems not covered in fixed-content physical simulation courses. May be repeated for credit as needed.

991 Seminar in Scientific Computing (1:1:0). Considers selected topics in a specific area of computational sciences and informatics either not covered in fixed-content courses or as an extension of fixed-content courses. Format for presentation is that of a seminar with student participation. May be repeated for credit; however, a maximum of three credits of CSI 898, 899, and 991 may be applied toward the Ph.D.

996 Doctoral Reading and Research (1-12:0:0). Prerequisites: Admission to doctoral program and permission of instructor. Reading and research on a specific topic in computational sciences and informatics under the direction of a faculty member. May be repeated as needed.

998 Doctoral Dissertation Proposal (1-12:0:0). Prerequisite: Permission of advisor. Covers development of a research proposal under the guidance of a dissertation director and the doctoral committee. The proposal forms the basis for the doctoral dissertation. This course may be repeated as needed; however, no more than a total of 24 credits in CSI 998 and 999 may be applied toward satisfying doctoral degree requirements. Out of the 24-hour total, no more than 12 credits of CSI 998 may be applied.

999 Doctoral Dissertation (1-12:0:0). Prerequisite: Admission to doctoral candidacy. Involves doctoral dissertation research under the direction of the dissertation director. May be repeated as needed; however, no more than a total of 24 credits in CSI 998 and 999 may be applied toward satisfying doctoral degree requirements.

Computer Science (CS)

105 Computer Ethics and Society (1:1:0). Prerequisite: 12 hours of undergraduate course work. Intensive introduction to the legal, social, and ethical issues surrounding software development and computer use. Professional conduct, social responsibility, and rigorous standards for software testing and reliability are stressed. Issues such as liability, ownership of information, privacy, security, and crime are examined. Students read, write, discuss, and present reports on these topics. Students who have received credit for CS 305 cannot apply credit for this course towards the major requirements of the B.S. in Computer Science.

112 Computer Science I (4:3:2). Prerequisites: Thorough understanding of high school algebra and trigonometry and successful completion of Math Placement Test offered through the Testing Center, or a grade of C or better in MATH 105. Introduction to computer science for majors and others with a serious interest in computer science. Topics include an overview of computer system hardware and organization, problem-solving methods and algorithm development, program structures, abstract data types, simple data and file structures, introduction to analysis of algorithmic complexity and program correctness, and application.
365 Computer Systems Architecture (3:3:0). Prerequisites: Grade of C or better in CS 265 and ECE 301. Computer hardware organization, software structure, and data organization. Students complete a term project that simulates one computer system on another.

412 Introduction to Software Engineering (3:3:0). Prerequisites: Grade of C or better in CS 310 (or both CS 211 and SYST 301) and ENGL 302. Techniques in software design and development. Discusses formal models of structured programming, software engineering methods and tools, functional or object-oriented design, and documentation. Working in teams, students organize, manage, and develop a software engineering project.

440 Language Processors and Programming Environments (3:3:0). Prerequisites: Grade of C or better in CS 310, 330 and 365. Survey of basic programming language processors and software development tools such as assemblers, interpreters, compilers, and CASE tools. Topics include design and construction of language processors, formal syntactic definition methods, parsing techniques, and code generation techniques.

450 Database Concepts (3:3:0). Prerequisite: Grade of C or better in CS 310 and 330. Data models and data sublanguages for the relational, hierarchical, and network approaches to database management systems. Covers normal forms, external models, implementation, data independence, alternative logical views of data, and object-oriented design. Various approaches are compared in the context of applications.

451 Computer Graphics and Software Design (3:3:0). Prerequisites: Grade of C or better in MATH 203, CS 310 and 365. Basic graphics principles and programming. Topics include graphics hardware, graphical user interfaces, scan conversion, transformations, viewing, hidden surface removal, illumination, and graphics software design and techniques.

455 Computer Networking Systems (3:3:0). Prerequisites: Grade of C or better in CS 310, 365, and STAT 344. Data communications and networking protocols, with study organized to follow the layers of the Internet Protocol Suite (the TCP/IP family of protocols). Topics include the role of various media and software components, local and wide area network protocols, network performance, and emerging advanced commercial technologies.

471 Operating Systems (3:3:0). Prerequisites: Grade of C or better in CS 310 and 365. Issues in multiprogramming. The course covers concurrent processes and synchronization mechanisms, processor scheduling, memory management, file management, I/O management, deadlock management, performance of operating systems, and projects dealing with synchronization in a multiprogrammed OS and with virtual memory management.

475 Concurrent and Distributed Systems (3:3:0). Prerequisite: Grade of C or better in CS 471 or permission of instructor. Practical issues in designing and implementing concurrent and distributed software. Topics include concurrent programming, synchronization, multitreading, local and wide-area network protocols, distributed computation, systems integration, and techniques for expressing coarse-grained parallelism at the application level. Projects involve network programming at the application level (e.g., client-server programming using sockets and remote procedure calls).

480 Introduction to Artificial Intelligence (3:3:0). Prerequisites: Grade of C or better in CS 310 and 330. Principles and methods for knowledge representation, reasoning, learning, problem solving, planning, heuristic search, and natural language processing and their application to building intelligent systems in a variety of domains. LISP, PROLOG, or an expert system programming language is used.

482 Computer Vision (3:3:0). Prerequisite: Grade of C or better in both MATH 203 and CS 310. Basic principles of visual perception and their implementation on computer systems. Topics include early visual processing, edge detection, segmentation, intrinsic images, image modeling, representation of visual knowledge, and image understanding. Students complete projects involving real images.

483 Data Structures and Analysis of Algorithms (3:3:0). Formerly CS 465. Prerequisites: Grade of C or better in CS 310, 330, and MATH 114. Analysis of the computational resources required for important problem types by alternative algorithms and their associated data structures, using mathematically rigorous techniques. Specific algorithms are analyzed and improved.

490 Design Exhibition (3:3:0). Prerequisites: Grade of C or better in CS 421, 483, two other CS 400-level courses, and senior standing. Capstone course focusing on the design and successful implementation of a major software project, encompassing a broad spectrum of knowledge and skills, developed by a team of students. Final exhibition of the result to a faculty/industry panel is required.

491 Great Principles of Information Technology (3:3:0). Prerequisites: senior standing (at least 90 credit hours) including two 400-level CS courses. A synthesis course for CS majors. Offers a holistic view of the field and its connections with other fields. Covers great principles of information technology from algorithms and programming, distributed systems, and cooperative systems. Emphasizes the historical development of these principles, why they have stood the tests of time, how they relate to one another, and how they relate to issues in other fields. Also covers major contemporary open questions in information technology. Includes a project with an oral presentation.

498 Independent Study in Computer Science (1-3:3:0:0). Prerequisites: 60 credits, major in computer science, and permission of instructor. Research and analysis of selected problems or topics in computer science. Topic must be arranged with an instructor and approved by the department chair before registering. May be repeated for a maximum of six credits if the topics are substantially different.

499 Special Topics in Computer Science (3:3:0). Prerequisites: 60 credits and permission of instructor; specific prerequisites vary with nature of topic. Topics of special interest to undergraduates. May be repeated for a maximum of six credits if the topics are substantially different.

540 Language Processors (3:3:0). Prerequisites: MATH 125, CS 265, 310, and 330. Basic programming language processors such as assemblers, interpreters, and compilers. Topics include design and construction of language processors, formal syntactic definition methods, parsing techniques, and code generation techniques. Lab includes client-server programming using sockets and remote procedure calls.

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construction of language processors and experience with programming environments.


580 Introduction to Artificial Intelligence (3:3:0). Prerequisites: CS 310 and 330. Principles and methods for knowledge representation, reasoning, learning, problem solving, planning, heuristic search, and natural language processing and their application to building intelligent systems in a variety of domains. LISP, PROLOG, or an expert system programming language is used.

583 Analysis of Algorithms (3:3:0). Prerequisites: CS 310, 330, and MATH 125. Topics include the analysis of sequential and parallel algorithmic strategies (such as greedy methods, divide and conquer strategies, dynamic programming, searching and traversal techniques, approximation algorithms), the analysis of specific algorithms falling into these classes, NP-Hard and NP-Complete problems.

631 Object-Oriented Design Patterns (3:3:0). Prerequisite: SWE 619 or 620 or CS 540 or 571 or a graduate course in object-oriented programming or equivalent. Principles of object-oriented design through design patterns. A study of the selection of appropriate object-oriented structure after the system requirements or requirements specification of the software system have been developed. Design patterns are created in the logic view of the software system. A study of generalized design solutions for generalized software design problems. A study of the reuse of design patterns. Once developed, design patterns may be specified in any object-oriented language.

635 Foundations of Parallel Computation (3:3:0). Prerequisites: CS 583 and 540 or 571, or equivalent. Survey of the field of parallel computation. Three major parallel computing paradigms (MIMD computation, SIMD computation, and data flow computation) are covered. Emphasis is placed on the interfaces between algorithm design and implementation, architecture, and software. Parallel algorithms and parallel programming languages are examined relative to the architecture of particular parallel computers.

640 Advanced Compilers (3:3:0). Prerequisites: CS 540 and 583 or equivalent. Examination of advanced compiler techniques such as code optimizations for sequential and parallel machines; compilers for logical, functional, or object-oriented languages; and other selected topics in the current literature.

650 Database Engineering (3:3:0). Prerequisites: CS 540, 583, and 571. Data models for network, hierarchical, object-oriented, and relational management information systems. Covers development (including internal structures) of a database system.


656 Computer Communications and Networking (3:3:0). Prerequisites: CS 571 and STAT 344 or equivalent. Techniques and systems for communication of data between computational devices and the layers of the Internet Protocol Suite. Topics include the role of various media and software components, local and wide area network protocols, network design, performance and cost considerations, and emerging advanced commercial technologies. Emphasis is on the TCP/IP family of protocols.

668 Computer Architecture Systems (3:3:0). Prerequisite: CS 571 or 540 or equivalent. Examination of the principles and practices relating computer architecture to programming execution and efficiency. A new approach that stresses the performance and cost of architecture is presented. The principles of compiler and OS implications, instructions sets, basic processors, pipelines, and memory-hierarchy are examined. Specific topics may include RISC machines, cache memories, register usage, VAX architecture, and vector machines.

671 Advanced Operating Systems (3:3:0). Prerequisite: CS 571 or permission of instructor. Advanced topics in the design and implementation of microkernel-based, object-oriented, and distributed operating systems. Specific topics include support for interprocess communication, the interaction between computer architecture and operating systems, distributed file systems, transactions, and distributed shared memory.

672 Computer System Performance Evaluation (3:3:0). Prerequisites: CS 571 and MATH 351, or permission of instructor. Theory and practice of analytical models of computer systems. Topics include queuing networks, single and multiple class mean-value analysis, models of centralized and client-server systems, software performance engineering, and web servers performance.


680 Natural Language Processing (3:3:0). Prerequisites: CS 540 and 580. Explores the principles of the design of computer programs that respond appropriately to questions, commands, and statements expressed in human language, particularly English. Role of knowledge representation and linguistic theory. Students become familiar with current literature to implement a limited natural language processor.

681 Designing Expert Systems (3:3:0). Prerequisite: CS 580. Design, construction, and evaluation of software systems that solve problems generally deemed to require human expertise. Focuses on the study and use of relevant languages, environments, mathematics, and logic. Case studies of successful systems are examined. Programming projects include development of tools or small-scale systems.

682 Computer Vision (3:3:0). Prerequisite: CS 580 and 583. Study of computational models of visual perception and their implementation on computer systems. Topics include early visual processing, edge detection, segmentation, intrinsic images, image modeling, representation of visual knowledge, and image understanding.

683 Parallel Algorithms (3:3:0). Prerequisite: CS 583; CS 635 recommended. Examination of the design and analysis of parallel algorithms. Material focuses on algorithms for both theoretical and practical models of parallel computation. Algorithm design and analysis for the PRAM are
considered, as well as for existing SIMD and MIMD type architectures. Topics include sorting, graph algorithms, numerical algorithms, and computational complexity.

684 Graph Algorithms (3:3:0). Prerequisite: CS 583. Data structures and analytical techniques for the study of graph algorithms. Data structures discussed include disjoint sets, heaps, and dynamic trees. Algorithms treated include minimum spanning trees, shortest path, maximum flow, and graph planarity.

685/ECE 651/SYST 672 Intelligent Systems for Robots (3:3:0). Prerequisite: CS 580; or ECE 650; or SYST 611 or 555; or equivalent. Review of recent developments in the area of artificial autonomous systems. Applications of artificial intelligence, computer vision, and machine learning to robotics are studied. Topics include analysis and design of algorithms and architectures for planning, navigation, sensory data understanding, sensor fusion, spatial reasoning, motion control, knowledge acquisition, learning of concepts and procedures, self-organization, and adaptation to the environment.

686 Image Processing and Applications (3:3:0). Prerequisites: CS 583 and either STAT 344 or MATH 351, or equivalent. Concepts and techniques used in image processing. Methods for image capture, transformation, enhancement, restoration, and encoding are discussed. Students complete projects involving naturally occurring images.

687 Advanced Artificial Intelligence (3:3:0). Prerequisite: CS 580. Exploration of foundational issues of artificial intelligence, such as the roles of knowledge and search, the formalization of knowledge and inference, and symbolic versus emergent approaches to intelligence. Advanced programming techniques for artificial intelligence and their relationship both to the foundational issues and to the most important application areas for artificial intelligence are studied. Major programming project required.

688 Neural Network Principles (3:3:0). Prerequisite: CS 580 or equivalent. Study of neural network models, algorithms, and applications. Several connectionist and biologically based models are introduced, and their capabilities and limitations are discussed. Variety of application areas are presented. Network simulation project is required.

697 Independent Reading and Research (1-3:0:0). Prerequisites: Graduate standing, completion of at least two core courses (CS 540, 571, 580, 583), and permission of instructor. In areas of importance but insufficient demand to justify a regular course, a student may undertake a course of study under the supervision of a consenting faculty member. Students normally submit a written statement of the content of the course and a tentative reading list as part of the request for approval to take the course. Literature review, project report, or other written product is normally required.

699 Advanced Topics in Computer Science (3:3:0). Prerequisites: Completion of at least two core courses and permission of instructor. Special topics in computer science not occurring in the regular computer science sequence. May be repeated for credit when the subject is distinctly different.

700 Quantitative Methods and Experimental Design in Computer Science (3:0:0). Prerequisites: STAT 344, at least two 600 level courses in computer science, and doctoral status. Integrated treatment to the models and practices of experimental computer science. Topics include scientific methods applied to computing, workload characterization, forecasting of performance and quality metrics of systems, uses of analytic and simulation models, design of experiments, interpretation and presentation of experimental results, hypothesis testing, and statistical analyses of data. Involves one or more large-scale projects.

706 Concurrent Software Systems (3:3:0). Prerequisite: CS 571 and SWE 621 or 631 or equivalent. Study of issues related to the development of concurrent software systems. Topics include concurrent programming languages and constructs and the specification, design, verification, and validation of concurrent programs. Students are required to solve concurrent programming problems and to check their solutions by using verification, testing, and debugging tools.

707 Distributed Software Systems (3:3:0). Prerequisite: CS 706 or permission of instructor. Issues in the design and implementation of distributed applications. Topics covered include distributed programming using sockets as well as higher-level technologies such as remote procedure calls and distributed object middleware technologies including Java RMI, CORBA, and DCOM.

735 Concurrency (3:3:0). Prerequisite: CS 635 or equivalent. Description of the formal specification of concurrent systems and algorithms, using formal methodology based on the theory of communicating sequential processes. Emphasis is placed on using the Occam programming language to the implementation of formal specifications of concurrent systems.

750/IT 750 Theory and Applications of Data Mining (3:3:0). Prerequisite: CS 681, 687, or 688, or permission of the instructor. Concepts and techniques in data mining and their multidisciplinary applications. Topics include databases, data cleaning and transformation; concept description; association and correlation rules; data classification and predictive modeling; performance analysis and scalability; data mining in advanced database systems, including text, audio, and images; and emerging themes and future challenges. Term project and topical review required.

752 Interactive Graphics Software (3:3:0). Prerequisite: CS 652. Advanced graphics methods and tools. Topics include visualization, modeling, rendering, animation, simulation, virtual reality, graphics software tools, and current research topics.

755 Advanced Computer Networks (3:3:0). Prerequisite: CS 656. Current and emerging issues in advanced computer networks and their applications. Topics include software systems associated with packet and cell switched networking architectures and protocols, high-performance LANs, scheduling and congestion control, mobile networking, multimedia applications, and the next generation of the Internet.

756 Performance Analysis of Computer Networks (3:3:0). Prerequisite: CS 656 or equivalent. Analytical and simulation techniques for modeling and analysis of computer networks. Examines elementary queueing analysis; networks of queues; routing and flow controls; and applications to local and wide area networks, internets, and emerging networking technologies such as Asynchronous Transfer Mode.
773 Real-Time Systems Design and Development (3:3:0). Prerequisite: CS 636 or 671. Real-time systems and the principles supporting their design and implementation. Emphasis is placed upon fundamental results from real-time scheduling theory and their relevance to computer system design. Topics include system design issues for real-time applications involving communication networks, operating systems, databases, and multimedia.

777 Human-Computer Intelligent Interaction (3:3:0). Prerequisites: CS 580 and 652 (or 682) or permission of the instructor. Current and emerging issues in human-computer intelligent interaction and human-centered systems and their applications. Topics include video processing, visualization, virtual environments, adaptation and tutoring, image and scene modeling, analysis and synthesis, face and gesture recognition, speech and natural language processing. Term project and topical review required.

782 Machine Learning (3:3:0). Prerequisite: CS 681, 687, or 688 or permission of instructor. Survey of the field of machine learning that is concerned with developing intelligent adaptive systems that are able to improve through learning from input data or from their own problem-solving experience. Topics provide broad coverage of past and current developments in machine learning, including basic learning strategies and multistrategy learning.

785 Knowledge Acquisition and Problem Solving (3:3:0). Prerequisite: CS 680, 681, or 687 or permission of instructor. Principles and major methods of the basic stages of knowledge acquisition (systematic elicitation of expert knowledge, knowledge base refinement, and knowledge base optimization) in the context of general problem-solving methods. Case studies of successful knowledge acquisition and problem solving systems are presented. Projects include development or application of knowledge acquisition tools for knowledge-based systems.

980 Project Seminar (3:3:0). Prerequisite: 18 credits applicable toward the M.S. in Computer Science. Master's degree candidates undertake a project using the knowledge gained in the M.S. program. Topics are chosen in consultation with an advisor. Intended to meet the project or thesis requirement for the M.S. in Computer Science.

999 Thesis (1-6:0:0). Prerequisite: 18 credits applicable toward the M.S. in Computer Science. Original or expository work evaluated by a committee of three faculty members.

998 Doctoral Dissertation Proposal (1-12:0:0). Work on a research proposal that forms the basis for a doctoral dissertation. May be repeated as needed. No more than 24 credits of CS 998 and 999 may be applied to doctoral degree requirements.

999 Doctoral Dissertation (1-12:0:0). A formal record of commitment to doctoral dissertation research under the direction of a faculty member in computer science. May be repeated as needed. No more than 24 credits of CS 998 and 999 may be applied to doctoral degree requirements.

Conflicts Analysis and Resolution (CONF)

Institute for Conflict Analysis and Resolution (CONF)

Unless otherwise noted, all nondepartmental majors and extended study students require permission of instructor to register for CONF classes. Note: The ICAR curriculum is being revised for 2003. Please call for more information.

501 Introduction to Conflict Analysis and Resolution (3:3:0). Prerequisite or corequisite for all M.S. CONF majors. Introduction to the field of conflict analysis and resolution. Examines definitions of conflict and diverse views of its "resolution." Explores thinking about human behavior and social systems as they relate to the origins of conflict and the role of conflict in violent and peaceful social change. Considers appropriate responses to conflict at interpersonal, intergroup, industrial, communal, and international levels.

601 Theories of Conflict and Conflict Resolution (3:3:0). Prerequisite: CONF 501 or 801. Examines major social scientific theories of conflict. Emphasis is on the need for theories to inform our ability to resolve conflict. Weaves together ideas from conventional disciplines with new approaches, especially to causes of deep-rooted conflict. Focus is on analysis as a tool.

610 Philosophy and Methods of Conflict Research (3:3:0). Prerequisite: CONF 501 or 801. Introduction to research design, including use of theory to define the problem; exploring research approaches; gathering, analyzing, and interpreting data. Latter includes field observation; field experiments; lab experiments (simulations); surveys and sampling techniques; and archival, documentary, and literature resources. Quantitative techniques include theories of measurement (numerical and ordinal scales); distributions; and analysis techniques (chi-square, correlating, factor analysis). Briefly introduces philosophies of science and its limits.

611 M.S. Research #2 (3:3:0). Prerequisite: CONF 501 and 610. Builds on the foundation of CONF 610. Guides students through the design, execution, interpretation, analysis, presentation, and evaluation of field research into conflict and conflict resolution.

642 Integration of Theory and Practice (3:3:0). Taken in the last semester of master's course work. Assists students in developing their own "generic" theory of conflict by reviewing and integrating their prior course work. Students are expected to demonstrate a holistic comprehension of the field by writing a major essay of publishable quality about the causes, events, and resolution of a particular conflict of their own choosing.

690 Practicum in Conflict Analysis and Resolution (6:1:5). Prerequisite: CONF 501 or 801 and 713; 714 or 715 recommended but not required. Two semesters, taken 3 credits per semester. Involves students in an in-depth field study of ongoing conflict situations and in the design and delivery of intervention processes to manage or resolve the conflicts.

694 Internship (1-6:0:1-6). Prerequisite: 21 hours of prior course work, including CONF 713 and 714. CONF 715 recommended. Under direction of the clinical coordinator, students spend at least 160 hours working on a project involving the study and/or resolution of conflict. Students are expected to mesh theory and practice through observation and experience. The course includes a comprehensive report analyzing the individual's experience.

695 Selected Topics (3:3:0). Topics vary from year to year. They are announced each academic year.
697 Directed Reading (1-3:0:1-3). Independent reading at the master's level on a specific topic related to conflict analysis and resolution as agreed to by a student and a faculty member. This may be repeated up to 6 credits.

701 Theories of Social Harmony (3:3:0). Prerequisite: CONF 501 or 801; CONF 601 recommended but not required. Part of a series of theory courses and the companion to CONF 601. This course explores theories that define and explain social harmony and cooperation. Examining social institutions that manage and mediate conflict at all levels (interpersonal to international), the course provides a foundation for subsequent courses in peace building, peace making, multilateral organizations, social change, and development.

702 Peace Studies (3:3:0). Traces the evolution of peace studies since World War II with particular attention to changing definitions of “peace,” “conflict,” and “violence,” and the implications for the field of conflict analysis and resolution. Links peace keeping, peace building, and peace making in an integrative framework.

703 Conceptions of Practice (3:3:0). Prerequisites: CONF 501, 601, 713. Provides a framework for integrating theory and practice in conflict resolution. Reviews types of practice and theories of intervention and change, discusses the analytic process of assessment and diagnosis before intervention. Considers how research can be incorporated into practice and how thoughtful practice generates research questions. Includes methods of program evaluation and action research. Students are encouraged to identify and/or develop their own theories of practice.

709 War, Violence, and Conflict Resolution (3:3:0). Prerequisite: CONF 501 or 801. Considers various theories of violence, its causes and conditions, and applies them to a variety of instances: family abuse, religious and ethnic violence; terrorism, revolution, and warfare. Insights gained from study of initiation, escalation, management, resolution, and prevention of violence are applied to theories about the resolution of deep-rooted conflicts.

713 Laboratory and Simulation I: Interpersonal and Intergroup Conflict (3:0:3). Prerequisite or corequisite for all CONF majors: CONF 501 or 801. An introductory skill-building course that integrates conflict theory and practice using a reflective practitioner model. Students learn necessary skills for third-party facilitation and mediation including active listening, empathy, paraphrasing, reframing, and negotiation, and analytical skills of problem solving and creation of transformational processes. Although these skills are essential for all levels of conflict intervention, cases for practice mainly focus on interpersonal and intergroup conflict.

714 Laboratory and Simulation II: Organizational and Community Conflict (3:0:3). Prerequisites: CONF 501 or 801 and 713. Moves from conflicts that are simply described to those with multilevel components, such as community and organizational conflicts. This course expands the skills acquired in 713 by adding the following: recording chronology; identifying roles played by various participants; observing turning points in the resolution process; precisely stating the agreed-upon solution.

715 Laboratory and Simulation III: International and Interc communal Conflict (3:0:3). Prerequisites: CONF 501, 713, and 714, or permission of instructor. A continuation of the study of resolution processes as applied to highly complex systems, especially where one party denies the legitimacy of existing political authority. Considers third-party options for intervention in revolutionary and international conflicts, and means for building communication and trust among parties, and implementing agreements.

720 Ethnic and Cultural Factors in Conflict Resolution (3:3:0). Prerequisite: CONF 501 or 801. Examines the role culture plays in the genesis, structuring, and resolution of processes of conflict within and between groups. Special attention is given to ethnicity and other subcultural markers of identity in complex social systems as both the generators and outcomes of conflict. The relevance of these variables to the success or failure of conflict resolution is explored.

721 Conflict and Race (3:3:0). Prerequisite: CONF 501 or 801. Cross-listed as SOCI 523. Addresses historic analyses of racial and ethnic identity conflicts and their resolution.

722 Conflict and Religion (3:3:0). Prerequisite: CONF 501 or 801. Explores the role of organized religions in conflict, war, peace making, and conflict resolution.

723 Conflict and Gender (3:3:0). Prerequisite: CONF 501 or 801. Examines constructs of gender and conflict as they relate to a critical analysis of theory and practice. Feminist theories are reviewed for their contributions to social and conflict theories. Narratives are used to explore how gender and power dynamics interact in conflict.

724 Conflict and “isms” (3:3:0). Prerequisite: CONF 501 or 801. “Them” and “Us.” Deals with the identification and analysis of interrelationships and similarities among the various ways human beings bifurcate themselves into “us” and “them” based on national, ethnic, religious, gender, and other criteria. Further, the course explores the role these divisions play in the development and intractability of identity-based conflicts and the implications for conflict analysis and resolution. Examples include nationalism, racism, sexism, ageism, classism.

725 Conflict and Spirituality (3:3:0). Prerequisite: CONF 501 or 801. Explores the role of spirituality in the naming, framing, and unwinding of conflict. The roles of apology, reconciliation, and forgiveness are considered as these relate to the deconstruction of enemy images in protracted communal and interpersonal conflicts. Relational empathy and ways of cultivating connection across perceived deep differences is examined.

726 Moral and Philosophical Foundations of Conflict (3:3:0). Prerequisite: CONF 501 or 801. Provides an overview of moral, philosophical, and ethical underpinnings of concepts of conflict and conflict resolution. The course enhances a student’s ability to engage in discourse approaching conflict from a moral or philosophical disciplinary background.

727 Cross-Cultural Analysis of Conflict (3:3:0). Prerequisite: CONF 501 or 801. Introduces techniques of participant observation and anthropological research. Provides insights into cross-cultural fieldwork experience, an important skill for facilitating of working with groups outside their own “worldview.” This course is highly recommended for students interested not only in understanding diverse groups, but in gaining first-hand insights into the wide variation in world views and values understandings held by different people.
730 Structural Sources of Conflict (3:3:0). Prerequisites: CONF 501 or 801, and 601 for M.S.; or 802 for Ph.D. Examines how structures and institutions affect behavior and give rise to conflictual relationships at all social levels, from the interpersonal to the international. Explores the role of conflict resolution as a political process proving opportunities for nonviolent system change.

731 Conflict in Organizations (3:3:0). Prerequisite: CONF 501 or 801. Explores the intersection and the dynamics of organizational behavior and the dimensions of conflict. Theoretical perspectives and cases are used to examine the issues involved in conflict analysis and resolution. Strategies for prevention and intervention are practiced. Students conduct field research in the greater metropolitan area to help integrate course content.

732 Conflict in Development (3:3:0). Prerequisite: CONF 501 or 801. Economic and social development cause trauma as new ideas conflict with old ones. Particularly when development is generated or directed by forces outside of a culture, the conflict takes on deep-rooted character. This course explores how conflict analysis and resolution approaches can be applied to conflicts of development and change.

733 Law and Jurisprudence in Conflict Resolution (3:3:0). Prerequisite: CONF 501 or 801. Contrasts legal processes and institutions with alternative approaches to dispute resolution. Defines and distinguishes among law, "alternative dispute resolution," and problem-solving analysis as methods for resolving rather than controlling conflict. Asks to what extent legal procedures are truly applicable to resolving deep-rooted conflict.

734 Crime and Conflict Resolution (3:3:0). Prerequisite: CONF 501 or 801 or permission of instructor. Explores the usefulness of conflict analysis and resolution perspectives in analyzing the causes, nature, and consequences of criminal behavior, and alternative approaches to the crime problem.

735 Global Context of Conflict (3:3:0). Prerequisite: CONF 501 or 801. Advances students' skills and expands their knowledge base in critical analysis and creative problem solving. The root causes of conflict in a global context are examined in terms of gender inequality, cultural differences, unequal North/South relations, militarism, economic oppression, genocide, maldevelopment, religious and ethnic struggle, and environmental scarcity. Students are expected to develop their own conceptual tool boxes needed to analyze conflicts in different parts of the world.

738/HSCI 635 Research Seminar in Health and Conflict Analysis (3:3:0). This capstone seminar is the final course in the graduate certificate program in conflict resolution for health professionals. It involves conducting research and analyzing a specific conflict situation in depth. The course builds on theory, research, and practice learned in previous courses for this certificate.

740 Conflict Roles, Resources, and Ethics (3:3:0). Prerequisites: CONF 501 or 801, 713. Analyzes and critiques the nature and roles in conflicts. Theoretical perspectives and case histories are used to understand how settings affect roles. Includes ethical assessment of interventions in a variety of conflict settings.

741 Negotiations (3:3:0). Prerequisite: CONF 501 or 801 or permission of the instructor. Student's negotiating experiences are used to construct a framework for thinking about and analyzing negotiation processes. The framework is then used to organize a review of the research literature on the "rhythms" and "patterns" of negotiation as well as to analyze a variety of actual cases. Exercises and class projects are interwoven with state-of-the-art concepts and findings as described in Professor Druckman's article in the October 1996 issue of The Negotiation Journal ("Bridging the Gap between Negotiating Experience and Analysis").

742 Mediating Policy Conflict (3:3:0). Prerequisite: CONF 501 or 801 or permission of the instructor. Analyzes disputes involving the formation, implementation, and reform of social policy. Development and assessment of the roles of mediation and other intervention approaches in policy conflicts in the public, private, and citizens sectors.

743 Dynamics of Conflict Termination (3:3:0). Prerequisite: CONF 501 or 801. Analytically studies the nature of the "peace process" in terminating international, transnational, and civil conflicts. Includes analysis of parties' decision-making procedures during processes of de-escalation, pre-bargaining, and negotiation. Examines impact of various third-party roles (mediator, conciliator, facilitator) on the overall process, including implementation and monitoring of agreements. Takes as exemplary case studies efforts to terminate such conflicts of the Iran-Iraq war, the Cyprus dispute, and the Eritrean conflict.

744 Peace Keeping (3:3:0). Prerequisite: CONF 501 or 801. Designed to answer questions as: To what degree do international "peace-keeping" forces embrace conflict resolution and peace-building as part of their mission? To what degree could conflict resolution be integrated? What are the roles conflict resolvers can play in peace-keeping environments?

745 Leadership Roles in Conflict and Conflict Resolution (3:3:0). Prerequisite: CONF 501 or 801 or permission of the instructor. Working premise for the course is that leadership responses to conflict are affected by several variables, among them race, ethnicity, and gender. Explores roles of leadership decision-making styles as agents of conflict across a range of conflict scenarios at the interpersonal, community, organizational, and international levels.

746 Peace Building (3:3:0). Prerequisite: CONF 501 or 801. Building on initiatives of the United Nations and other multilateral organizations, this course explores the dynamics of post-conflict peace building. Further, it prepares students of conflict resolution to play innovative roles in the reconstruction of civil societies.

747 Reconciliation (3:3:0). Prerequisite: CONF 501 or 801. Explores processes of acknowledgment, reconciliation, forgiveness, and restitution. Literature, case studies, and other research are reviewed to assess the applicability and impact of these efforts.

795 Professional Development Seminars (1-3:1-3:0). Prerequisite: CONF 501 or 801. These one- and two-credit courses will be scheduled nonconventionally using weekends, concentrated presentations, and intersession periods to give students advanced professional skills. Possible topics include Marketing Conflict Resolution Services, Academic Course Design, Training Design, Mediation, Facilitation, Family Practice, Fundraising, Writing for Publication.
Conflict Analysis and Resolution (CONF) • Counseling and Development (EDCD) 319

Advanced Field Research Techniques, Grassroots Applications of Conflict Resolution. May be repeated.

799 Master's Thesis (1-6:0:1-6). Prerequisites: CONF 501, 713, 610. Two semesters, normally taken as 3 credits per semester. Original research or analysis under the direction of a thesis committee.

801 Introduction to Conflict Analysis and Resolution (3:3:0). Prerequisite: either corequisite or corequisite for all Ph.D. CONF students. Introduction to the field of conflict analysis and resolution for doctoral students. Examines definitions of conflict and diverse views of its “resolution.” Explores thinking about human behavior and social systems as they relate to the origins of conflict and the role of conflict in violent and peaceful social change. Considers appropriate responses to conflict at interpersonal, intergroup, industrial, communal, and international levels.

802 Micro Theories (3:3:0). Prerequisites: CONF 801, and acceptance in the doctoral program, or permission of instructor. Understanding human conflict requires knowledge of human behavior, motivation and perception. This course reviews and critically analyzes several psychological theories for their application to conflict analysis and resolution. The work of major personality theorists is surveyed as well as material on cognition, creativity, and change.

803 Macro Theories (3:3:0). Prerequisites: CONF 801, 802 and acceptance in the doctoral program, or permission of instructor. Understanding social conflict and the potential for conflict resolution requires that both conflict and cooperation be perceived in relationship to patterns of social change. This course reviews and critiques significant theories of social change to establish a basis for creative conflict analysis and resolution.

810 Philosophy of the Social Sciences (3:3:0). Prerequisite: CONF 801 or permission of instructor. A philosophical inquiry into the history and structure of ideas and the building of scientific hypotheses. This course assumes that the ways we think, as human beings, and the ways we build and test our theories about the world are closely linked. Explores and critiques the thinking of major 20th century thinkers from the social sciences on this topic, thus forming an introduction to research methodology.

811 Advanced Research Methods I (3:3:0). Prerequisite: CONF 801, 810, or permission of instructor. A prior course such as STAT 510 in intermediate statistics is presumed. Building on the logic of inquiry, this course introduces students to the steps in the research process needed to prepare a dissertation and implement published research. The course covers a wide array of quantitative and qualitative research approaches used in the social sciences with an emphasis on conflict analysis.

812 Advanced Research Methods II (3:3:0). Prerequisite: CONF 811 or permission of instructor. A continuation of steps in the research process needed to prepare a dissertation and implement published research. It builds on CONF 811 by extending the coverage of quantitative and qualitative research approaches used in the social sciences with an emphasis on conflict analysis.

890 Practicum in Conflict Analysis and Resolution (6:1:5). Prerequisite: CONF 801 and 713 (714 or 715 recommended but not required). Two semesters. Involves students in an in-depth field study of ongoing conflict situations and in the design and delivery of intervention processes to manage or resolve the conflicts.

897 Directed Reading (3:3:0). Independent reading at the doctoral level on a specific topic related to conflict and conflict resolution as agreed to by a student and faculty member.

900 Integrating Theory, Practice, and Method in Conflict Analysis (3:3:0). Prerequisites: CONF 801, 802, and at least nine further credits in the doctoral core program. Analyzes the theoretical basis underlying the methods of research in conflict resolution. Exploration of how theory is built through the reciprocal influence of research and practice.

901 Theory Development (3:3:0). Prerequisites: CONF 801 and 802 or permission of instructor. Examines recent developments in theory and research in conflict analysis, with particular emphasis on project and dissertation work recently undertaken and completed. Its purpose is to link ongoing research in this and parallel fields to students’ own plans for dissertation work, and examine methodological approaches currently being used as well as the direction and focus of current substantive research.

998 Doctoral Dissertation Proposal (1-6:1-6:0). Prerequisite: successful completion of all course work and doctoral qualifying examinations. Work on a research proposal that forms the basis for a doctoral dissertation. May be repeated for up to six total credits toward degree.

999 Doctoral Dissertation Research (1-12:0:1-12). (Credits vary. At least six credits must be taken toward the degree.) Research on an approved dissertation topic under the direction of a committee. (Note: At least 12 credits of 998 and 999 must be accumulated toward the degree).

Counseling and Development (EDCD)

Graduate School of Education

500 In-Service Educational Development (1-6:0:0). See EDUC 500.

525 Advanced Human Growth and Development (3:3:0). Covers human development throughout the life span, including emotional, physical, and cognitive development, and emphasizes personal adjustment and achievement.

597 Special Topics in Education (3:3:0). See EDUC 597.

598 Directed Reading, Research, and Individual Projects (1-6:0:0). See EDUC 598.

599 Thesis (6:0:0). See EDUC 599.

600 Workshop in Education (1-6:0:0). See EDUC 600.

601 Introduction to Research in Counseling (3:3:0). Enhances students’ knowledge of and involvement in counseling research by introducing techniques and principles used to design, implement, and evaluate research projects and program development in community and school settings.

602 Foundations in Counseling (3:3:0). Provides basic counseling skills. Emphasizes history of counseling, multifaceted role of counselors, professional organizations and memberships, and APA style of research. Introduces portfolio.

603 Counseling Theories and Practice (3:3:0). Prerequisites: EDCD 602 and admission to counseling and development program or permission of instructor. Covers major

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320 Counseling and Development (EDCD)

Theoretical approaches to counseling, including psychodynamic, Adlerian, existential, person-centered, cognitive-behavioral, systems, solution-focused, and integrated. Provides supervised practice in basic counseling skills. A lab is included.

604 Assessment and Appraisal in Counseling (3:3:0). Prerequisite: EDCD 601. Prepares students to become skilled practitioners of psychological and educational tests and assessment procedures that are used and applied in a counseling context.

605 Introduction to Counseling Theory and Practice (3:3:0). Introduces counseling theories, principles, and practices. Students review, discuss, and analyze four of the basic therapeutic approaches to individual and group counseling with clients. The emphasis is on learning basic counseling skills through supervised practice and critique sessions. This course includes a lab.

606 Counseling Children and Adolescents (3:3:0). Prerequisite: EDCD 603 or permission of instructor. Presents theories, techniques, and strategies for working with children and adolescents and their families. Explores counseling issues related to this population. Provides practice of techniques and strategies with emphasis on supervised practice sessions.

607 Advanced Counseling Theory and Practice (3:3:0). Prerequisite: Admission to the counseling and development program, EDCD 525 or equivalent, and EDCD 605; or permission of instructor. Covers in-depth selected counseling theories, principles, and topics. Provides intensive practice in advanced counseling techniques and approaches with emphasis on supervised practice sessions. A lab is included.

608 Group Processes and Analyses (3:3:1). Prerequisites: Admission to the counseling and development program; EDCD 603 or 605; and either EDCD 607, 608, or 609. Presents theories appropriate to various types of groups and descriptions of group practices, methods, dynamics, and facilitative skills. Focuses on application of theory to practice. A lab is included.

609 Advanced Counseling Skills and Strategies (3:3:0). Prerequisites: EDCD 603 and admission to the counseling and development program or permission of instructor. Covers counseling skills and strategies associated with major counseling theories, principles, and topics. Provides intensive practice in both technical and conceptual skills with emphasis on case studies and supervised practice.

610 Career and Educational Counseling (4:3:2). Prerequisite: Admission to the counseling and development program; EDCD 604 and 603; or EDCD 605 and either 607, 606, or 609. Covers vocational choice theory, sources of occupational and educational information, approaches to career decision-making processes, and career development exploration techniques. Focuses on application of theory to practice. A lab is included.

611 Introduction to Ethical and Legal Issues in Counseling (2:2:0). Prerequisite: EDCD 602. Introduces principles, practices, and application of ethical and legal issues in counseling.

623 Principles and Practices of Elementary School Counseling (3:3:0). Introduces school counseling programs at the elementary school level. Presents the philosophy, principles, and practices of effective elementary school counseling, as well as developmental needs of students 5 to 10 years of age.

626 Principles and Practices of School Counseling (3:3:0). Prerequisite: EDCD 602 and admission to counseling and development program or permission of instructor. Introduces school counseling programs at the elementary, middle, and high school levels. Presents philosophy, principles, and practices of effective school counseling, as well as developmental needs of students 5 to 18 years of age.

627 Principles and Practices of Secondary School Counseling (3:3:0). Introduces school counseling programs at the secondary school level. Presents philosophy, principles, and practices of effective secondary school counseling, as well as developmental needs of students 14 to 18 years of age.

628 Counseling Leadership, Social Change, and Advocacy (3:3:0). Prerequisites: Admission to the counseling and development program; EDCD 603; and EDCD 626 or 634 or permission of instructor. Covers basic theories, models, and strategies of leadership, social change, and advocacy in community and school settings. Emphasizes application of the theories and models.

629 Principles and Practices of School Counseling Leadership and Administration (3:3:0). Prerequisites: Master's degree in counseling or related counseling field from an accredited institution of higher education; and/or permission to the school counseling leadership certificate program; and/or permission of counseling and development coordinator. Provides advanced study of philosophy, principles, and practices in education for secondary school counselors preparing for a career in school counseling leadership and administration. Introduces specific school counseling leadership and administrative responsibilities at the secondary level (to include middle and high school).

630 School Counseling Leadership (3:3:0). Prerequisites: Master's degree in counseling or related counseling field from an accredited institution and/or admission to the school counseling leadership certificate program and/or permission of program coordinator AND completion of EDCD 629. Covers basic theories, models, and applications of leadership in education. Major emphasis is on leadership in school counseling.

631 Ethical and Legal Issues in Counseling (3:3:0). Prerequisites: Admission to the counseling and development program and EDCD 605 or postgraduate counseling students by permission of program coordinator/instructor. Covers principles, practices, and application of ethics and law in counseling.

652 Introduction to Substance Abuse Counseling (3:3:0). Prerequisites: Admission to the counseling and development program and EDCD 603, or permission of instructor. Provides an introduction to substance abuse counseling. Covers topics such as addiction issues, diagnosis and treatment planning, and individual and group counseling strategies with diverse populations.

654 Counseling, Ethics, and Consultation in Community Agencies (3:3:0). Emphasizes the types of services and facilities provided, the needs and problems of the client population served, the role and function of the counse-
lor in the agency setting, and the personnel needs of the individual agency.

656 Diagnosis and Treatment Planning for Mental Health Professionals (3:3:0). Prerequisites: Admission to the counseling and development program and EDCD 603. Using actual and hypothetical cases, this course helps the student develop written plans and simulate implementation for overall diagnosis and treatment of clients and their families.

658 Couples and Family Counseling (3:3:0). Prerequisites: Admission to the counseling and development program; EDCD 603 or 605; and EDCD 607 or 609. Introduces major approaches to counseling from a multicultural perspective. Covers the issues, characteristics, and needs relevant to diverse populations as they relate to counseling. Explores counseling from a multicultural perspective.

660 Multicultural Counseling (3:3:0). Prerequisites: Admission to the counseling and development program; EDCD 608; EDCD 603 or 605; and EDCD 607, 606, or 609. Covers the issues, characteristics, and needs relevant to diverse populations as they relate to counseling. Explores counseling from a multicultural perspective.

668 Counseling and Development Programming (3:3:0). Prerequisite: EDCD 605 or permission of instructor. Explores needs assessment, planning, and implementation of counseling and human development programs, including the development of workshop, group, and individual sessions. Focuses on consultation and collaboration with other professionals to facilitate human development and self-direction.

754 Practicum in Counseling and Development (3-6:3:3). Prerequisites: Completion of the counseling and development program except for practicum and internship; permission of advisor; overall GPA of 3.000; no grade of C in any skills courses [EDCD 605, 607, 608, and 610]; no more than two grades of C in any other graduate course work required by the counseling and development program. Provides supervised practice in a counseling setting similar to the setting in which the student may work. This is a weekly graduate class with an emphasis on site processing.

755 Practicum in Counseling (3:3:3). Prerequisites: Completion of the counseling and development program except for practicum and internship; permission of advisor; overall GPA of 3.000; no grade of C in any skills courses [EDCD 603 or 605; EDCD 608; EDCD 606, 607, or 609; and EDCD 610]; no more than two grades of C in any other graduate course work required by the counseling and development program. Provides supervised practice of 200 clock hours (minimum) in a counseling setting similar to the setting in which the student may work. This is a weekly graduate class with an emphasis on site processing.

791 Internship in Counseling (3:3:3). Prerequisites: Completion of the counseling and development program except for internship; permission of advisor; overall GPA of 3.000; no grade of C in any skills courses [EDCD 603 or 605; EDCD 608; EDCD 606, 607, or 609; and EDCD 610]; no more than two grades of C in any other graduate course work required by the counseling and development program. Provides supervised practice of 200 clock hours (minimum) in a counseling setting similar to the setting in which the student may work. Skills and practice build on previous practicum experiences. This is a weekly graduate class with an emphasis on site processing.

795 Advanced Internship in Counseling and Development (2-6:3:0). Prerequisites: Master's degree in counseling or related counseling field from an accredited institution of higher education; and/or admission to the school counseling leadership certificate program; and/or permission of counseling and development coordinator and EDCD 629. Provides supervised practice of advanced counseling in a setting similar to that in which the student plans to work.

797 Advanced Topics in Education (3:3:0). See EDUC 797.

895 Emerging Issues in Counseling and Development (3:3:0). Prerequisite: Admission to the Ph.D. program or permission of instructor. Examines current and controversial issues in the counseling profession, including counseling theory and methodology, development of client groups, new roles and settings for counselors, emerging assessment procedures, and new understanding of diagnosis, as well as the impact of societal changes on the counseling profession.

896 Advanced Multicultural Counseling (3:3:0). Prerequisites: Master's degree in counseling or related counseling field from an accredited institution of higher education; EDCD 660 or equivalent; EDCD 895; and admission to the counseling and development Ph.D. specialization or permission of instructor. Focuses on advanced issues in multicultural counseling, including an examination of multicultural counseling theories, skills, assessment, supervision, research, ethics, and current multicultural issues.

897 Advanced Group Counseling (3:3:0). Prerequisites: Master's degree in counseling or related counseling field from an accredited institution of higher education; EDCD 608 or equivalent; EDCD 895; and admission to the counseling and development Ph.D. specialization or permission of instructor. For doctoral students who have had experience and training in group work. Focuses on providing a greater understanding and advanced skill application in group dynamics, group process, and group leadership.

898 Grant Writing and Publishing (3:3:0). Prerequisites: Master's degree in counseling or related counseling field from an accredited institution of higher education; EDCD 895; and admission to the counseling and development Ph.D. specialization or permission of instructor. Focuses on grant writing and publishing in the field of counseling and psychology.

990 Advanced Internship in Counseling Leadership (3:3:0). Prerequisites: Admission to the counseling and development Ph.D. specialization; EDCD 895; and EDCD 628 or equivalent. Provides supervised practice in a counseling leadership setting or position. Emphasizes counseling leadership in practice. This is a biweekly class with an emphasis on site processing.
emphasizes on site processing, leadership skills, and topical seminars.

991 Advanced Internship in Multicultural Counseling (3:3:0). Prerequisites: Admission to the counseling and development Ph.D. specialization; EDCD 895; EDCD 896; and EDCD 628 or equivalent. Provides students with supervised practice in a multicultural training setting. Emphasizes the intensive use of multicultural competencies in practice, supervision, and program development and evaluation in school and community agency settings. This is a biweekly class with an emphasis on site processing, leadership skills, and topical seminars.

992 Advanced Internship in Social Justice (3:3:0). Prerequisites: Admission to the counseling and development Ph.D. specialization; EDCD 628 or equivalent; and EDCD 895. Provides the opportunity for students to implement programs and strategies designed to affect social justice for clients in school or community settings. This is a biweekly class with an emphasis on topical seminars and supervision.

Cultural Studies (CULT)

Cultural Studies

802 Histories of Cultural Studies (3:3:0). Prerequisite: Admission to program, to M.A. "feeder" track, or permission of instructor. This course required of all students. Provides a historical survey of the principal works and theories of cultural studies. Offers an overview of the contemporary situation of cultural studies and assesses the possibilities for its future development.

806 Research Seminar in Cultural Studies (3:3:0). Prerequisites: Admission to program and CULT 802. Introduction to research methods in cultural studies. Specific topics vary.

808 Student/Faculty Colloquium in Cultural Studies (1:1:0). Prerequisite: Admission to program or permission of instructor. Forum for the presentation of original and current research in cultural studies. Students register for one credit per semester over a three-semester period.

810 Culture and Political Economy (3:3:0). Prerequisite: Admission to program or permission of instructor. Designed to survey many of the social science and humanities classics that relate cultural production and consumption to underlying political economic conditions: from Marx to Lukacs to the Frankfurt School, from work in semiotic neo-Marxism to productivist theories of power indebted to Foucault, and taking in such diverse sources as Baudrillard, Bourdieu, Harvey, Jameson, Mauss, Mill, Polanyi, Sahlin, A. Smith, and Weber.

812 Visual and Performance Culture (3:3:0). Prerequisite: Admission to program or permission of instructor. Examines theories of visual culture, covering such topics as film, video, visual arts, music, display, ritual, performance, performativity, theories of the aesthetic, as well as their production, consumption, and reception. Key readings from theorists such as Adorno, Artaud, Benjamin, Brecht, Bryson, Doane, Fiske, Heath, Marcuse, Merleau-Ponty, and Sartre.

814 Gender and Sexuality (3:3:0). Prerequisite: Admission to program or permission of instructor. Interrogates the various ways in which the notion of gender functions both in the maintenance and in the analysis of issues of social and cultural power. Examines conflicting notions of sexuality and their role in cultural signification. At the same time, the course seeks to explicate the relation between sexuality and gender.

816 Science/Technology (3:3:0). Prerequisite: Admission to program or permission of instructor. Considers theories of and major debates about the culture of science, the social construction of nature, and the effects of technology on modern cultural forms—key concepts for many areas of cultural studies. Readings from such theorists as Nietzsche, Heidegger, Horkheimer, Feyerabend, Bahro, Haraway, and Latour.

818 Social Institutions (3:3:0). Prerequisite: Admission to program or permission of instructor. Considers theories of institutional practice and social structures, from Max Weber to Michel Foucault. Covers such key topics for cultural studies as prisons, bureaucracies, museums, schools, political parties, and social movements.

820 After Colonialism: Race, Ethnicity, Nationalism (3:3:0). Prerequisite: Admission to program or permission of instructor. Surveys the making of racial, ethnic, caste, and national identities in colonial contexts; the roles of scientific racism in both "periphery" and "core" sites; the subsequent history of race, ethnic, national identities and conflicts; classical and contemporary texts by authors such as DuBois, Fanon, Gilroy, and Spivak; and the particular place of issues of national, racial, and ethnic identities in contemporary cultural studies.

860 Special Topics in Cultural Studies (1-3:1-3:0). Prerequisite: Admission to program or permission of instructor. Specialized interdisciplinary topics in cultural theory and analysis. Content varies. May be repeated.

870 Directed Readings (3:0:0). Intensive reading course aimed at developing comprehensive coverage for specific fields as agreed on in consultation with student's advisor. May be repeated.

880 Independent Study (1-3:0:0). Reading and research on a specific topic, resulting in a written project. May be repeated.

998 Doctoral Dissertation Proposal (1-6:0:0). Work on a research proposal that forms the basis for the doctoral dissertation. Students enrolling in 998 must have completed all cultural studies course work, fulfilled the foreign language requirement, and passed the comprehensive examination. Course may be repeated once for credit. Graded S/NC.

999 Doctoral Dissertation (1-12:0:0). Prerequisites: Completion of CULT 998 and public presentation of the dissertation proposal. Doctoral dissertation research and writing under the direction of the student's dissertation committee. Graded S/NC.

Dance (DANCl)

College of Visual and Performing Arts

101 Dance Appreciation (3:3:0). Introduction to dance as universal human activity, an expression of cultural identity and an art form. This survey of global dance includes folk, ceremonial/ritual, trance, court, classical, and theatrical dance forms.
114 Rhythmic Analysis and Music Resources for Dance (3:3:0). Prerequisite: Dance major or permission of instructor. Introduction to the rhythmic structure, notation, and basic forms of music. Experience with audio equipment in creating simple sound scores. Taught in a lecture/lab format.

118 World Dance (3:3:0). Develops knowledge, skills, and an appreciation of world dance forms through the presentation of fundamental techniques, music, and culture. Area of concentration varies to include as many cultures as possible. May be repeated for a total of 6 credits. Fulfills non-western requirement for students in the College of Arts and Sciences and the global understanding requirement of university general education.

120 Special Topics in Dance (1-3:1-3:0). Rotating topic. Introduction and exploration of topical studies in dance and/or related study areas (e.g., dance forms of the United States: Social Dance, Folk Dance, Square Dance, or Contra Dance). Topic depends on instructor. May be repeated for a total of 9 credits provided the specific course content is different.

125 Beginning Modern Dance (3:3:0). Develops knowledge, skills, and an appreciation of modern dance through the presentation of fundamental techniques and creative movement experiences. May be repeated for a total of 6 credits.

131 Beginning Jazz Technique (3:3:0). Students are advised to take DANC 121 concurrently: Mechanics of movement in the jazz style of dance. Emphasis on development of techniques for jazz training. May be repeated for a total of 6 credits.

145 Beginning Ballet (3:3:0). Introduction to the elements of ballet technique and vocabulary. Stress on learning the elementary positions and movements characteristic of this highly stylized art form. May be repeated for a total of 6 credits.

150 Dance Improvisation (3:3:0). Prerequisite: Admission to the dance major program, or permission of instructor. Exploration into the creation of spontaneous movement experiences. Emphasis on encouraging freedom of self-expression and creative awareness.

161 Beginning Tap Dance (3:3:0). Elementary exploration into the rhythms and steps basic to the art form of tap dancing. May be repeated for a total of 6 credits.

170 Orientation to Dance Production (1:1:1). Prerequisite: Admission to the dance program, or permission of instructor. Introduction to sound, lighting, and stage management elements and terminology as related to dance performance. Taught in an intensive workshop setting emphasizing laboratory experience.

210 Dynamic Alignment (3:3:0). Prerequisite: Dance major or permission of instructor. Aspects of anatomy and kinesiology that directly apply to the correct development of dance technique. Emphasis on the use of exercise correctives and imagery to correct insufficient muscle pattern and reduce stress upon the body.

225 Beginning Intermediate Modern Dance (3:3:0). Prerequisite: DANC 125 or permission of instructor. Designed to further develop the knowledge, skills, and appreciation of modern dance through the continued exploration of techniques, aesthetics, and creativity. May be repeated for a total of 9 credits.

231 Intermediate Jazz Technique (3:3:0). Prerequisite: DANC 131 or permission of instructor. Continued study of movement in the jazz style of dance. May be repeated for a total of 12 credits.

245 Beginning Intermediate Ballet (3:3:0). Prerequisite: DANC 145 or permission of instructor. Further development of knowledge, skills, and appreciation through the technique, vocabulary, and history of ballet. May be repeated for a total of 9 credits.

251 Dance Composition I (3:3:0). Prerequisites: DANC 125 and DANC 150 or permission of instructor. Introduction to basic principles for composing movement for dance. Emphasis on simple compositional forms in dance as they apply to the solo performer.

252 Dance Composition II (3:3:0). Prerequisite: DANC 251 or permission of instructor. Exploration of the elements of compositional forms in dance as they apply to group forms. Experience in composing and performing duets, trios, quartets, and mass pieces.

270 Dance Production Lab (1-6:1-1). Prerequisite: DANC 170 or permission of instructor. Practical experience in the areas of stage crew, sound, and/or lighting of dance productions through rehearsal to public performance for university dance concerts or guest artist programs. May be repeated for a total of 6 credits.

314 Music Accompaniment for Dance (3:3:0). Prerequisite: DANC 114, or permission of instructor. Lecture practicum course that gives both dance and music students practical experience in dance accompaniment, primarily through the use of percussion instruments. Students use their knowledge of music and rhythm to accompany and enhance a dance technique class.

325 Intermediate Modern Dance (1-3:1-3:0). Prerequisite: Admission to the dance major program, audition, or permission of instructor. Continued exploration in movement and motion to further develop technical ability in dance. Emphasis on improvement of technical and performance skills. May be repeated for a total of 12 credits.

326 Dance Performance Practicum (1:0:3). Prerequisite: Audition. Practical experience in the area of dance performance through the rehearsal process of university dance concerts. May be repeated for a total of 3 credits.

330 Dance/Movement Therapy I (3:3:0). Prerequisites: DANC 125, 150, PSYC 100, PSYC 211, or permission of instructor. An overview of Dance/Movement Therapy exploring the meaning of movement as communication and expression. Theoretical approaches, treatment goals and interventions in Dance Therapy are explored with a wide variety of patient groups, and are enhanced through selected readings, movement explorations, and volunteer field observations.

345 Intermediate Ballet (1-3:1-3:0). Prerequisite: Admission to the dance major program, audition, or permission of instructor. Continued training at the intermediate level. Emphasis on increasing technical proficiency and aesthetic awareness. May be repeated for a total of 12 credits.

350 Advanced Dance Improvisation (1-3:1-3:0). Prerequisite: DANC 125, DANC 150, or permission of instructor.
Lecture/performance course for continued study of dance improvisation, including "contact improvisation." Each student is responsible for creating and directing advanced problems in dance improvisation. May be repeated for a total of 6 credits.

360 Choreography (3:3:0). Prerequisite: DANC 252 or permission of instructor. Continued choreographic exploration and research, culminating in bringing completed works to production.

362 Directed Choreography (1:0:3). Prerequisite: DANC 252 or permission of instructor. Faculty-guided, individual learning experience where students learn to choreograph a dance work by auditioning dancers, costuming, staging, lighting, selecting musical accompaniment, and composing original movement material. May be repeated for a total of 6 credits.

370 Dance Performance (1:0:3). Prerequisite: Audition or permission of instructor. Practical experience in the areas of performance, repertoire, and choreography through rehearsal and public performance of university dance concerts or guest artist programs. May be repeated for a total of 12 credits.

371 Residency Workshop (1:0:3). Prerequisite: Audition. Rehearsal and performance of either a new or restaged dance by a guest choreographer in an intensive rehearsal setting. May be repeated for a total of 6 credits.

372 Advanced Dance Production (1:1:1). Prerequisite: DANC 170, 270, or permission of instructor. Methodology and practice of stage make-up, costume design, and lighting as dictated by specific needs of a dance performance. Taught in a series of workshop settings.

390 Dance History: Pre-20th Century (3:3:0). Examines dance as it developed as a Western theatrical form from its beginnings in social and folk dance through its evolution into ballet. Emphasis is placed upon romantic and classical ballet. In addition, American dance forms are studied as they evolved in spectacles, burlesques, minstrelsy and social dance. All forms of dance are placed within their social, political, cultural, aesthetic and historical context.

391 Dance History: 20th Century (3:3:0). Examines the revolutions that occurred in the transformation of twentieth-century Western dance into forms and institutions that radically departed from their predecessors. The development of contemporary dance carried with it reflections of the influence of technology and the media as well as the concept of a global culture. Renewed interest in traditional dance forms acknowledges the power of dance to serve as a carrier of cultural and societal values. These dance forms are placed within their social, political, cultural, aesthetic and historical contexts.

399 Independent Study (1-3:0:0). Prerequisite: Permission of instructor. Individual research or creative project supervised by a faculty member. May be repeated for a total of six credits.

418 Global Dance Intensive (1-3:1-3:0). Intensive investigation and study of a selected dance idioms within its vital cultural and artistic context. Course work will be supplemented by participation in, and observation of, the ambient culture. A comparative analysis will be constructed of the similarities, differences and common antecedents between the selected culture and North American dance idioms. May be repeated for a total of 6 credits.

420 Special Topics in Dance (1-3:1-3:0). Prerequisite: Nine credits of dance courses or permission of instructor. In-depth presentation and exploration of topical studies in dance and/or related study areas (e.g., dance as therapy, avant-garde dance, philosophic approach to 20th century dance artists, cinedance). Topic depends on instructor. May be repeated for a total of 9 credits.

425 Advanced Modern Dance (1-3:1-3:0). Prerequisite: Admission to the dance major program, audition or permission of instructor. Continued training for advanced students. Emphasis on attainment of high-quality technical and performance skills. May be repeated for a total of 24 credits.

430 Dance/Movement Therapy II (3:3:0). Prerequisites: DANC 210, 330, PSYC 324, 325, or permission of instructor. Application of Dance/Movement Therapy as a psychotherapeutic process that furthers the emotional, cognitive, social, and physical integration of the individual.

445 Advanced Ballet (1-3:1-3:0). Prerequisite: Admission to the dance major program, audition, or permission of instructor. Performance/lab dealing with ballet at the advanced level. Emphasis on attainment of high-quality technical and performance skills. May be repeated for a total of 24 credits.

453 Teaching Creative Movement (3:3:0). Prerequisites: DANC 125 and DANC 150, or permission of instructor. To provide theory, methodology and practicum experience in preparation for teaching creative movement to children K+12, with some application to special populations.

454 Teaching Principles of Modern Dance (3:3:0). Prerequisites: Six credits of dance technique and DANC 210. Provides advanced dance students with the methods, principles, and background knowledge for teaching modern dance. Students are expected to apply knowledge gained from previous courses in technique and alignment in the demonstration of their ability to teach a modern dance class.

455 Teaching Practicum (1-3:3:0). Prerequisites: DANC 454 and permission of instructor. Full semester of supervised teaching experience in an approved school or studio dance program. Credits are based on number of teaching contact hours per week. May be repeated for a total of 12 credits.

480 Introduction to Laban Movement Analysis (3:3:0). Prerequisite: DANC 210 or permission of instructor. Introduction to the components of Laban Movement Analysis: Body, Shape, Effort, and Space. Includes Motif Writing for recording and analyzing movement.

490 Senior Dance Seminar (3:3:0). Prerequisite: Senior status in the dance major program. Culminating seminar devoted to analyzing and synthesizing knowledge and skills gained through undergraduate course work as it applies to dance, arts education, and professional development. Students will develop a senior project that includes both written and oral presentation in a public forum.

501 Graduate Dance Seminar (3:3:0). Presentation and discussion of current issues in dance specific to the areas of education, research, and professional development in the field.

520 Special Topics in Dance (1-3:1-3:0). Prerequisite: Nine credits of dance courses or permission of instructor.
In depth presentation and exploration of topical studies in dance and/or related study areas. Topic depends on instructor. May be repeated for a total of 9 credits.

525 Advanced Modern Dance (1-3: 1-3: 0). Prerequisite: Admission to the graduate dance program, audition, or permission of instructor. Advanced training in modern technique emphasizing the attainment of high technical ability and performing skills. May be repeated for a total of 18 credits.

545 Advanced Ballet (1-3: 1-3: 0). Prerequisite: Admission to the graduate dance program, audition, or permission of instructor. Advanced training in ballet technique with an emphasis on high technical quality, performance skills, ballet vocabulary, and styles. May be repeated for a total of 18 credits.

553 Teaching Creative Movement (3: 3: 0). Prerequisite: DANC 125 and 150, or permission of instructor. Provides theory, methodology and practicum experience in preparation for teaching creative movement to children K-12, with some application to special populations.

560 Directed Choreography (3: 3: 0). Prerequisite: DANC 351 or permission of instructor. Intensive study and exploration of advanced choreographic forms culminating in a public performance of a complete dance work. May be repeated for a total of 12 credits.

562 Directed Choreography (1-3: 0). Prerequisite: Permission of instructor. Individual choreographic project supervised by a faculty member. May be repeated for a total of 6 credits.

570 Advanced Dance Performance (1-3: 0: 3-9). Prerequisite: Audition. Advanced performance through participation in university productions and professional dance companies. May be repeated for a total of 12 credits.

571 Residency Workshop (1: 0: 3). Prerequisite: Audition. Rehearsal and performance of a new or restaged dance by a guest choreographer in an intensive rehearsal setting. May be repeated for a total of 6 credits.


598 Philosophy and Aesthetics of Dance (3: 3: 0). Prerequisites: DANC 390 and 391, or permission of instructor. Study of the philosophical theories and aesthetic principles of dance as a performing art.

599 Independent Study (1-6: 0: 0). Individual research or a creative project in close consultation with an instructor. May be repeated for a total of 6 credits.

615 Contemporary Trends (3: 3: 0). Prerequisite: Graduate standing. Study of contemporary art and artists and their current ideas and practices as they relate to the making of new work.

627 Advanced Teaching Seminar (3: 3: 0). Prerequisite: DANC 454 or permission of instructor. Discussion of advanced problems in teaching from both the scientific and creative points of view.

680 Dance Management (3: 3: 0). Prerequisite: Graduate standing. Exploration into the technical, financial, and economic aspects of dance management, including the areas of marketing, fund raising, publicity, incorporation, booking, nonprofit vs. profit-making organizations, and issues relating to current practices in the performing arts industry.

790 Internship (1-3: 0: 0). Prerequisites: Graduate standing and permission of advisor. Study that would involve intensive professional experience through sponsorship by a dance company, agency, or other arts organization in the areas of management, administration, performance, choreography, or teaching. May be repeated for a total of 6 credits.

799 Thesis (1-6: 0: 0). Prerequisites: Graduate standing, permission of advisor, and approval of proposal. Original research, including written work and a public performance, under the direction of a thesis committee. May be repeated for a total of 6 credits.

Decision Sciences (DESC)
School of Management

If a student takes noncore, upper-level business courses before acceptance to the School of Management, those courses will not count on an undergraduate degree application for any major in the School of Management (except as general elective credit). A grade of C or higher must be presented on the graduation application for each upper-level course in the major. Prerequisites are strictly enforced. Degree status is defined as formal admission to the School of Management.

210 Statistical Analysis for Management (4: 4: 0). Prerequisites: MATH 108 or 113. Corequisites: MIS 102. Introduction to the application of statistical methods to support quantitative decision analysis in resolving business problems.

301 Operations Management (3: 3: 0). Prerequisite: DESC 210. Examines the principal aspects of an organization's operations in various settings. Emphasizes planning and decision making activities associated with the management of operations with a focus on service operations. Analytical models are used to describe key planning and control activities managing operations.

320 Supply Chain Management and E-Business (3: 3: 0). Prerequisites: DESC 301, MKTG 301, degree status. An introduction to the design, development, and management of supply chain systems, including production and inventory management, distribution channels, and information systems that support them. Emphasizes the impact of e-business on companies and industries, including the impact of the Internet on the way in which goods and services flow through the value chain from providers to customers.

352 Methods and Models of Management Science (3: 3: 0). Prerequisites: DESC 301, degree status. Operation research for business management. Modeling is through mathematical programming and probabilistic methods. Specific topics include linear programming, integer programming, transportation problems, goal programming, network flow models, decision theory of games, Markov processes, queuing models, and Monte Carlo simulation.

435 Simulation for Business Decision Making (3: 3: 0) Prerequisites: DESC 301, degree status. Introduction to computer simulation of complex business systems. Topics include Monte Carlo methods, discrete-event modeling, simulation experiment design, simulation output analysis,
simulation validation, and specialized simulation languages. Examples are drawn from all types of business operations. The methods are demonstrated and used through computer software.

452 Business Forecasting (3:3:0). Prerequisites: DESC 210, degree status. Introduction to methods for producing predictions of future business operations as aids for making planning decisions. Specific topics include judgmental forecasting, forecast accuracy; correlation analysis; smoothing methods; regression models; decomposition; autoregressive and ARIMA models. The methods are demonstrated and used through computer software.

456 Quality Management (3:3:0). Prerequisites: DESC 301, degree status. Provides an understanding of the multifaceted nature of Quality Management by emphasizing issues such as quality philosophies, total quality management, design quality, process quality, and managing quality in information systems development. Discusses ISO 9000 and the Capability Maturity Model. Use of software and case studies.

493 Management of Technology Projects (3:3:0). Prerequisites: DESC 301, degree status. Focuses on the managerial problems associated with meeting the technical, cost, and time constraints of technology projects. Discusses various areas of project management such as project organizations, teams, scheduling, cost control, earned value analysis, risk management, and managing project quality. Discusses software cost estimation models. Use of software and case studies.

499 Independent Study in Operations Management (1-3:0:0). Prerequisites: DESC 552, degree status. Investigation of a business problem according to individual interest that uses state-of-the-art decision science methodology. By special arrangement with an instructor and approval from the associate dean for undergraduate programs.

511 Universality and Diversity in Child and Family Development, Ages 3–5 (3:3:0). Prerequisite: Admission to the UTEEM program or permission of the instructor. Provides students with knowledge of child and family development from a diverse and cultural perspective. Students explore the role of culture and theories for understanding and interpreting child and family growth and development. Students learn about various disabilities and acquire an appreciation for the critical role of families.

512 Assessment of Diverse Young Learners, Ages 3–5 (3:3:0). Prerequisite: Admission to the UTEEM program or permission of the instructor. Provides students with an understanding of the forms, functions, methods, and roles of assessment for planning and implementing effective early childhood programs for children ages 3–5 years from diverse cultures and with varied learning needs. Students learn to use both qualitative and quantitative approaches to evaluation and assessment. They learn about technological adaptations and gain an understanding of appropriate strategies for conducting, reporting, and decision making related to specific functions of assessment. They also learn about assessment strategies necessary for second language learners and about adaptations for children with disabilities.

513 Language Development and Emergent Literacy for Diverse Learners, Ages 3–5 (3:3:0). Prerequisites: Admission to the UTEEM program or permission of the instructor. Provides students with an understanding of first and second language acquisition, and covers the interrelationship of speaking, listening, reading, and writing. Students also gain an understanding of the diversity of oral and written communication styles in families, communities, and cultures.

514 Creating Environments and Adapting Curriculum for Diverse Learners, Ages 3–5 (3:3:0). Prerequisite: Admission to the UTEEM program or permission of the instructor. Provides students with an understanding of developmentally appropriate programs and practices for culturally, linguistically, and ability diverse young children. Students explore, plan, and implement curricula and environments using individually, age-related, and culturally appropriate methods and materials. Provides an understanding of the important role of play, active exploration, the construction and representation of knowledge, and social interaction with peers and family members.

521 Infant/Toddler Development in Family and Cultural Contexts (3:3:0). Prerequisite: Admission to the UTEEM program or permission of the instructor. Provides students with knowledge of the development of infants and toddlers in family/cultural contexts. Students explore the role of family, culture, and developmental theories in providing frameworks for understanding and interpreting behavior of children from birth to age three. Students learn about factors that place infants and toddlers at developmental risk and other various disabilities.

522 Family-Centered Assessment of Diverse Infants and Toddlers (3:3:0). Prerequisite: Admission to the UTEEM program or permission of the instructor. Focuses on family-centered practice in assessing infants and toddlers from diverse cultures and with diverse abilities. Students learn assessment practices that lead to plans for supporting infant development in ways that are individually and culturally relevant for families and caregivers. Students gain an understanding of appropriate strategies for conducting, reporting, and decision making related to specific functions of assessment and adapting assessment practices for culturally, linguistically, and ability diverse infants and toddlers and their families.

523 Language Acquisition and Communication for Diverse Infants and Toddlers (3:3:0). Prerequisite: Admission to the UTEEM program or permission of the instructor. Provides students with an understanding of early language development in terms of each of the five major components of language. Speech, language, and communication are discussed, particularly in terms of their interrelatedness with cognitive and sociocultural development. The importance of adult-child interaction and the impact of bilingualism, cultural diversity, cognitive ability, and language disorder also are explored.

524 Culturally, Linguistically, and Developmentally Appropriate Practices with Infants, Toddlers, and Their Families (3:3:0). Prerequisite: Admission to the UTEEM
program or permission of the instructor. Provides students with an understanding of culturally, linguistically, and developmentally appropriate programs and practices in community settings that provide services to infants and toddlers with varied abilities and their families. Students explore, plan, and implement developmentally supportive activities with infants and toddlers and their families. Students are expected to become familiar with the cultural context of the infants and toddlers with whom they are working. A special emphasis of this course is providing home-based services.

612 Development and Assessment of Diverse Learners, K–3 (3:3:0). Prerequisite: Admission to the UTEEM program or permission of the instructor. Provides students with an understanding of the forms, functions, methods, and roles of assessment for planning and implementing effective early childhood programs across content areas for culturally, linguistically, and ability diverse children in kindergarten through third grade.

613 Language and Literacy Development for Diverse Learners, K–3 (3:3:0). Prerequisite: Admission to the UTEEM program or permission of the instructor. Develops and applies knowledge of the stages of literacy in conjunction with appropriate instructional materials and techniques for the K–3 grade learner. Analyzes, synthesizes, and applies knowledge of recent research to teaching practices in literacy development. Applies a variety of instructional approaches in response to the needs of diverse students in a culturally and developmentally sensitive manner.

614 Integrating and Adapting Curriculum across the Content Areas for Diverse Learners, K–3 (3:3:0). Prerequisite: Admission to the UTEEM program or permission of the instructor. Provides an understanding of developmentally appropriate programs and practices for teaching children in kindergarten through the third grade. Covers strategies for planning and implementing a community of learners that is inclusive of children with diverse abilities and needs. This is an integrative class that enables students to link their knowledge in specific content areas to the broader picture of managing the classroom day, to implementing an integrated curriculum across content areas, and to applying the philosophical principles related to effective instruction of diverse young learners.

615 Developing Concepts in Early Childhood Mathematics and Science for Diverse Learners, K–3 (3:3:0). Prerequisite: Admission to the UTEEM program or permission of the instructor. Examines pre-operational and concrete operational thought processes of conservation, seriation, observation, comparison, classification, and early number concepts. Uses concrete science/math materials and experiences to foster development of quantitative thinking operational thought processes of geometry, measurement, graphing, and whole number concepts. Uses concrete science/math materials and experiences to foster development of quantitative thinking operational thought processes of geometry, measurement, graphing, and whole number concepts. Covers the construction of math and science lessons and hands-on experiences that address the needs of a variety of student populations, such as children with disabilities, gifted and talented children, and minority and culturally diverse groups.

781 Frameworks for Unified, Transformative Early Care and Education (3:3:0). Prerequisite: Admission to the UTEEM program or permission of the instructor. Provides students with the opportunity to analyze foundational frameworks for developing a unified perspective for their work with culturally, linguistically, and ability diverse young learners, birth to age eight, and their families. Students examine foundational work from the separate fields of early childhood education, early childhood special education, multicultural education, and second language acquisition/bilingual education.

782 Policy Perspectives Affecting Diverse Young Learners and Their Families (3:3:0). Prerequisite: Admission to the UTEEM program or permission of the instructor. This advanced seminar provides students with an understanding of both historical and current trends and issues involving legislation and policy in early childhood education, bilingual education, early childhood special education, and multicultural education. Focuses on the historical role of social advocacy, the development of advocacy skills, and collaboration and consultation with other professionals and staff in the field of early childhood education. Provides an understanding of the continuum of services and the context of service delivery.

790 Internship with Diverse Learners, Ages 3–5 (3:3:0). Prerequisite: Admission to the UTEEM program or permission of the instructor. Enables students to participate full time in an inclusive early childhood setting serving families of infants and toddlers with diverse learning needs. Students continuously link university course work to the real world of working with diverse families and their infants and toddlers. Students engage in a carefully planned learning sequence, including observing infants and toddlers, environments, and intervention strategies that identify family concerns, priorities, and resources related to their child’s needs.

791 Internship with Diverse Infants and Toddlers and Their Families (3:3:0). Prerequisite: Admission to the UTEEM program or permission of the instructor. Enables students to participate full time in a comprehensive early childhood setting serving families of infants and toddlers with diverse learning needs. Students continuously link university course work to the real world of working with diverse families and their infants and toddlers. Students engage in a carefully planned learning sequence, including observing infants and toddlers, environments, and intervention strategies that identify family concerns, priorities, and resources related to their child’s needs.

792 Internship with Diverse Learners, K–3 (3:3:0). Prerequisite: Admission to the UTEEM program or permission of the instructor. Enables students to participate full time in an early childhood setting serving children with diverse learning needs. As a result, students are able to continuously link university course work to the real world of teaching. Students engage in a carefully planned learning sequence, beginning with targeted observations and culminating with their taking responsibility for the entire planning process for a three- to four-week period.

793 Specialization Internship with Diverse Learners and Their Families (6:6:0). Prerequisite: Admission to the UTEEM program or permission of the instructor. Enables students to participate full time in an education setting serving diverse children and their families. Interns are involved in a full range of activities to ensure that they experience and understand the complexity, uniqueness, and significance of the work done.
E-commerce (EC)
School of Information Technology and Engineering

511 E-commerce Basic IT Infrastructure (3:3:0). Discusses the basic networking infrastructure used in e-commerce environments and the typical multi-tiered e-commerce architectures of e-commerce sites. The ISO OSI Reference Architecture. Functions and main features of the IP protocol. Functions and main features of the TCP protocol: connection establishment, error control, congestion control. The HTTP protocol. Load balancers, web servers, application servers, and databases servers in an e-commerce site architecture. Software architecture elements such as servlets, transaction processing services, remote method invocation, CGI scripts, and active server pages are discussed.


521/MBA 603 Managerial Economics and Decisions of the Firm (3:3:0). Prerequisite: Admission to M.S. in E-Commerce program. Provides a fundamental understanding of how microeconomics concepts are usefully applied to managerial decision making. Principles of microeconomic theory are explored fully, including market supply and demand, production and cost functions, industry structure, and product and resource pricing.

522/MBA 613 Financial Reporting and Decision Making (3:3:0). Prerequisite: Admission to M.S. in E-Commerce program. Foundation course focusing on the economics and analysis of business transactions and related financial reporting issues. Topics include an introduction to the accounting framework used in financial reporting, analysis of economic events and their impact on financial reports, analysis of the impact of accounting method choices on financial reports, and financial statement analysis.


541 Integrative Case Studies in Electronic Commerce (3:3:0). Open to EC majors only. Prerequisites: EC 511, 521, and 531. Students apply knowledge and skills from core courses to manage the complexity of e-commerce in specialized applications. Using case study methods, students analyze and synthesize the requirements for successful e-commerce program development and management in industry-specific applications in health care, banking, retail, and government.

600 Group Project in Electronic Commerce (3-6:3-6:0). Prerequisite: Completion of all core courses and at least 9 credits in the specialization area of the M.S. in E-commerce program. Group projects in electronic commerce selected to illustrate special problems and solutions in development, design, and implementation of e-commerce systems. The final project will be exhibited to a panel of judges composed of faculty members and experts from private and government organizations.

Economics (ECON)

Economics

Individual courses taken for credit under their former numbers may not be repeated for credit under their present numbers. A grade of C or better in ECON 103 and 104 is a prerequisite to upper division economics courses.

100 Economics for the Citizen (3:3:0). Not available to economics majors. A broad introduction to economic concepts and how they can contribute to a better understanding of the world around us. Concepts are developed and applied to current economic and social problems and issues. Less formal modeling than in the 103–104 sequence.

103 Contemporary Microeconomic Principles (3:3:0). Introduction to microeconomics in the context of current problems. Explores how the market mechanism allocates scarce resources among competing uses; uses basic tools of supply and demand and production and distribution theory to analyze diverse problems.


110 Introduction to Economic Science (2:2:0). Prerequisites: Registration is controlled: contact instructor for guidelines to register. Introduction to economics as an observational science, covering such topics as personal vs. impersonal exchange, strategic interdependence and game theory, group decision making, and market design.

111 Laboratory Methods in Economics (1:0:3). Prerequisites: Registration is controlled: contact instructor for guidelines to register. Participate in experimental economics research by recruiting subjects, writing experiment instructions, and monitoring sessions.

306 Intermediate Microeconomics (3:3:0). Prerequisites: ECON 103 and 104, and MATH 108 or 113. Basic factors of price and distribution theory, including analysis of demand, costs of production and supply relationships, and price and output determination under various market structures.

309 Economic Problems and Public Policies (3:3:0). Prerequisites: ECON 100 or 103 and 104 or permission of instructor. Important economic problems in light of current and proposed public policies.
310 Money and Banking (3:3:0). Prerequisites: ECON 103 and 104 or permission of instructor. Monetary, commercial, and central banking systems, with particular emphasis on their relationship with American government programs, fiscal policies, and controls.

311 Intermediate Macroeconomics (3:3:0). Prerequisites: ECON 103 and 104 or permission of instructor. Aggregate economic accounts, including the measurement of national income; determinants of levels of income and output; and causes and solutions for problems of unemployment, inflation, and economic growth.

316 Economic Growth and Business Cycle (3:3:0). Prerequisite: ECON 310 or 311 or permission of instructor. Factors contributing to sustained economic growth with additional emphasis on business fluctuations and their measurement.

320 Labor Problems (3:3:0). Prerequisites: ECON 103 and 104 or permission of instructor. American labor unions and their effect on society. Causes of and proposed solutions to selected problems.

321 Economics of Labor (3:3:0). Prerequisite: ECON 306. Factors that determine levels of wages and employment and economic consequences. Attention is directed to recent developments in unionism, collective bargaining, and industrial technology.

330 Public Finance (3:3:0). Prerequisite: ECON 306 or permission of instructor. Intergovernmental financial relationships; types, incidences, and consequences of taxation; other sources of governmental income; governmental expenditures and their effect; public economic enterprises; public borrowing; and debt management and its economic effect.

335 Environmental Economics (3:3:0). Prerequisites: ECON 103 and 104. Microeconomic analysis of environmental problems. Topics include an analysis of externalities and market failure, alternative solutions and policies, problems in monitoring and enforcement, economic analysis of the development of legislation and regulation, and applications to current policy issues.

340 Introduction to Mathematical Economics (3:3:0). Prerequisites: ECON 306 and 311 and MATH 113, or permission of instructor. Mathematical treatment of the theory of firm and household behavior, stabilization policy, growth theory, input-output analysis, and linear programming.

345 Introduction to Econometrics (3:3:0). Prerequisites: ECON 306 and 311 and DESC 210. Modern statistical techniques in estimating economic relations.

350 Regional and Urban Economics (3:3:0). Prerequisite: ECON 306 or permission of instructor. Regional development and metropolitan growth, including locational decisions of households and firms and problems associated with high-density urban economic activity.

360 Economics of Developing Areas (3:3:0). Prerequisites: ECON 103 and 104 or permission of instructor. Economic growth characteristic of developing countries. Economic development, obstacles to development, policies, and planning.

361 Economic Development of Latin America (3:3:0). Prerequisites: ECON 103 and 104 or permission of instructor. For non-Western credit. Economic development, institutions, and problems of Latin America.

365 Topics in Economic History (3:3:0). Prerequisites: ECON 103 and 104. Subject matter varies. Possible topics include ancient, medieval, modern European, and American economic history, using econometric analysis as necessary. May be repeated once for credit with permission of instructor.

370 Economics of Industrial Organization (3:3:0). Prerequisite: ECON 306 or permission of instructor. Factors influencing industrial structure and industrial conduct and performance.

372 Economics of E-Commerce (3:3:0). Prerequisites: ECON 103 or permission of instructor. Examines how the institutional rules, transaction costs, and the behavior of agents affect the performance of electronic marketplaces.

380 Economics in Transition (3:3:0). Prerequisites: ECON 103 and 104 or permission of instructor. Examination of the problems and achievements of formerly communist and socialist countries (including China, Eastern European countries, and Russia and other countries of the former Soviet Union) as they make the transition to more market-oriented economies. Includes examination of the theories of market economics and central planning.

390 International Economics (3:3:0). Prerequisites: ECON 306 and 311 or permission of instructor. Foreign exchange market, balance of payment, foreign trade policies, and theories of international trade.

403 Austrian Economics (3:3:0). Prerequisites: ECON 306 and 311. Microeconomic and macroeconomic models and the misallocation of resources. Alternative economic tools from the unique a priori and subjectivist approach of noted Austrian economists.

410 Public Choice (3:3:0). Prerequisite: ECON 306. Application of economic theory and methodology to the study of nonmarket decision making.

412 Game Theory and Economics of Institutions (3:3:0). Prerequisite: ECON 306 or permission of instructor. Introduction to game theory and its relevance for the analysis of the framework of rules and institutions within which economic processes occur. Application of game theoretical concepts to a comparative analysis of the causes and effects of alternative institutional arrangements.

415 Law and Economics (3:3:0). Prerequisite: ECON 306 or permission of instructor. An economic analysis of the law. Topics include an introduction to legal institutions and legal analysis; application of economic concepts to the law of property, contracts and torts, criminal law, and constitutional law; the economic efficiency of the common law; and a public choice perspective on the evolution of the law.

481 The Development of Economic Thought (3:3:0). Prerequisites: ECON 306 and 311 or permission of instructor. Developments in economic thought from 1500 to the present. Emphasis on historical origins, impact on contemporary economies, and theoretical validity.

490 Senior Seminar on Problems in Economics (3:3:0). Prerequisites: ECON 306 and 311, DESC 210, and 90 credits, economics majors only. Application of economic tools to investigate problems in economics.

496 Special Topics in Economics (3:3:0). Prerequisite: Varies with topic. Subject matter varies. May be repeated for credit with permission of department.
### Courses

<table>
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<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Prerequisites</th>
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<tbody>
<tr>
<td>330</td>
<td>Economics (ECON)</td>
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<tr>
<td>499</td>
<td>Independent Study (1-3:0:0). Prerequisites:</td>
<td>Economics majors with 90 credits and permission of both department and instructor.</td>
</tr>
<tr>
<td>535</td>
<td>Survey of Applied Econometrics (3:3:0). Prerequisites:</td>
<td>DESC 210, ECON 306 and 311, or permission of instructor. Applied introduction to estimating economic relationships. Simple equation and simultaneous equation system estimation along with their associated problems. (Students who take ECON 535 may not take ECON 637 for credit.)</td>
</tr>
<tr>
<td>611</td>
<td>Microeconomic Theory (3:3:0). Prerequisite:</td>
<td>Admission to the doctoral or master's program or ECON 306, ECON 311, and MATH 113, or permission of graduate coordinator. Theory of behavior of consumers, firms, and resource suppliers. Theories of choice under conditions of risk and uncertainty. Partial equilibrium analysis of competitive and noncompetitive markets. General equilibrium analysis, welfare economics, and introduction to capital theory.</td>
</tr>
<tr>
<td>615</td>
<td>Macroeconomic Theory (3:3:0). Prerequisite:</td>
<td>Admission to the master's program in economics or ECON 306, ECON 311, and MATH 108, or permission of graduate coordinator. Survey course covering monetary theory, theories of consumption and saving, budget deficits, economic growth, international finance, and monetary and fiscal policies.</td>
</tr>
<tr>
<td>623</td>
<td>American Economic History (3:3:0). Prerequisites:</td>
<td>ECON 611 and 615, taken concurrently, or permission of instructor. ECON 637 is recommended. Growth and development of the American economy as well as the evolution of economic institutions.</td>
</tr>
<tr>
<td>630</td>
<td>Mathematical Economics 1 (3:3:0). Prerequisite:</td>
<td>Admission to the doctoral or master's program or ECON 306, ECON 311, and MATH 113, or permission of instructor. Set theory, function, differential calculus, integration, series, and matrix algebra, with special emphasis on the economic applications.</td>
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<tr>
<td>637</td>
<td>Econometrics 1 (3:3:0). Prerequisite:</td>
<td>Acceptance to the Ph.D. program, DESC 210, or permission of instructor. Techniques of estimating relationships between economic variables. Introduction to multiple regression and problems associated with the single equation model-autocorrelation, multicollinearity, and heteroscedasticity.</td>
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<tr>
<td>715</td>
<td>Macroeconomic Theory 1 (3:3:0). Prerequisite:</td>
<td>Admission to the doctoral program or permission of graduate coordinator. Classical, neoclassical, Keynesian, and post-Keynesian theories of income and employment determination. Theories of inflation and growth. The demand for money and its implications for the effectiveness of monetary vs. fiscal policy.</td>
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<tr>
<td>816</td>
<td>Macroeconomic Theory II (3:3:0). Prerequisites:</td>
<td>ECON 611 and 715 or permission of instructor. Aggregate economic activity and price levels with emphasis on dynamic models. Topics vary.</td>
</tr>
<tr>
<td>817</td>
<td>Monetary Theory and Policy (3:3:0). Prerequisites:</td>
<td>ECON 615 and 637 or permission of instructor. Theory of the mechanisms through which central banking affects economic activity and prices. Analysis of the demand for money and its relationship to economic activity. The development of monetary theory with emphasis on current theories and controversies in the field.</td>
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<tr>
<td>820</td>
<td>History of Economic Thought (3:3:0). Major figures in the history of economic thought and the tools of analysis they created; emphasis on classical, neoclassical, and Keynesian theories.</td>
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<tr>
<td>821</td>
<td>History of Economic Thought II (3:3:0). Development of economic analysis from the &quot;marginal revolution&quot; of 1877 to present. Emphasis on the development of neoclassical economic theory.</td>
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<tr>
<td>823</td>
<td>Topics in Economic History (3:3:0). Prerequisites:</td>
<td>ECON 611 and 615. Economic analysis of various historical epochs, such as the Industrial Revolution, evolution of political reform, rise of unions, growth of government.</td>
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<tr>
<td>825</td>
<td>Political Economy and Public Policy I (3:3:0). Prerequisite:</td>
<td>ECON 611 or permission of instructor. Economic process of public policy formulation and implementation. Economic behavior of principals in policy making and execution.</td>
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<td>826</td>
<td>Political Economy and Public Policy II (3:3:0). Prerequisites:</td>
<td>ECON 611, 615, and 825 or permission of instructor. Specific issues related to political economy of public policy. Topics include privatization, political economy of deficit spending, regulation and deregulation, and the economics of rent seeking.</td>
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<tr>
<td>827</td>
<td>Economic Philosophy (3:3:0). Prerequisite:</td>
<td>ECON 611 or permission of instructor. Analysis of the philosophical organization. Interrelations between economics and legal and political institutions. Philosophical presuppositions of a capitalist economy under constitutional democracy. Consideration of alternative presuppositions for noncapitalist economies. Critical evaluation of history of ideas in social and moral philosophy.</td>
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<td>828</td>
<td>Constitutional Economics (3:3:0). Prerequisite:</td>
<td>ECON 611 or permission of instructor. Analysis of existing and proposed elements of the &quot;economic constitution.&quot; Emphasis on fiscal, monetary, transfer, and regulatory powers of government and on constitutional limits on such powers, especially in the United States. Also includes analysis of proposed changes in these limits.</td>
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<tr>
<td>829</td>
<td>Economics of Institutions (3:3:0). Prerequisite:</td>
<td>ECON 611 or permission of instructor. Analysis of the framework of rules and institutions within which economic activities and transactions are carried out. Emergence and working properties of different institutions. Comparative</td>
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discussion of classical and contemporary approaches to an economic theory of institutions.

831 Mathematical Economics II (3:3:0). Prerequisite: ECON 630 or permission of instructor. Mathematical treatment of economic theories. Static and dynamic analysis of macromodels. Input-output analysis. Optimization techniques such as Lagrangian multipliers, linear programming, nonlinear programming, and game theory.

838 Econometrics II (3:3:0). Prerequisite: ECON 637 or permission of instructor. Econometric models and simultaneous equation systems. Identification of parameters and least squares bias; alternative estimation methods and block recursive systems.


849 Public Finance (3:3:0). Prerequisite: ECON 611 or permission of instructor. Theoretical and institutional analysis of government expenditure, taxation, debt management, and intergovernmental fiscal relations. Allocative and distributional effects of alternative tax and subsidy techniques. Principles of benefit-cost and cost-effectiveness analysis for government decisions.

852 Public Choice I (3:3:0). Prerequisite: ECON 611 or permission of instructor. Application of economic theory and methodology to the study of nonmarket decision making.

854 Public Choice II (3:3:0). Prerequisite: ECON 611 or permission of instructor. The public choice approach is applied to study such topics as the causes and consequences of governmental growth, the behavior of public bureaucracies, and the economic reasoning behind constitutional limitations on the size and growth of government.

856 Urban and Regional Economics (3:3:0). Prerequisite: ECON 611 or permission of instructor. Regional development and metropolitan growth economics including the locational decisions of households and firms, and problems associated with high-density urban economic activity.


866 Economic Development (3:3:0). Prerequisites: ECON 611 and 615 or permission of instructor. Forces contributing to and retarding economic progress in developing countries. The role of foreign trade, economic integration, foreign investment, multinational corporations, and technological transfers.

869 International Trade and Policy (3:3:0). Prerequisite: ECON 611 or permission of instructor. Classical, neoclassical, and modern theories of international trade. A study of the theory and practice of world trade models such as project LINK. Analysis of foreign investment and economic growth, tariffs and nontariff barriers, and economic integration; recent developments with emphasis on natural resources.

871 International Monetary Economics (3:3:0). Prerequisite: ECON 611 or permission of instructor. Examination of the international adjustment mechanism, price and income effects, controls, and the monetarist approach. Development of the international monetary system, the demand for international reserves, capital movements, and the role of the International Monetary Fund.

880 Austrian Theory of the Market Process I (3:3:0). Prerequisite: ECON 611. Economic theory developed by Menger, Mises, Hayek, and others of the Austrian School and comparison with other currently popular theories.

881 Austrian Theory of the Market Process II (3:3:0). Prerequisites: ECON 611 and 615 (ECON 880 is recommended). Continuation of ECON 880. Topics vary and include emphasis on market-process approach to analysis of capital accumulation, growth, money and credit institutions, inflation, unemployment, and industrial fluctuations.

885 Experimental Economics (3:3:0) Prerequisites: ECON 611 or permission of instructor. Designed for graduate students who have a desire to learn how experimental methods can be used to inform economic research and practice. Students are expected to have a working understanding of both basic economic concepts and multivariate calculus.

886 Economic Systems Design (3:3:0). Prerequisites: ECON 885 or permission of instructor. Exposes students to research in applied mechanism design. Topics represent the basic tools required to build, test, and implement mechanisms in an applied setting.

895 Special Topics in Economics (3:3:0). Topics vary according to interests of instructor. Emphasis on new areas of the discipline. May be repeated for credit as topics vary.

896 Directed Reading and Research (3:0:0). Independent reading and research paper on a topic agreed on by student and faculty member.

918 Seminar in Monetary Theory and Policy (3:3:0). Prerequisite: ECON 817. Selected topics of current interest are discussed.

950 Seminar in Public Finance (3:3:0). Prerequisites: ECON 611 and 849. Important public finance issues treated in seminar format.

985 Workshop in Experimental Economics (3:3:0). Prerequisites: ECON 885, ECON 886. Designed for graduate students who have taken Experimental Economics and Economic Systems Design and are applying experimental methods to their own or collaborative research projects.
332 Economics (ECON) • Education (EDUC)

998 Doctoral Dissertation Proposal Research. Research on a prospective dissertation topic. For students who have completed their course work but who have not yet advanced to candidacy. Graded S/NC.

999 Doctoral Dissertation Research (variable credit). Prerequisites: Admission to Ph.D. economics program and permission of dissertation advisor. Research on an approved dissertation topic under the direction of dissertation committee. May be repeated. Twenty-four credits may be applied to the doctoral degree requirement. Graded S/NC.

Education (EDUC)

Graduate School of Education

300 Introduction to Teaching (3:3:0). Introduces the teaching profession by examining the roles of a teacher, the nature of American schools, and the students' potential contributions. School-based field experience is required during the course.

301 Educationally Diverse Populations: Handicapped, Gifted, Multicultural (3:3:0). Introduces the psychological, sociological, educational, and physical aspects of diverse populations in today's schools for early and middle education. Emphasizes litigation and legislation pertaining to the education of diverse populations. School-based field experience is required during the course.

302 Human Growth and Development (3:3:0). Examines human development through the life span with special emphasis on the cognitive, language, physical, social, and emotional development of children. Emphasizes contemporary theories of human development and their relevance to educational practice. School-based field experience is required during the course.

418 Student Teaching in Music Education (6:6:0). Prerequisite: Completion of requirements for admission to the music education concentration. Provides intensive, supervised clinical experience in approved Virginia schools, and supplemental course work appropriate to the student's area of concentration (vocal/choral or instrumental). Experiences are in elementary or secondary school settings.

500 In-Service Educational Development (1-6:0:0). Prerequisite: Employment in professional capacity by sponsoring division or agency. Offered at the request of the school division or other educational agency. Content varies. May be repeated for credit.

509 Advanced Child Development: Infancy to Middle Childhood (3:3:0). Prerequisites: Admission to the Graduate School of Education, or permission of instructor and EDRS 590. Provides an advanced course in the physical, psychological, cognitive, and personality development of the child from birth to age 12. Emphasizes the critical review of contemporary theories of human development and their relevance to educational practice.

511 Introduction to Education in International Schools (3:3:0). Introduces students to the structure and variations of international schools. Includes an analysis of human growth and development, an overview of educational psychology, and an introduction to the use of technology across the curriculum.

512 Teaching Elementary Social Studies in International Schools (3:3:0). Focuses on the translation of knowledge and data-gathering processes from the social sciences into appropriate and meaningful K–8 social studies experiences. Helps students develop an understanding of the aims and methodologies of history, geography, government/political science, sociology, anthropology, and psychology.


514 Teaching Elementary Science in International Schools (3:3:0). Covers the theory and practices of effective teaching of K–8 science in international schools. Uses laboratory and discovery techniques to design essential science components and integrate them with other disciplines. Introduces students to the design and implementation of activities for developing concepts, solving problems, and strengthening thinking skills in K–8 science.

516 Language Across the Elementary International School Curriculum (3:3:0). Introduces the current methods of teaching integrated language arts in elementary and middle school settings (K–8). Includes language and literacy development, second language acquisition, reading and writing in the content areas, and children's literature. The course has an international focus and considers needs of second language learners in regular classroom settings.

520 Elementary Curriculum, Instruction, and Assessment in International Schools (3:3:0). Addresses the interrelationship of instruction, curriculum, and assessment in international schools. Includes a review of research and effective practice in each of the three fields.

521 Foundations of Education PK-12 (3:3:0). Provides an overview of the various ways of educating and of the socialization processes operating within American educational institutions and other organizations. Analyzes current educational practices in terms of history, philosophy, psychology, and sociocultural factors of formal and informal learning. Emphasizes trends, issues, and alternative futures. Field experience in public schools is required.

522 Introduction to Secondary Education (3:3:0). Prerequisite: Admission to the Graduate School of Education or permission of instructor. Analyzes the philosophical assumptions, curriculum issues, learning theories, and history associated with current teaching styles. Emphasizes applications to all disciplines taught in secondary schools. Examines current educational trends and issues in relation to the sociology of secondary school settings. Field experiences are required.

530 Contemporary Social Issues in Education (3:3:0). Prerequisite: Admission to the Graduate School of Education or permission of instructor. Examines selected social issues in education. Uses concepts and information from social sciences to help students understand the social issues and suggest possible remedies through practice and policy.

537 Foundations of Multicultural Education (3:3:0). Examines multicultural education through a focus on the historical, sociological, and philosophical foundations of education. Emphasizes the role of ethnicity in the develop-
ment of the nation and its education system. Includes an overview of multicultural/multilingual curricula and culturally and linguistically responsive instructional and assessment techniques. Field experience is required.

539 Human Development and Learning, PK–12 (3:3:0). Provides practicing teachers with the foundations of psychological theory, research, and professional practice relating to development and learning in inclusive PK–12 classroom settings. Field experience in public schools is required.

542 Introduction to Elementary Curriculum (3:3:0). Prerequisite: Admission to the elementary education licensure program. Examines the historical background of education as it relates to elementary schools and curriculum. Helps students develop an understanding of the relationship between society and education; explores contemporary innovations that influence curriculum. Field experience is required.

543 Children, Family, Culture, and Schools, 4–12 Year Olds. (3:3:0). Prerequisite: Admission to the elementary education licensure program. Examines child and family development and the ways that children, families, schools, and communities interrelate. Children's developing physical, social, emotional, and cognitive abilities are linked to planning curriculum and developing instructional strategies. Field experience is required.

597 Special Topics in Education (3:3:0). Prerequisite: Admission to a program in the Graduate School of Education. Provides advanced study on a selected topic or emerging issue in American or international education. May be repeated for credit with permission of the Graduate School of Education.

598 Directed Reading, Research, and Individual Projects (1-6:0:0). Prerequisites: Admission to a degree program and permission of dean. Presents various subjects and projects, principally by directed study, discussion, research, and participation under the supervision of a member of the graduate faculty. May be repeated for up to 12 credits.

599 Thesis (6:0:0). Prerequisite: EDRS 590. Provides for the study of a problem of significant interest to the student, using accepted research methods under the supervision of a member of the graduate faculty. May be repeated for up to 12 credits.

600 Workshop in Education (1-6:0:0). Offers full-time workshops and weekend seminars dealing with selected topics in education and education tour seminars. May be repeated for credit.

606 Education and Culture (1-6:1-6:0). Practitioners use the Cultural Inquiry Process (CIP) and web site to acquire cultural, social, and language-related perspectives on educational processes; learn skills in analyzing educational settings; and expand their strategies to address "puzzlements" in their own practice.

611 Cultural Issues in Second Language Acquisition (3:3:0). Prerequisite: Admission to TESL or bilingual/multicultural education program, doctoral status, or permission of instructor. Explores the impact of linguistic and cultural diversity among students on the teaching of second language across the curriculum. Draws on theoretical foundations in second language acquisition, cross-cultural communication, socio- and psycholinguistics, and educational anthropology.

612 Inquiry into Practice (2:2:0). Provides experience using research skills to foster systematic and thoughtful inquiry into classroom practice. Practitioners explore relevant classroom practice issues through critical writing and action and research. Emphasizes cultural diversity and gender issues in the conduct of research.

613 How Students Learn (3:3:0). This is an advanced course in the study of learning based on research and theory from different disciplines. Focuses on increasing students' learning through the study of different learning systems and understanding each learner in the context of the learning process itself.

614 Designing and Assessing Teaching and Learning (2:2:0). Explores the design and development of curricular, pedagogical, and assessment strategies that are responsive to the needs and interests of students. Investigates factors that affect teaching and learning and examines multiple ways of knowing that teachers bring to classrooms.

615 Educational Change (2:2:0). Explores influences on educational change at the classroom, school, community, state, and national levels. Investigates implications of a range of factors and influences that affect educational change. Analyzes influences and factors and involves students in reflecting on their own experiences, both past and present.

634 The Role of the School Library Media Specialist (3:3:0). Introduces participants to the basic concepts of library science, and the professional responsibilities and ethical standards of the library media specialist. Addresses this role as an instructional partner and resource person for students and staff.

640 Selection and Utilization of Library Media Materials and Equipment, Including Technology (3:3:0). Introduces prospective library media specialists to various uses of technology within the library setting and the elements involved in media collection development.

641 Reference and Bibliography (3:3:0). Covers the library reference process and the content of bibliographic tools to meet the needs of library patrons seeking information.

642 Organization and Technical Processing of Materials (3:3:0). Emphasizes the application of basic cataloging principles in the bibliographic description of print and nonprint materials. Students develop procedures for organizing, cataloguing, and maintaining a media collection using technological support.

643 Organization Administration and Evaluation of the School Library Media Center (3:3:0). Helps students develop the skills necessary to implement an effective school library media program. Focuses on management principles, interpersonal skills, and lifelong learning skills in relation to evaluation of services, collection development, and public relations for school libraries.

644 Production of Media and Instructional Materials (3:3:0). Provides guidance and practice with available audiovisual and computer-based technology in the planning, production, and presentation of useful instructional materials.

645 Literature for Young Adults (3:3:0). Gives students in-depth knowledge of young adult literature and the ability to relate that knowledge to their library programs. Extensive reading of young adult literature is required.

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646 Literature for Children (3:3:0). Helps students develop critical abilities in selecting and using literature for children. Focuses on selecting materials to support the curriculum and to promote reading.

670 The Culture of Teaching (3:3:0). Prerequisite: Admission to the secondary education program. Corequisite: Initial methods course. Explores the roles, responsibilities, and realities of teaching in secondary schools. Examines teaching in the context of contemporary educational issues, legal matters, diverse and exceptional learners, classroom management, and professional practices.

671 Schools and Culture (3:3:0). Prerequisites: Initial methods course and EDUC 670. Corequisite: EDUC 672. Focuses on the relationship between schools and the communities they serve. Explores the historical roots of contemporary educational practice and then examines important directions defined by contemporary school reform efforts.

672 Human Development and Learning: Secondary Education (3:3:0). Explores developmental issues associated with middle and high school students as well as theories that provide a basis for understanding the learning process. Addresses implications for the design of instruction and curriculum. Field experience in public schools is required.

673 Communication Arts Across the Curriculum (4:4:0). Prerequisite: EDUC 672. Corequisite: EDUC 790. Helps students understand the language and literacy process as it applies to teaching in the middle and high schools. Particular attention is paid to reading and writing in the content areas and instructional strategies to support students' literacy development. Focuses on ways reading, writing, speaking, and listening are developed and used within the learning of discipline-specific curriculum, including adaptations for culturally diverse and exceptional learners. Develops connections between knowledge of the literacy process, using language to support learning, and effective instruction incorporating reading and writing.

674 Assessing Learning and Teaching in the Secondary School Classroom (3:3:0). Supports beginning teachers' development and design of assessment practices for promoting student learning. Focuses on the individual differences and classroom, teacher, school, and cultural factors that impact assessment; different types and purposes of assessment; and the relationship of assessment to national and state standards.

695/ENGL 695 Northern Virginia Writing Project Inservice Program (1-3:0:0). Prerequisite: Admission to the graduate program or permission of dean. Offered at the request of a school division or other educational agency. Content varies. May be repeated with the permission of the department, but no more than 6 semester hours of credit in ENGL 695, ENG 695, and/or ENGL 699 may be applied toward a master's degree.

697/ENGL 697 Theory of Composition (3:3:0). Prerequisites: ENGL 615 and ENGL 695 or equivalent. Acquaints classroom teachers with current theory relating to writing and teaching composition. Focuses on making explicit participants' theories, reading the works of leading theorists, and developing a statement describing the implications of theoretical consistency in the teaching of writing.

797 Advanced Topics in Education (3:3:0). Provides advanced study of selected topics in education for students preparing for doctoral studies or who have been admitted to the Ph.D. program in education. May be repeated for credit with the approval of the Graduate School of Education.

800 Ways of Knowing (3:3:0). Prerequisite: Admission to the Ph.D. program. Provides an understanding of the characteristic ways of knowing in various liberal arts disciplines while examining the disciplines' subject matter, scope, key concepts, principles, methods, and theories. Analyzes selected philosophical traditions underlying educational practice and research. This course is required during the first spring semester of study in the program.

802 Leadership Seminar (3:3:0). Prerequisite: Admission to the Ph.D. program. Provides intensive study of leadership, emphasizing concepts of leadership, decision and change processes, and the assessment and development of leadership skills. This course is required during the first semester of study in the program.

805 Doctoral Seminar in Education (1:1:0). Prerequisite: Admission to the Ph.D. program. Covers in depth selected topics in education. Students participate in an information exchange with other students, faculty members, and other scholars about current research interests and ideas.

830 Foundations of Literacy: Birth through Later Childhood (3:3:0). Prerequisites: EDUC 800 and EDRS 810. Explores theory, research, and practice related to emergent literacy and literacy development during childhood. Topics include literacy acquisition and development; historical trends in theories of literacy development; psychological and linguistic, socio-cultural, and instructional influences on literacy development; vocabulary development; the role of narrative and scripts on linguistic development; authentic tasks and assessment and early literacy; and development in academically diverse children.

831 Foundations of Literacy: Adolescence through Adulthood (3:3:0). Prerequisites: EDUC 800 and EDRS 810. Explores theory, research, and practice related to adolescent and adult literacy. Topics include influences on adolescents' and adults' literacy practice and development, current and historical understanding of literacy, connections between literacy and learning in the content areas, and needs of diverse learners. Students review both a common core research literature and topics of individual interest.

840 Seminar in Adult Development and Learning (3:3:0). Prerequisite: Admission to the Ph.D. program or permission of instructor. Provides an advanced course on the nature of the adult learner and the processes of adult learning and development. Emphasizes adults as learners, motivations of adult learners and their participation patterns in adult education activities, and learning theory implications for adult learners.

870 Education Policy: Process, Context, and Politics (3:3:0). Prerequisite: Admission to the Ph.D. program or permission of instructor. Covers the study of policy as process in the local, state, and federal arenas. The primary focus is on policy questions of compulsory schooling, the purpose of schooling, curriculum and testing, governance, and finance. Also addresses issues of quality, efficiency, equity, and choice.
881 Seminar in Bilingual Education: Policy (3:3:0). Prerequisite: Admission to the Ph.D. program. Examines the historical development of education for language minority students in the United States, including federal and state legislation and court decisions. Explores in depth policy issues regarding administrative program models, instructional approaches, curricular reform, and assessment policies for language minority students developed in response to legal mandates, legislative decisions, and the school reform movement.

882 Seminar in Bilingual Education: Theory and Research (3:3:0). Prerequisite: Admission to the Ph.D. program. Examines the theoretical foundations of bilingual/ESL education through focus on linguistics, anthropology, sociology, psychology, and education research addressing language minority students.

890 Doctoral Internship in Education (3:3:0) or (1:1:0 to 6:6:0). Prerequisites: Admission to the Ph.D. program and prior approval of advisor and Ph.D. director. Requires 100 hours of on-site internship completed over at least a five-week period. Interns work with an appropriate staff member in a cooperating school, school system, or other educational institution, agency, or setting. Up to 6 hours of EDUC 890 may be applied toward Ph.D. degree requirements.

893 Seminar in Educational Anthropology (3:3:0). Prerequisite: Admission to Ph.D. program or permission of instructor. Examines how theories and research from educational anthropology and educational sociology can help clarify and address contemporary educational issues and concerns. Focuses on U.S. public schools, with comparative materials from other educational settings and other societies.

894 Seminar in Multicultural Education (3:3:0). Examines the knowledge base, policy issues, and curricular/instructional features of multicultural education in the U.S. and other countries.

895 Seminar in Emerging Issues of Education (3:3:0). Prerequisite: Successful completion of EDUC 800. Focuses on the study of selected emerging issues or problems in education. Students engage in research, study, discussion, and writing about various aspects of the topics selected for study. May be repeated for credit. Up to 6 hours of 895 course work may be applied to Ph.D. requirements.

897 Independent Study for the Doctor of Philosophy in Education (varying credit). Prerequisites: Admission to the Ph.D. program and prior approval of advisor and Ph.D. director. Provides a structured learning experience to extend and develop skills and knowledge relative to a field of professional expertise.

994 Advanced Internship in Education (3:3:0). Prerequisites: Admission to the Ph.D. program and prior approval of advisor and Ph.D. director. Requires an internship in a setting related to the student's major area of study, and a minimum of 100 hours completed over at least a five-week period. Each intern works with an appropriate staff member in a cooperating school, school system, or other educational institution or agency. Internship must be in a setting that differs from regular employment.

998 Doctoral Dissertation Proposal (1:3:1-3:0). Prerequisites: Admission to candidacy in the Ph.D. program; successful completion of the doctoral qualifying examination; and EDRS 810, 811, and 812 or their equivalents.

999 Doctoral Dissertation Research (1-9:1-9:0). Prerequisites: Admission to candidacy in the Ph.D. program and faculty approval of the dissertation proposal. Provides continued faculty assistance on an individual basis to complete the dissertation planned in EDUC 998 and initiate new projects. May be repeated for credit. No more than 11 hours of EDUC 998 and 999 may be applied toward the minimum Ph.D. degree requirements.

Other Courses For other Ph.D. courses, see EDUC 840, 881, 882; EDRS 810, 811, 812, 820, 895; EDIC 701, 705; EDUC 895; EDCD 895; EDIC 895.

Education Leadership (EDLE)

Graduate School of Education

500 In-Service Educational Development (1-6:0:0). See EDUC 500

597 Special Topics in Education (3:3:0). See EDUC 597

598 Directed Reading, Research, and Individual Projects (1-6:0:0). See EDUC 598

600 Workshop in Education (1-6:0:0). See EDUC 600

611 Schools and Communities (3:3:0). Covers schools from historical, political, sociological, and anthropological perspectives. Emphasizes effective school and community relations, including conflict management and resolution.

612 Education Law (3:3:0). Covers law as related to education, including history and precedence.

621 School Administration (3:3:0). Analyzes the principalship with particular attention to assessment and development of leadership skills. (EDLE 611 and 621 should be the first courses taken in education leadership programs.)

626 Curriculum Development and Evaluation (3:3:0). Covers curriculum design and evaluation in education, with emphasis on the roles of educational leaders, models of change, and strategies of learning and instruction.

630 The Application of Learning and Motivational Theory (3:3:0). Covers contemporary learning and motivational theories that affect the administration of schools and other educational settings. Emphasizes adult learning.

631 Supervision and Evaluation of Instruction (3:3:0). Prerequisites: EDLE 611 and 621. Analyzes instructional elements, processes, theory, and practices in the evaluation/supervision of instructional programs and staff.

725 School Business Management (3:3:0). Prerequisites: EDLE 611 and 621. Covers research, theories, and practices in the management of finances in education. Emphasizes school-site tasks, covers site-based management.

740 Personnel Administration in Education (3:3:0). Covers theory, research, and practice relating to human resources management in education, including recruitment, selection, placement, evaluation, development, and rewarding of employees.
336 Education Leadership (EDLE) • Electrical & Computer Engineering (ECE)

789 Organizational Theories and Leadership Development (3:3:0). Covers theories of organizational development with emphasis on leadership in educational settings.

791 Internship in Education Leadership, PK–12 (3-6:3:0). Prerequisite: Permission of advisor. Applies administrative and supervisory theory to practice and the analysis of practice through approved field experiences. The internship may be repeated for credit.

797 Advanced Topics in Education (3:3:0). See EDUC 797.

895 Emerging Issues in Administration and Supervision (3:3:0). Prerequisite: Admission to the Ph.D. program or permission of instructor. Covers selected emerging issues in educational leadership. Students engage in research, study, discussion, and writing about the various topics selected for study.

Education Research (EDRS)
Graduate School of Education

531 Educational and Psychological Measurement (3:3:0). Emphasizes techniques and principles used in the construction, administration, and quantification of measuring devices for evaluation purposes. Discusses interpretation of standardized tests of ability, aptitude, achievement, interest, and personality.

590 Education Research (3:3:0). Helps students develop skills, insights, and understanding basic to performing research, with emphasis on interpretation and application of research results. The course critiques research and uses findings in educational settings.

597 Special Topics in Education. (3:3:0). See EDUC 597.

797 Advanced Topics in Education (3:3:0). See EDUC 797.

810 Problems and Methods in Education Research (3:3:0). Prerequisite: Admission to the Ph.D. program or permission of instructor. This is an advanced course in the interpretation and application of education research methods. Emphasizes comparison of alternative philosophies of research, ways of formulating questions/hypotheses, research plans, and analysis procedures. Students evaluate existing studies and investigate a range of research approaches.

811 Quantitative Methods in Educational Research (3:3:0). Prerequisite: Satisfactory completion of EDUC 810 or its equivalent, or permission of instructor. Emphasizes advanced methods of conducting research using quantitative methods of data collection and analysis appropriate for research in education. Includes the design of experimental and quasi-experimental research studies and methods of analysis appropriate to these studies, including the analysis of variance and multiple linear regression.

812 Qualitative Methods in Educational Research (3:3:0). Prerequisite: Satisfactory completion of EDUC 810 or its equivalent, or permission of instructor. Allows students to study and apply qualitative data collection and analysis procedures used in educational research, including ethnographic and other field-based methods, and unobtrusive measures. Emphasizes vary depending on the interests and needs of the students.

820 Evaluation Methods for Educational Programs and Curricula (3:3:0). Prerequisites: Successful completion of EDRS 810 or permission of instructor. Prior completion of EDRS 811 and EDRS 812 is helpful but not required. This course explores the development and types of current systems and models for evaluating educational programs and curricula. The emphasis is on the evaluation needs and problems of public and private elementary and secondary schools, as well as colleges and universities, although the needs of government agencies, industry, and health-related organizations are also considered.

821 Advanced Applications of Quantitative Methods (3:3:0). Prerequisite: EDRS 810 and EDRS 811. This course provides an advanced study of applications of quantitative methods in the practice of educational research, and reinforces and builds on concepts and skills acquired in EDRS 811. It uses a modular approach, and provides an advanced study of techniques appropriate to survey research, group-experimental and quasi-experimental research, selected multivariate procedures and factor analysis, and quantitative synthesis (meta-analysis) of research. Students learn through a combination of text reading assignments, critiques and discussion of relevant journal articles, and application activities.

822 Advanced Applications of Qualitative Methods (3:3:0). Prerequisite: EDRS 810 and EDRS 812. This is an advanced seminar devoted to the study of current topics in qualitative research. The seminar deals with cutting-edge information on selected advanced topics in qualitative research, and provides students with opportunities to apply new skills and knowledge to projects related to their own interests.

823 Advanced Research Methods in Single Subject/Case Design (3:3:0). Prerequisites: EDRS 810, 811, and 812. Prepares students to conduct research using single subject design and single case study design. This advanced seminar provides students with an understanding of the salient features as well as the advantages and disadvantages of these research methodologies. Students critique and analyze published research using these methodologies. Opportunities are provided for students to apply these methodologies to research questions related to current student interests.

Electrical and Computer Engineering (ECE)

Electrical and Computer Engineering

101 Introduction to Information Technology (3:3:1). Introduces students to the fundamental concepts in information technology that provide the technical underpinning for state-of-the-art applications. Both fundamental engineering skills and a perspective on the range of information technology is presented through lectures and hands-on experiments. Additionally, the historical development and social implications of efforts in information technology form an integral part of the course. F,S

201 Introduction to Electrical Engineering (3:3:1). Prerequisite: A grade of C or better in MATH 113. Provides a technically more rigorous introduction to problems and tools commonly encountered by electrical engineers. Students are introduced to mathematical modeling of engineering problems and their solutions. Standard software packages for electrical engineering are introduced as tools to simulate engineering problems on a computer. Mathematical and
### Courses

#### Electrical & Computer Engineering (ECE) 337

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<tr>
<th>Course Title</th>
<th>Prerequisites</th>
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<tr>
<td>220 Signals and Systems I (3:3:1)</td>
<td>Prerequisite: C or better in ECE 201 or equivalent; corequisites: MATH 203, 214. First of a two-semester sequence of courses that provide the mathematical background for many ECE courses taken in the junior and senior years. This course introduces students to methods of representing continuous-time signals and systems and the interaction between signals and systems. Analysis of signals and systems via differential equations and transform methods is discussed. Laplace and Fourier transforms as convenient analysis tools are presented, and the powerful concept of frequency response of systems is emphasized. Stability of systems is studied in both the time and frequency domains. Application examples from communications, circuits, control, and signal processing are presented.</td>
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<tr>
<td>280 Electric Circuit Analysis (5:4:2)</td>
<td>Prerequisites: Grade of C or better in PHYS 260 and 261 (formerly 350 and 351); corequisite: ECE 220 must be taken concurrently with or before ECE 280. Builds on the simple circuit concepts (current, voltage, ohm's Law, Kirchhoff Voltage Law) introduced in PHYS 260. Circuit analysis using superposition, equivalent circuits, transient and steady state analysis of RL, RC, and RLC circuits. Applications of Laplace transform in circuit analysis, sinusoidal excitations and phasors, resonance, filters, AC steady-state analysis, coupled coils, and three phase circuits. A lab demonstrating and investigating circuit analysis concepts is included.</td>
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<tr>
<td>301 Digital Electronics (3:2:2)</td>
<td>Course is not intended for those majoring in electrical or computer engineering. Introduction to digital systems, circuits, and computers. Topics include binary systems and codes, digital logic gates and circuits, microelectronics and integrated circuits, coding and multiplexing, multivibrators, shift registers, counters, A/D converters, and digital computer architecture.</td>
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<tr>
<td>305 Electromagnetic Theory (3:3:0)</td>
<td>Prerequisites: PHYS 260 (formerly 350) and a grade of C or better in MATH 214. Static and time varying electric and magnetic fields, dielectrics, magnetization, Maxwell's Equations, and introduction to transmission lines. Course uses vector calculus and algebra of complex numbers.</td>
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<tr>
<td>320 Signals and Systems II (3:3:1)</td>
<td>Prerequisite: Grade of C or better in ECE 220 and MATH 203. Second of a two-semester sequence of courses that provide the mathematical background for many ECE courses taken in the junior and senior years. This course provides students with methods of representing and analyzing discrete-time signals and systems. The effects of converting from continuous-time to discrete time are studied, and the Z-transform is presented as a convenient analysis tool. The powerful concept of frequency response of systems developed in the first semester of the sequence continues to be emphasized. Random signals are studied in both continuous time and discrete time. Application examples from communications, circuits, control, and signal processing are presented.</td>
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<tr>
<td>331 Digital System Design (3:3:0)</td>
<td>Corequisites: ECE 280 and 332. ECE 332 should be taken concurrently with ECE 331. Credit may not be received for ECE 301 and 331. Principles of digital logic and digital system design and their implementation in VHDL. Topics include number systems, Boolean algebra, analysis, design, and minimization of combinational logic circuits; analysis and design of synchronous and asynchronous finite state machines; and an introduction to VHDL and behavioral modeling of combinational and sequential circuits.</td>
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<tr>
<td>332 Digital Electronics and Logic Design Lab (1:0:3)</td>
<td>Prerequisites: PHYS 261 or 265 (formerly 351 or 355) or permission of instructor. Corequisite: ECE 331. Lab associated with ECE 331.</td>
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<tr>
<td>333 Linear Electronics I (3:3:0)</td>
<td>Prerequisite: Grade of C or better in ECE 280. ECE 334 is normally taken concurrently with ECE 333. Principles of operation and application of electron devices and linear circuits. Topics include semiconductor properties, diodes, bipolar and field effect transistors, biasing, amplifiers, frequency response, operational amplifiers, and analog design.</td>
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<tr>
<td>334 Linear Electronics Lab I (1:0:3)</td>
<td>Prerequisites: PHYS 261 or 265 (formerly 351 or 355) or permission of instructor; corequisite: ECE 333. Lab associated with ECE 333.</td>
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<tr>
<td>410 Introduction to Signal Processing (3:3:0)</td>
<td>Prerequisites: Grade of C or better in ECE 320 and STAT 346. Introduction to statistical signal processing. The course reviews probability theory with emphasis on continuous random variables and transformations; treatment of discrete-time signals with introduction to sampling and filtering of random signals; and spectral analysis of random signals, detection of signals in noise, and estimation of signal parameters.</td>
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<tr>
<td>421/SYST 421 Classical Systems and Control Theory (3:3:0)</td>
<td>Prerequisites: A grade of C or better in ECE 220 or permission of instructor. Introduction to the analysis and synthesis of feedback systems. Course covers functional description of linear and nonlinear systems, block diagrams, and signal flow graphs; state-space representation of dynamical systems, frequency response methods, and Root Locus, Nyquist, and other stability criteria. Performance indices and error criteria, and applications to mechanical and electromechanical control systems are also discussed.</td>
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<tr>
<td>422 Digital Control Systems (3:3:0)</td>
<td>Prerequisite: A grade of C or better in ECE 320 and 421. Introduction to the analysis and design of digital control systems, Z-transform, discrete linear systems, frequency domain, and state variable techniques. Use of microcomputers in control systems is discussed.</td>
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<tr>
<td>429 Control Systems Lab (1:0:3)</td>
<td>Prerequisite: A grade of C or better in ECE 421. Laboratory experiments for topics in control systems analysis, design, and implementation with an emphasis on the use of microcomputers.</td>
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<tr>
<td>430 Principles of Semiconductor Devices (3:3:0)</td>
<td>Prerequisites: MATH 214, ECE 305, and a grade of C or better in ECE 333, or permission of instructor. Introduction to solid state physics and its application to semiconductors and semiconductor devices. Topics include band theory, doping, p-n junctions, diffusion theory, low-frequency circuits, devices including bipolar transistor, MOSFET, CMOS, and photo transistors.</td>
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<tr>
<td>431 Digital Circuit Design (3:3:0)</td>
<td>Prerequisites: A grade of C or better in ECE 331 and 333. Analysis and design of discrete and integrated switching circuits. Topics include the transient characteristics of diodes, bipolar, and field-effect transistors, MOS and bipolar inverters; nonregen-</td>
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erative and regenerative circuits; TTL, ECL, IIL, NMOS, and CMOS technologies; semiconductor memories, VLSI design principles; and SPICE circuit analysis.

433 Linear Electronics II (3:3:0). Prerequisite: A grade of C or better in ECE 333. Second course in linear electronics covering the following topics: differential amplifiers, feedback circuits, power amplifiers, feedback amplifier frequency response, analog integrated circuits, operational amplifier systems, oscillators, wide band and microwave amplifiers, and computer-aided design.

434 Linear Electronics II Laboratory (1:0:3). Prerequisite: ECE 334; corequisite: ECE 433. Second lab course in linear electronics involving analysis and design of the topics listed in ECE 433.

435 Digital Circuit Design Laboratory (1:0:3). Prerequisite: ECE 334; corequisite: ECE 431. Lab experiments for topics covered in ECE 431.

437 Principles of Microelectronic Device Fabrication (3:2:3). Prerequisites: ECE 333 or 430 or permission of instructor. Introduces students to the fundamentals of microelectronic semiconductor device fabrication technology. The processing steps include photolithography, oxidation, diffusion, ion-implantation, chemical vapor deposition, ohmic contact metallization, interconnects, packaging, MOS process integration, and bipolar process integration, etc. A laboratory project involving the above mentioned processing steps will be an integral part of the course.

442 Digital Computer Design and Interfacing (3:3:0). Prerequisite: ECE 445. Overview of digital computer development. Computer design principles, design of processors, instruction sets, memory systems, cache, interface, RISC principles, and principles of pipelining and pipeline hazards are examined. Instruction-level parallelism, and superscalar and superpipelined systems. Course presents an overview of modern RISC-type systems.

445 Computer Organization (3:3:0). Prerequisite: Grade of C or better in ECE 331. General overview of the operation of a digital computer. Topics include computer arithmetic, the arithmetic unit, hardwired and microprogrammed control, memory, register-to-register, input-output operations, and behavioral modeling of computer organization using VHDL.

447 Single-Chip Microcomputers (4:3:3). Prerequisites: CS 211, ECE 332, and 445, all with a grade of C or better, or permission of instructor. Designing with single-chip microcomputers and microcomputer interfacing. Topics include the role of microcomputers as compared with microprocessors and other computers, microcomputer architecture and organization, real-time control issues, assembly language programming for control, design of control software, input/output methods, design tools, and available single-chip microcomputers. Students select a project and design and construct a system including a single-chip microcomputer and the ancillary hardware to implement a control system.

449 Computer Design Lab (1:0:3). Prerequisites: ECE 332 and 445. A laboratory course providing experience in the design and fabrication of a digital computer using field programmable arrays (FPGA) and/or other VLSI-integrated circuits. The course includes the specification of a simple computer using VHDL, simulation of the computer, and the fabrication of the computer in programmable logic devices (FPGA, PLA, PAL, etc.). A comparison is made between the simulation and the hardware implementation.

450 Introduction to Robotics (3:3:0). Prerequisite: ECE 320. Introduction to robotic manipulator systems. Topics include an overview of manipulation tasks and automation requirements; actuators, sensors, and computer interfaces; arm and hand kinematics; path, velocity, and force control; elements of computer vision; and real-time programming languages. Design projects are conceived, simulated, and tested by the students.

460 Communication and Information Theory (3:3:0). Prerequisites: A grade of C or better in ECE 220 and in STAT 346, or permission of instructor. Signal analysis, Fourier transform, power spectrum, and sampling. Course covers concepts of information content and channel capacity, principles of modulation: amplitude, frequency, and phase modulation; frequency and time division multiplexing; and digital transmission, pulse code modulation and delta modulation. Applications to radio, telephone, and satellite systems are discussed.

461 Communication Engineering Laboratory (1:0:3). Prerequisites: ECE 460 and ECE 334. Lab experiments in the analog and digital communication areas covered in ECE 460.

462 Data and Computer Communications (3:3:0). Prerequisite: STAT 346 or permission of instructor. Introduction to modern data communications and computer networks. Topics include point-to-point communication links and transmission of digital information, modems, and codecs, packet switching, multiplexing and concentrator design, multiaccess and broadcasting, local area networks, wide area networks, and ISDN. Course discusses the architectures and protocols for computer networks and the concept of the OSI reference model, the OSI seven layers; physical interfaces and protocols, data link control layer, and network layer. Examples of data networks are provided.

463 Digital Communications Systems (3:3:0). Prerequisite: ECE 460. Introduction to digital transmission systems. Topics include quantization, digital coding of analog waveforms, PCM, DPCM, DM, baseband transmission, digital modulation schemes, ASK, FSK, PSK, MSK, QAM, pulse shaping, intersymbol interference, partial response, voiceband and wideband modems, digital cable systems, regenerative repeaters, clock recovery and jitter, multipath fading, digital radio design, optimal receiver design, MAP receiver, and probability of error.

464 Modern Filter Design (3:3:0). Prerequisite: ECE 320. Solution to the filtering approximation problem via Butterworth, Chebyshev, Elliptic, and Bessel approaches. The course covers transfer function scaling and type transformations, review of Z-transform, time and frequency domain effects of A/D and D/A conversion, and Digital filter design and implementation.

465 Computer Networking Protocols (3:3:0). Prerequisites: STAT 346 or 344, CS 211, and either ECE 331 or 301. An introduction to computer networking protocols and concepts, with emphasis on the Internet and the Internet Protocol Suite. Course coverage includes computer networking protocols at the application, transport, and network layers, including multimedia networking protocols. Other topics include network security and network management.
469 Microwave Circuit Laboratory (1:1:2). Prerequisites: ECE 305 and 334, or permission of instructor. Introduction to microwave engineering laboratory techniques and measurements. Design, fabrication, and test of microwave microstrip circuits.

491 Engineering Seminar (1:1:0). Prerequisite: 90 credits in electrical or computer engineering program. Engineering ethics, professionalism, the role of the engineer in society, current topics, and employment opportunities. f.s

492 Senior Advanced Design Project I (1:1:0). Prerequisite: Senior status in electrical engineering program. Conception of the senior design project and determination of the feasibility of the proposed project. Work includes developing a preliminary design and an implementation plan. f.s

493 Senior Advanced Design Project II (2:2:0). Prerequisite: ECE 492, preferably in the preceding semester. Implementation of project for which preliminary work was done in ECE 492. Project includes designing, constructing of hardware, writing required software, conducting experiments or studies, analyzing the complete system. Oral and written reports are required during the project and also at the project's completion. f.s

498 Independent Study in Electrical and Computer Engineering (1-3:0:0). Directed self-study of special topics of current interest in ECE. Topic must be arranged with an instructor and approved by the department chair before registering. Course can be taken for a maximum of three credits. f.s

499 Special Topics in Electrical Engineering (1-3:0:0). Prerequisites: Permission of instructor; specific prerequisites vary with the nature of the topic. Topics of special interest to undergraduates. May be repeated for a maximum of six credits if the topics are substantially different. f.s

511 Microprocessors (3:3:0). Prerequisite: ECE 445 or equivalent. Introduction to microprocessor software and hardware architecture. Fundamentals of microprocessor system integration, instruction set design, programming memory interfacing, input/output, direct memory access and interrupt interfacing. Microprocessor architecture evolution. Study of the Intel family of microprocessors. Review of the other microprocessor families, architectures and of trends in microprocessor design. f.

513 Applied Electromagnetic Theory (3:3:0). Prerequisite: ECE 305 or equivalent. Maxwell's Equations, electromagnetic wave propagation, wave guides, transmission lines, radiation, and antennas. f.

520 Applications of Analog And Digital Integrated Circuits (3:3:0). Prerequisites: ECE 433 and 431 or permission of instructor. Study of analog and digital integrated circuits mainly from communications applications point of view. Topics consist of the analog, digital, and mixed (analog/digital) building block circuits used in system design including operational amplifiers, comparators, voltage regulators, video amplifiers, oscillators, modulators, phase-locked loops, multiplexers, active filters, A/D and D/A converters, and optoelectronic circuits. f.

521 Modern Systems Theory (3:3:0). Prerequisite: ECE 320 or equivalent. Introduction to linear systems theory. Course covers a review of linear algebra, state variables, state space description of dynamic systems, an analysis of continuous-time and discrete-time linear systems, controllability and observability of linear systems, stability theory, and an introduction to the design of linear feedback control systems. f.s

528 Introduction to Random Processes in Electrical and Computer Engineering (3:3:0). Prerequisites: ECE 220 and STAT 346 or permission of instructor. Probability and random processes are fundamental to communications, control, signal processing, and computer networks. This course provides the basic theory and some important applications. Topics include probability concepts and axioms, stationarity and ergodicity, random variables and vectors, functions of random variables, expectation and variance, conditional expectation, moment generating and characteristic functions, random processes (such as white noise, Gaussian, etc), autocorrelation and power spectral density, linear filtering of random processes, basic ideas of estimation and detection.

535 Digital Signal Processing (3:3:0). Prerequisites: ECE 320 and 528 or permission of instructor. Representation analysis and design of digital signals and systems. Course covers sampling and quantization, Z-transform and Discrete Fourier Transform, digital filter realizations, design techniques for recursive and nonrecursive filters, the Fast Fourier Transform algorithms, and spectrum analysis. Additional topics may include adaptive filtering, homomorphic digital signal processing, digital interpolation and decimation, and VLSI signal processors.

537 Introduction to Digital Image Processing (DIP) (3:3:0). Prerequisite: Graduate standing. First course in digital image processing in which the concepts of scanning systems, focal plane array detectors, data acquisition methods, display hardware, image preprocessing algorithms, feature extraction, and basic image processing methods are introduced. A semester-long image processing project is included utilizing modern image processing system prototyping software.

540/TCOM 500 Modern Telecommunications (3:3:0). Prerequisite: Graduate standing. For students outside of the program. Cannot be applied toward degrees in electrical or computer engineering. Comprehensive overview of telecommunications including current status and future directions. Topics include a review of the evolution of telecommunications, voice and data services; basics of signals and noise, digital transmission, network architecture, and protocols; local area, metropolitan, and wide area networks and broadband ISDN, asynchronous transfer mode and broadband ISDN; and satellite systems, optical communications, cellular radio, personal communication systems, and multimedia services. Examples of real-life networks are provided to illustrate the basic concepts and gain further insight.

542 Computer Network Architectures and Protocols (3:3:0). Prerequisites: STAT 344 or equivalent, and graduate standing in the School of IT&E. Introduction to the architectures and protocols of computer networks and the concept of packet switching. Topics include ISO standard layer model, physical interfaces and protocols, data link control, multiaccess techniques, packet switching, routing and flow control, network topology, data communication subsystems, error control coding, local area network, satellite packet broadcasting, packet radio, interconnection
of packet-switching networks, network security and privacy, and various examples of computer networks. f,s,summer

545 Introduction to VHDL (3:3:0). Prerequisite: Graduate standing. Course introduces the concept of a hardware description language and hardware design through VHDL. An understanding of the impact and uses of VHDL is emphasized through VHDL models of typical digital computers and processors. There is a semester long project in which a digital system is implemented and simulated in VHDL.

546 Parallel Computer Architectures (3:3:0). Prerequisite: ECE 445. Study of computation schemata, Petri nets, parallel floating point operations, instruction handling techniques, pipeline systems, functional parallelism, memory organization, arbitration and deadlock, pipeline computer architecture, and massive parallelism.

548 Sequential Machine Theory (3:3:0). Prerequisite: ECE 331 or permission of instructor. Theoretical study of sequential machines. Topics include sets, relations and lattices, switching algebra, functional decomposition, iterative networks, representation, minimization and transformation of sequential machines, state identification, state recognizers, and linear and stochastic sequential machines.


563 Introduction to Microwave Engineering (3:3:0). Prerequisite: ECE 305 or permission of instructor. Study of the generation, control, and propagation of microwave signals. Course examines transmission lines, waveguides, resonators, scattering parameters, Smith charts, measurement techniques, instrumentation, and microwave devices.

565 Introduction to Optical Electronics (3:3:0). Prerequisites: ECE 305 and 333. Introduction to optoelectronic devices for generation, detection, and modulation of light. Topics include electrooptic modulators, gas, solid state and semiconductor lasers, photodetectors, and detector arrays.

567 (formerly 667) Optical Fiber Communications (3:3:0). Prerequisite: ECE 565 or permission of instructor. Study of the components and integration of fiber-optic transmission systems. Topics include optical fibers, signal degradation, optical sources, power launching and coupling, photodetectors, receiver circuits, link analysis, and optical measurements.

584 Semiconductor Device Fundamentals (3:3:0). Prerequisite: ECE 430 or permission of instructor. Study of the principals of operation of semiconductor devices based on solid state physics. Topics include the band theory of solids, intrinsic and extrinsic semiconductor properties, pn junction diode, bipolar junction transistor, Schottky diode, metal-insulator semiconductor junctions, field-effect transistors, and heterostructures.

586 Digital Integrated Circuits (3:3:0). Prerequisites: ECE 331 and 430, or permission of instructor. Study of the design and analysis of digital integrated circuits, with emphasis on CMOS technology. Review of MOSFET operation and SPICE modeling. Analysis and design of basic inverter circuits. Structure and operation of combinational and sequential logic gates. Dynamic logic circuits, chip I/O circuits, and a brief introduction to VLSI methodologies.

587 Design of Analog Integrated Circuits (3:3:0). Prerequisites: ECE 433 and 430, or permission of instructor. Study of the design methodologies of CMOS based analog integrated circuits. Topics include differential amplifiers, current sources, output stages, operational amplifiers, comparators, frequency response, noise, computer-aided design.

590 Selected Topics in Engineering (3:3:0). Prerequisite: Graduate standing or permission of department. Selected topics from recent developments and applications in various engineering disciplines. Course is designed to help the professional engineering community keep abreast of current developments.

595/SYST 595 Discrete Event Systems (3:3:0). Prerequisite: SYST 500 or equivalent. Introduction to modeling and analysis of discrete event dynamical systems. Course covers elements of discrete mathematics including sets and multisets, lattices, relations, and graph theory, untimed and timed models of discrete event systems, Condition/Event nets, Place/Transition nets, and their properties, concurrent and asynchronous processes, colored Petri Nets and the modeling of systems, simulation and performance analysis, and executable models for system architectures and structured analysis and object-oriented system design approaches. Applications are from several domains: command and control, air traffic control, flexible manufacturing systems, robotics, decision making organizations, decision support systems, and software intensive systems.

611 (formerly 516) Advanced Microprocessors (3:3:0). Prerequisite: ECE 511 or permission of instructor. Covers principles of advanced 32-bit and 64-bit microprocessors. Microprocessor structure and architecture, pipelined execution and pipeline hazards, and instruction-level parallelism; superscalar and superpipelined execution. Intel x86 and Motorola M68000 families are studied in detail. RISC principles and advantages, and examples of RISC-type microprocessors are discussed.

612 (formerly 512) Real-Time Embedded Systems (3:3:0). Prerequisite: ECE 511 or permission of instructor. A study of real-time operating systems and device drivers for embedded computers. The emphasis is on microprocessor systems and associated input device sampling strategies, including interrupt driven and polled I/O. Basic input/output operations, analog to digital conversion methods, I/O programming techniques and process, and communication control methodologies are covered. The course involves a design project.

620 Optimal Control Theory (3:3:0). Prerequisite: ECE 521 or permission of instructor. Detailed treatment of optimal control theory and its applications. Topics include system dynamics and performance criteria, the calculus of variations and Pontryagin's minimum principle, computational methods in optimal control, and applications of optimal control.

621 Systems Identification (3:3:0). Prerequisites: ECE 521 and 528 or permission of instructor. Foundations of parameter estimation using the least squares method. Iden-
624 Control Systems (3:3:0). Prerequisites: ECE 421 and 521, or permission of instructor. Analysis, design, and implementation of digital feedback control systems. Topics include discrete-time models, pole-placement, controller design methods, MIMO system decoupling, and observer design. Course may include a simulation and design project.

630 Statistical Communication Theory (3:3:0). Prerequisite: ECE 528. Introduction to optimum receiver design in the additive white Gaussian noise environment. Topics include efficient signal set design, modulation techniques, matched filter, correlation detector, coherent and noncoherent detections, fading and diversity channels, random amplitude and phase, diversity techniques, performance bounds of communications, and waveform communications.

633 Coding Theory (3:3:0). Prerequisite: ECE 528 or permission of instructor. Mathematics of coding groups, rings, and fields; polynomial algebra. Topics include linear block codes, generator and parity check matrices; error syndromes, binary cyclic codes, convolutional codes; and implementation of encoders and decoders.

635 Adaptive Signal Processing (3:3:0). Prerequisite: ECE 528. Introduction to adaptive systems and adaptive signal processing. Topics include correlation functions and correlation matrices; performance functions; search of minimum; steepest descent and Newton algorithms; least mean squares algorithms; noise perturbed search and misadjustment; sequential regression algorithm and convergence issues; recursive least squares algorithm and forgetting factor; frequency domain algorithms; adaptive equalization; pseudorandom binary sequences and system identification; adaptive interference cancellation; adaptive beam forming and adaptive arrays. Simulation of the adaptive algorithms.

638/IT 838 Fast Algorithms and Architectures for Digital Signal Processing (3:3:0). Prerequisite: ECE 535 or permission of instructor. Study of recent advances in the development of signal processing algorithms and relevant computational architectures. Topics include fast polynomial transforms, Winograd's algorithm, multirate processing of digital signals, spectral estimation, adaptive filtering, and wavelet transforms.

640 Massively Parallel Computers (3:3:0). Prerequisite: ECE 546 or permission of instructor. Topics include basic concepts of parallelism, two-dimensional computation schemata, types of intercommunication networks between processing elements, single-instruction-stream multiple-data-stream computers, computers with massive parallelism, pyramid computing structures, multiple-instruction-stream multiple-data-stream computers, and parallel processing of images.

641 Computer System Architecture (3:3:0). Prerequisite: ECE 511 or permission of instructor. Advanced course in computer architecture. Definitions, multiple processors, VLSI architecture, data flow, computation, the semantic gap, high-level language architecture, object-oriented design, RISC architecture, and current trends in computer architecture are covered.

642 Design and Analysis of Computer Communication Networks (3:3:0). Prerequisites: ECE 542 and 528 or equivalent. Introduction to queuing theory. Other topics include concentrator design, multiplexing, capacity assignments, random access schemes, polling and probing techniques, topology design, flow control and routing, packet radio, protocol specification, and validation.


644 Architectures and Algorithms for Image Processing (3:3:0). Prerequisite: ECE 511 and 537 or equivalent. Architectures and algorithms for the analysis and processing of pictorial information. Topics include systems and techniques for the digital representation of images; image scanning methods and their applications; picture processing languages; image data structures; feature detection, extraction, and reconstruction; detection of symmetries; systems and methods for regular decomposition, image segmentation, object thinning, real-time orthogonal transformations, and applications. Course includes a design project.

645 Computer Arithmetic: Hardware and Software Implementations (3:3:0). Prerequisites: ECE 545 or permission of instructor. Course covers computer arithmetic as applied to the design of general-purpose microprocessors, and application-specific integrated circuits for cryptography, coding, and digital signal processing. The focus is on efficient implementations of all basic arithmetic operations in three major domains: integers, real numbers, and elements of the Galois Fields $GF(2^n)$. The course provides the way of choosing between various hardware algorithms and architectures depending on the primary optimization criteria, such as speed, area, and power consumption. The best algorithms for implementing arithmetic operations in software and hardware are compared and contrasted.

646 (formerly 543) Cryptography and Computer Network Security (3:3:0). Prerequisites: ECE 542 or permission of instructor. Topics covered include need for security services in computer networks, basic concepts of cryptography, historical ciphers, modern symmetric ciphers, public key cryptography (RSA, elliptic curve cryptosystems), efficient hardware and software implementations of cryptographic primitives, requirements for implementation of cryptographic modules, data integrity and authentication, digital signature schemes, key exchange and key management, standard protocols for secure mail, www and electronic payments, security aspects of mobile communications, key escrow schemes, zero-knowledge identification schemes, Smart cards and PCMCIA cards, quantum cryptography, and quantum computing.

650 Robotics (3:3:0). Prerequisite: ECE 521 or permission of instructor. Introduction to robotics and advanced automation with an emphasis on electrical engineering standpoint. Topics include hardware overview, coordinate systems and manipulator kinematics; differential motion and the inverse Jacobian; manipulator path control and motion planning; design and control of articulated hands; sensory feedback; machine vision; applications to industrial automation.
662 Microwave Electronics (3:3:0). Prerequisites: ECE 563 or permission of instructor. Study of the generation, control, and propagation of microwave signals. Topics include solid-state microwave devices and high-power microwave devices and microwave applications.

665 Fourier Optics and Holography (3:3:0). Prerequisites: ECE 565. Study of optical systems for processing temporal signals as well as images. Topics include use of coherent optical systems for image processing and pattern recognition, principles of holography, and acousto-optic systems for radar-signal-processing optical computers.

670/SYST 680 Principles of Command, Control, Communication, and Intelligence (C I) — Part I (3:3:0). Prerequisites: ECE 528 or SYST 500, or equivalent. See SYST 680.

671/SYST 681 Principles of Command, Control, Communication, and Intelligence (C I) — Part II (3:3:0). Prerequisite: ECE 670/SYST 680 or permission of instructor. See SYST 681.

680 Physical VLSI Design (3:3:0). Prerequisites: ECE 586 or permission of instructor. Introduction to NMOS, CMOS and BiCMOS integrated circuit technology and fabrication. Review of MOS and BiCMOS inverter structures and operation. MOS and BiCMOS circuit design processes, MOS layers, stick diagrams, design rules and layout. Subsystem design and layout illustration of the design process through the design of a 4-bit arithmetic processor and its parts, adder, multiplier, register, and memory cells. Aspects of system timing; test and testability; and a review of currently available VLSI CAS tools.

681 VLSI Design Automation (3:3:0). Prerequisites: ECE 545 and 586 or permission of instructor. A broad introduction to basic concepts, techniques and algorithms used by modern VLSI design automation software. The course covers hardware description languages, logic synthesis, simulation, static timing analysis, formal verification, test generation/verification and test design.

682 (formerly 588) VLSI Test Concepts (3:3:0). Prerequisite: ECE 586. Broad introduction to basic concepts, techniques, and tools of modern VLSI testing. Fundamentals of defect modeling, fault simulation, design for testability, built-in self-test techniques, and failure analysis. Test economics, physical defects and fault modeling, automated test pattern generation, fault simulation, design for test, build-in self-test, memory test, PLD test, mixed signal test, lddq test, boundary scan and related standards, test synthesis, diagnosis and failure analysis, automated test equipment, embedded core test.

684 MOS Device Electronics (3:3:0). Prerequisite: ECE 584 or permission of instructor. Study of MetalOxide-Semiconductor (MOS) based device theory, characteristics, models, and limitations. Topics include MOS capacitance, MOSFETs, CMOS, charge coupled devices, scaling, hot carrier effects, latchup, radiation effects, and isolation techniques.

689 VLSI Processing (3:3:0). Prerequisite: ECE 584 or permission of instructor. In-depth study of various steps in silicon VLSI circuit processing. These steps include thermal oxidation, diffusion, ion-implantation, epitaxial growth, poly-silicon, metal and insulator layer deposition, photolithography, and MOS processing integration. This course also involves hands-on laboratory projects and use of the process simulator SUPREM.

698 Independent Reading and Research (3:3:0). Prerequisites: Graduate standing, completion of at least two core courses, and permission of instructor. Study of a selected area in electrical and computer engineering under the supervision of a faculty member. Written report is required. May be taken no more than twice for graduate credit.

699 Advanced Topics in Electrical and Computer Engineering (3:3:0). Prerequisites: permission of instructor. Advanced topics of current interest in electrical and computer engineering. Topics are chosen in such a way that they do not duplicate any of the other courses in the department. Active participation of the students is encouraged in the form of writing and presenting papers in the research areas.

720/IT 843 Multivariable and Robust Control (3:3:0). Prerequisite: ECE 620 or permission of instructor. Eigenstructure assignment for multivariable systems, the Smith-McMillan form, internal stability, modeling system uncertainty, performance specifications and principal gains, parametrization of controllers, loop shaping and loop transfer recovery, and the H methodology.

721/IT 846 Nonlinear Systems (3:3:0). Prerequisite: ECE 521. Nonlinear dynamical systems. Motivating examples. Analysis techniques include basic fixed point theory, implicit function theorem, dependence of trajectories on initial data and parameters. Course also covers computational simulation techniques, stability theory, including Lyapunov's direct method, nonlinear control systems: input-output stability, and absolute stability, strong positive real transfer functions. Feedback linearization of nonlinear systems, nonlinear canonical forms; nonlinear decoupling; sliding control; and applications to adaptive control, neural networks, and robotics are also included.

722/IT 841 Kalman Filtering with Applications (3:3:0). Prerequisite: ECE 521 and 528 or equivalent, or permission of instructor. Detailed treatment of Kalman Filtering Theory and its applications, including some aspects of stochastic control theory. Topics include state-space models with random inputs, optimum state estimation, filtering, prediction and smoothing of random signals with noisy measurements, all within the framework of Kalman filtering. Additional topics are nonlinear filtering problems, computational methods, and various applications such as Global Positioning System, tracking, system control, and others. Stochastic control problems include linear-quadratic-Gaussian problem and minimum-variance control.

728 Random Processes in Electrical and Computer Engineering II (3:3:0). Prerequisite: ECE 528 or permission of instructor. Provides students with the background in random processes needed for pursuing graduate studies and research in the areas of statistical signal processing, communications, control, and computer networks. It is recommended for advanced master's and doctoral students. Course covers probability spaces, random variables, Lebesque integration, conditional mean on a sigma-field, convergence of random variables, limit and ergotic theorems, Markov processes, and Martingales.

731 (formerly 631) Digital Communications (3:3:0). Prerequisite: ECE 630 or equivalent. Digital transmission of voice, video, and data signals. Course covers signal digitiza-
tion, pulse code modulation, delta modulation, low bit-rate coding, multiplexing, synchronization, intersymbol interference, adaptive equalization, frequency spreading, encryption, transmission codes, digital transmission using bandwidth compression techniques, and satellite communications.

732 Mobile Communication Systems (3:3:0). Prerequisites: ECE 542 and 630. Introduction to mobile communication system design and analysis. Topics include modeling of the mobile communication channel, signal set and receiver design for the mobile communication channel, access and mobility control, mobile network architectures, connection to the fixed network, and signaling protocols for mobile communication systems. Examples of mobile communication systems are presented, including the pan-European GSM system, the North American D-AMPS system, and Personal Communication Systems.

733 Advanced Coding Theory (3:3:0). Prerequisites: ECE 630 and 633. Theory and practice of advanced error-control coding techniques. Topics include trellis codes, multidimensional codes, Leech lattice, rotationally invariant codes, spectral analysis and transform coding. Applications of contemporary coding theory in mobile communications, magnetic and optical recording, high-speed modern, and high-density data storage design are presented.

734/IT 830 Detection and Estimation Theory (3:3:0). Prerequisite: ECE 528. Introduction to detection and estimation theory with communication and radar/sonar applications. Topics include classical detection and estimation theory, detection of known signals in Gaussian noise, signal parameter estimation, linear waveform estimation, and Wiener and Kalman filters.

735/IT 832 Data Compression (3:3:1). Prerequisite: ECE 528 or permission of instructor. In-depth study of lossy data compression techniques based on vector quantization with application to speech, image, and video signals. Vector quantization of both signal's waveform and commonly used parametric statistical models such as the autoregressive model are covered. Topics include scalar quantization, predictive quantization, transform coding, entropy coding, and variations on basic vector quantization such as constrained vector quantization and variable rate vector quantization.

737/IT 932 (formerly ECE 637) Spread Spectrum Communications (3:3:0). Prerequisite: ECE 630. Introduction to spread spectrum communications. Topics include pseudo-noise spread spectrum systems, feedback shift registers, jamming strategy, code acquisition, synchronization, tracking, Gold codes, burst-communication systems, time-hopping, frequency-hopping, and multiple access communications.


739/IT 833 (formerly ECE 639) Satellite Communications (3:3:0). Prerequisite: ECE 630 or permission of instructor. Introduction to the theory and applications of modern satellite communications. Topics include satellite channel characterization, channel impairments and transmission degradation, link calculations, modulation, coding, multiple access, broadcasting, random access schemes, demand assignment, synchronization, satellite switching and onboard processing, integrated service digital satellite networks, and satellite transponder, ground stations, packet switching, and optical satellite communications.

741 Wireless Networks (3:3:0). Prerequisite: ECE 642 or equivalent. Theoretical foundation and practice in design of wireless networks. Emphasis is on mobility and teletraffic modeling aspects. Networking issues and state of the art performance evaluation methods of radio and system infrastructure applicable to wireless cellular and local networks are discussed. Topics include analysis of mobility, handoff, control traffic loading, resource allocation techniques, multi-access protocols, admission policy and call control, network infrastructure and multi-layer configuration, wireless LANs, and packet data systems.

742/IT 834 High-Speed Networks (3:3:0). Prerequisite: ECE 528 and 642 or permission of instructor. Theories for design, analysis and evaluation of high-speed networks. Scalability, performance, and issues related to local area, metropolitan, and wide area networks. Course includes architecture, protocols, and applications of high-speed networks; performance modeling of high-speed networks; flow control and routing; design issues for high-speed switches, interfaces, and controllers; all optical networks and their architectures; examples of high-speed computer networks and internetworking; video, imaging, and multimedia applications, software issues, robustness, and applications, and selected topics in current research areas in high-speed computer networks.

743/IT 848 Multimedia Networking and Communication Software (3:3:0). Prerequisite: ECE 642 or equivalent. Advanced modern networks and services rely ever increasingly on communication protocols and their implementation in software. Course provides principle methodologies, constraints, and technologies for advanced store-and-forward or packet-switched communications nodes, networks and protocols as well as their emerging software-based applications. Specific examples include next generation integrated Internet and Intranet, their underlying transport infrastructure over wired and wireless media, switching, routing, multi-point and real-time multimedia and web-based services, and quality of services aspects.

744 Computer Vision and Expert Systems (3:3:0). Prerequisite: ECE 644 or permission of instructor. Brief review of image analysis; vision system architectures (human visual system, computer visual systems); vision system operations (focus and zooming); picture recognition languages; introduction to knowledge-based systems; learning algorithmic schemes, and applications to text processing/analysis (as expert systems). Design project is conceived, simulated, and tested by the students.

745 ULSI Microelectronics (3:3:0). Prerequisite: ECE 684. Study of UltraLargeScaleIntegration (more than one million devices in a single chip) by considering the limits of packing density, the modeling of the devices, and the circuit topology. Semiconductor material and device physics imposed "second order effects" and limitations on deep submicron CMOS performance and reliability will be studied through analytical (compact) modeling and numerical simulations. New ULSI technologies such as SOI CMOS will be presented and evaluated, as they become available.

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746 Secure Telecommunication Systems (3:3:0). Prerequisites: ECE 646 or permission of instructor. Discussion of integration of cryptographic algorithms with standard and emerging communication protocols. Issues related to implementation of security services in different kinds of telecommunication networks and at different layers of the network model. A study of selected cryptographic algorithms, including Advanced Encryption Standard and Elliptic Curve Cryptosystems. Choice of a cryptographic algorithm depending on the type of a network and implementation medium. Analysis of various means of implementing cryptographic transformations, including smart cards, desktop computers, routers, accelerator boards, and stand-alone devices. Criteria of choice between software and hardware implementations of cryptography.

749/IT 844 Neural Networks for Control (3:3:0). Prerequisites: ECE 549 and 620. General neural network principles for control applications and supervised control, direct inverse control, neural adaptive control, backpropagation-trout time (BTT), adaptive critics, sensorimotor principles. Topics include applications to adaptive control and system identification, neural networks for motion control and path planning in robotics, neural network process control, aerospace control problems and neural network autopilot, neural network control of aircraft flares and touchdowns, and neural network control of autonomous vehicles.

750/CS 685/SYST 672/IT 840 (formerly ECE 651) Intelligent Systems for Robots (3:3:0). Prerequisite: SYST 611 or ECE 650 or CS 580, or SYST 555 or equivalent. Review recent developments in the area of intelligent autonomous systems. The applications of artificial intelligence, control theory, operation research, decision sciences, computer vision, and machine learning to robotics are studied as well as correspondences between various fields. Topics include analysis and design of methods, algorithms and architecture for planning, navigation, sensory data understanding, visual inspection, spatial reasoning, motion control, learning, self-organization, and adaptation to the environment.

751/IT 886 (formerly ECE 632) Information Theory (3:3:0). Prerequisite: ECE 528 or permission of instructor. Comprehensive study of information with emphasis on concepts of reliable, efficient communication systems. Course includes measure of information, efficient representation of message sources, and communication channels and their capacity, as well as coding for reliable transmission over noisy channels.

752/IT 885 Spectral Estimation (3:3:0). Prerequisite: ECE 528 or STAT 652 or permission of instructor. In-depth study of spectral analysis and its application to statistical signal processing. Topics include classical Fourier analysis of deterministic signals and Wiener theory of spectral analysis for random processes; spectral estimation using the Periodogram and the window approaches; maximum entropy spectral estimation and its relation to autoregression modeling; signal subspace approaches for frequency estimation; and the wavelet transform and its relation to the short-time Fourier transform.

753/IT 888 Distributed Estimation and Multisensor Tracking and Fusion (3:3:0). Prerequisite: ECE 734 or SYST 611. Centralized and distributed estimation theory, hierarchical estimation, tracking and data association, multisensor multitarget tracking and fusion, distributed tracking in distributed sensor networks, track-to-track association and fusion, and Bayesian networks for fusion.


780/IT 845 (formerly ECE 622) High-Frequency Electronics (3:3:0). Prerequisite: ECE 563 and 684, or permission of instructor. Study of devices and circuits used in high-speed communications systems. Topics include microwave bipolar transistors, GaAs MESFET's, and high-speed integrated circuits; and the design of linear and power amplifiers using Sparameter techniques and computer simulation.

798 Research Project (3:0:0). Prerequisite: Nine graduate credits. Research project to be chosen and completed under the guidance of a graduate faculty member that results in an acceptable technical report.

799 Master's Thesis (1-6:0:0). Prerequisite: Nine graduate credits and permission of instructor. Research project chosen and completed under the guidance of a graduate faculty member that results in a technical report and an oral defense acceptable to a three-faculty-member thesis committee.

836/IT 886 Special Topics in Detection and Estimation Theory (3:3:0). Prerequisite: ECE 734. Advanced topics in detection, estimation, and signal processing in areas of current research interest. Topics may include spectral estimation, speech recognition, array processing; SAR, underwater acoustics, or higher order spectra.

847/IT 847 Topics in Photonics (3:3:0). Prerequisite: ECE 563 or permission of instructor. In-depth discussion of specific topics in photonics. Topics include optical storage (disks, holographic, 3D), digital optical computing, integrated optics, photonic switching networks, and optoelectronic devices. May be repeated when covering different topics.

945/IT 945 Advanced Topics in Microelectronics (3:3:0). Prerequisite: IT 845. Current topics of advanced research in microelectronics. Topics include very high speed integrated circuits, monolithic microwave integrated circuits, optoelectronic integrated circuits, novel device structures, and advances in semiconductor device technology. May be repeated with a change in topic.

998 Doctoral Dissertation Proposal (1-12:0:0). Work on a research proposal that forms the basis for a doctoral dissertation. May be repeated. No more than 24 credit hours of ECE 998 and 999 may be applied to doctoral degree requirements.
999 Doctoral Dissertation (1-12). Prerequisite: Admission to candidacy. Formal record of commitment to doctoral dissertation research under the direction of a faculty member in Electrical and Computer Engineering. May be repeated as needed.

Elementary/Secondary Education (EDCI)

Graduate School of Education

500 In-Service Educational Development (1-6:0:0). See EDUC 500.

501 Curriculum and Instruction in Early Childhood Education (3:3:0). Prerequisite: Admission to the Graduate School of Education or permission of instructor. Emphasizes designing curriculum based on the social studies unit, as well as health, nutrition, and safety issues. Focuses on evaluating and planning appropriate environments and instruction. Historical foundations, model programs, and early education initiatives are examined. Field experience in public schools is required.

502 Developing Concepts in Early Childhood Mathematics and Science (3:3:0). Prerequisite: Admission to the Graduate School of Education or permission of instructor. Examines preoperational and concrete operational thought processes of conservation, seriation, comparison, classification, and early number concepts. Uses concrete science materials and experiences to foster development of quantitative thinking in geometry, measurement, graphing, and whole number arithmetic. Field experience in public schools is required.

503 Language and Literacy in Early Childhood Education (3:3:0). Prerequisite: Admission to the Graduate School of Education or permission of instructor. Examines the interrelatedness of reading, writing, listening, and speaking, and provides opportunities for developing appropriate instructional strategies for early childhood levels. Focuses on creative development and critical thinking in communication. Field experience in public schools is required.

511 Developing Curriculum and Designing Instruction in Early Childhood Education (3:3:0). Covers procedures, materials, and organization of environments for young children. Field experiences are required for students without previous teaching or administrative experience in early childhood settings.

512 Family, School, and Community Relationships (3:3:0). Examines patterns and problems of family life to improve communication between teachers and parents.

513 Play in Applied Settings (3:3:0). Focuses on play as an approach to teaching and learning. Examines play as an intellectual, social, and emotional function in children's development.

514 Administering Early Childhood Programs (3:3:0). Examines programs and techniques relating to the administration and supervision of early childhood programs. Emphasizes the director's role in staff recruitment, hiring, development, and evaluation. Examines leadership and management techniques.

516 Bilingualism and Language Acquisition Research (3:3:0). Examines research in first and second language acquisition, including the interaction of a bilingual person's two languages, with applications for the classroom. Field experience in public schools is required.

519 Methods of Teaching in Bilingual/English as a Second Language Settings (3:3:0). Prerequisite: EDUC 516. Examines approaches, methods, and techniques for teaching English as a Second Language (ESL) in bilingual and ESL classrooms, as well as resources available in the field. Participants critically analyze and demonstrate teaching approaches based on second language acquisition research, including teaching language through content. Field experience in public schools is required.

520 Assessment in Bilingual/English as a Second Language Settings (3:3:0). Prerequisites: EDUC 516 and 519. Examines innovative approaches to assessing language minority students and English language learners. Topics include identification, placement, monitoring of student progress, development of authentic performance-based measures, design of portfolios, application of measurement concepts, analysis of assessment instruments, and linking assessment to instruction.

521 Curriculum Development in Bilingual/English as a Second Language Settings (3:3:0). Prerequisites: EDUC 516 and 519. Examines current approaches to curriculum development for second language learners and language minority students. Participants review, evaluate, and develop curricular materials, with emphasis on learner-centered activities, cooperative learning, interdisciplinary and thematic approaches, authentic and problem-based learning, integration of language and content, and linkage of assessment and instruction.

522 Children, Families, Schools, and Communities (Ages Birth to 8 Years) (6:6:0). Prerequisite: Admission to the Graduate School of Education. Provides students with a knowledge of child and family development from an integrated perspective. Students explore the role of culture and theories in providing frameworks for understanding and interpreting child and family growth and development. Examines both factors that facilitate development and factors that may place children at developmental risk. Students learn about various disabilities and the way both risk and actual disability affect family and child development. Students acquire an appreciation for the critical role of families and their diversity in supporting the development of the child.

528 Teaching and Learning Mathematics in Middle Education (3:3:0). Prerequisite: Admission to the teacher education program or permission of instructor. Focuses on the learning processes fundamental to the development of mathematical thinking. Examines a variety of instructional strategies and materials in relation to the broad scope of mathematical content taught in the middle grades. Field experience in public schools is required.

529 The Teaching and Learning of Social Studies and the Humanities in Middle Education (3:3:0). Prerequisite: Admission to the Graduate School of Education. Focuses on the design and delivery of an integrated curriculum centered on knowledge and skills from history and the social sciences for citizenship education. Examines the development of the social studies unit as the unifying core of the middle grades (4–8) curriculum. Field experience in public schools is required.
346 Elementary/Secondary Education (EDCI)

549 Foreign Language Immersion in the Elementary School (3:3:0). Covers theories and methods of teaching foreign language through the elementary school curriculum, as well as curriculum development, assessment, and community relations in foreign language immersion classes.

551 Curriculum and Instruction in Middle Education (3:3:0). Covers the development of curriculum in the middle grades, historical backgrounds, present programs, development and implementation of new programs, program evaluation, and instructional and organizational implications. Field experience in public schools is required.

552 Mathematics Methods for the Elementary Classroom (1-3:1-3:0). Prerequisite: Admission to the elementary education licensure program. Introduces methods for teaching all children topics in arithmetic, geometry, algebra, probability, and statistics in the elementary grades. Focuses on using manipulatives and technologies to explore mathematics and solve problems. Field experience in public schools is required.

553 Science Methods for the Elementary Classroom (1-3:1-3:0). Prerequisite: Admission to the elementary education licensure program. Helps students develop skills and abilities in science teaching methods, applications of technology, safety practices, and the creation of integrated science curricula. Examines science teaching based on contemporary theory, practice, and standards. Field experience in public schools is required.

554 Social Studies Methods for the Elementary Classroom (1-3:1-3:0). Prerequisite: Admission to the elementary education licensure program. Examines an integrated curriculum based on knowledge and skills from history and the social sciences. Develops interdisciplinary units based on the Virginia Standards of Learning and various national social studies standards. Field experience in public schools is required.

555 Literacy Teaching and Learning in Diverse Elementary Classrooms I (3:3:0). Prerequisite: Admission to the elementary education licensure program. Provides a research-based introduction to literacy teaching and learning for younger children. Emphasizes language development; reading and writing processes; emergent literacy; culture, families, and literacy; and literacy integration in the curriculum. Field experience is required.

556 Literacy Teaching and Learning in Diverse Elementary Classrooms II (1-3:1-3:0). Prerequisite: Admission to the elementary education licensure program. Provides a research-based introduction to literacy teaching and learning for older children. Emphasizes literacy and language processes and development; connections between cultures, families, and literacy; and literacy integration in the curriculum. Field experience is required.

557 Integrating Technology in the Elementary Curriculum (3:3:0). Prerequisite: Admission to the elementary education licensure program. Examines the development and implementation of curriculum and instruction in the elementary classroom. Emphasizes integrating technology in the curriculum and the inclusion of special needs and culturally diverse students. Field experience is required.

558 Integrating Fine Arts, Movement, and Health Elementary Education (3:3:0). Prerequisite: Admission to the elementary education licensure program. Examines children’s creative expression and physical development through movement, art, drama, and music. Emphasizes stages and types of movement, health and safety issues, developmental stages of art, interpreting music, and creative drama. Field experience is required.

560 Methods of Teaching Foreign/Second Languages in PK–12 Schools (3:3:0). Prerequisite: EDCI 516 or student is currently in a teaching position. Covers past and current approaches, theories, and methods of teaching foreign/second languages with practical application to the classroom. Students demonstrate teaching strategies, develop lesson and unit planning skills, and evaluate curricula and materials. Field experience in schools is required.

567 Teaching Social Studies in the Secondary School (3:3:0). This is an advanced course in the methods, materials, content, and organization of social studies programs in the secondary schools. Field experience is required for those seeking initial teacher licensure.


597 Special Topics in Education (3:3:0). See EDUC 597.

600 Workshop in Education (1-6:0:0). See EDUC 600.


602 Technology Applications in Early Childhood Education (3:3:0). Prerequisite: Admission to the Graduate School of Education. Examines criteria and methods for integrating technology into all areas of the early childhood curriculum. Emphasizes use of instructional technology to facilitate cognitive and social growth.

603 Trends, Issues, and Research in Early Childhood Education (3:3:0). Prerequisites: Admission to the Graduate School of Education and EDRS 590. Examines current trends, present and recurring issues, research findings, and resulting program development in the field.

605 Problem Solving in Early Childhood Mathematics and Science (3:3:0). Prerequisite: Admission to the Graduate School of Education or permission of program coordinator. Focuses on preoperational and concrete operational children and developing specific problem-solving strategies useful in mathematics and science. Emphasizes use of concrete materials to solve problems in mathematics and
science in the primary grades. Field experience in public schools is required.

606 Creative Expression and Play in Early Childhood Education (3:3:0). Prerequisite: Admission to the Graduate School of Education or permission of program coordinator. Covers children's creative expression and psychomotor development through play; developmental stages of art in two- and three-dimensional forms; musical chants, rhythms, and instruments; and listening to and interpreting music as an integral part of the total curriculum. Field experience is required.

607 Literature and Literacy in Early Childhood Education (3:3:0). Prerequisite: Admission to the Graduate School of Education or permission of program coordinator. Guides students in developing and applying criteria for evaluating children's literature. Examines stages of reading development, assessment procedures, teaching strategies, print environments, reading materials, and classroom organizational patterns. Field experience in public schools is required.

608 The Teaching and Learning of Science in Middle Education (3:3:0). Prerequisite: Admission to the Graduate School of Education or permission of program coordinator. Focuses on teaching all children, including those from non-mainstream populations. Emphasizes the design and delivery of an integrated science curriculum centered on knowledge, skills, and dispositions from history, geography, civics and economics, the arts and humanities, and multicultural education. Covers student assessment and the use of student data in instructional decision-making and improvement. Extensive field experience in public schools is required.

610 Literature and Literacy in Middle Education (3:3:0). Prerequisite: Admission to the Graduate School of Education. Emphasizes the interrelatedness of the language arts and their natural bond with literature. Features listening, speaking, reading, and writing as the means for encoding and decoding. Highlights books and authors, leading to the appreciation of books and reinforcement of the art and skill of written, oral, and nonverbal communication. Examines use of literature to nurture cognitive, personal, and social development. Critical thinking permeates the course. Field experience in public schools is required.

612 Content Area Reading in Middle Education (3:3:0). Covers theory, methods, diagnostic instruments, and evaluation practices to individualize content area instruction in grades 4–8. Includes review of testing instruments, techniques for instruction, and an overview of study skills. Field experience in public schools is required.

613 Curriculum and Assessment in Early Childhood Education 1 (3:3:0). This is the first of a two-course sequence that addresses current thinking about curriculum and assessment in programs for children preschool through third grade. Provides an overview of effective ways to plan and implement integrated curriculum with a special focus on the content/subject matter.

614 Curriculum and Assessment in Early Childhood Education II (3:3:0). This is the second of a two-course sequence that focuses on the planning and assessing of children's knowledge of content/subject matter. Emphasis is on action research.

615 Advanced Human Development (3:3:0). This is an advanced course in development and learning across the lifespan. Critically reviews contemporary research and theories of human development/learning and their relevance to educational practice and family contexts as they relate to children under eight years of age.

616 The Creative Arts and Play in Early Childhood Education (3:3:0). This is an advanced course that uses the creative arts and play as central approaches to teaching and learning. Focuses on an integrated approach to what an arts-based curriculum looks like and how it functions.

631 Research in Elementary Education (3:3:0). Prerequisite: Completion of elementary education (PK-6) licensure. Helps beginning teachers understand various research paradigms for the purpose of using the research literature and systemic evidence to improve their practice. Emphasizes linking research and practice and making data-based instructional decisions.

632 Advanced Social Studies Methods for the Elementary Classroom (3:3:0). Prerequisites: Completion of elementary education (PK-6) licensure and EDCI 631. Provides advanced study of the teaching of social studies in elementary education. Focuses on using inquiry, research, and reflection to improve the teaching of social studies. Emphasizes the design and delivery of an integrated social studies curriculum centered on knowledge, skills, and dispositions from history, geography, civics and economics, the arts and humanities, and multicultural education. Covers student assessment and the use of student data in instructional decision-making and improvement. Extensive field experience in public schools is required.

633 Advanced Mathematics Methods for the Elementary Classroom (3:3:0). Prerequisites: Completion of elementary education (PK-6) licensure and EDCI 631. Focuses on teaching all children, including those from non-mainstream populations. Emphasizes teaching problem solving and higher order thinking skills promoted by the National Council of Teachers of Mathematics and the Virginia Mathematics Standards of Learning. Uses techniques and materials to develop specific problem-solving strategies in a hands-on, activity, and workshop-oriented experience. Explores the teaching of problem solving, reasoning, communications, and connections in PK-6 mathematics by working with manipulatives and technologies. Field experience in public schools is required.

634 Advanced Science Methods for the Elementary Classroom (3:3:0). Prerequisites: Completion of elementary education (PK-6) licensure and EDCI 631. This master's-level course emphasizes inquiry and extensions of theoretical understanding of how children learn. Helps students develop expertise in teaching and assessment and incorporate technology, safety, and issues of culture and gender into the experiences of day-to-day teaching activities.

635 Applied Research in Elementary Education (3:3:0). Prerequisites: Completion of elementary education (PK-6) licensure and EDCI 631, 632, 633, and 634. Helps begin-
ning teachers plan and complete an action research project related to their current teaching assignment. Students will apply research methods explored throughout the prerequisite series of courses.


663 Teaching Science in the Elementary School (3:3:0). Prerequisites: Course in teaching science in the elementary school and/or permission of instructor. Provides advanced study of the methodology and materials involved in teaching the biological, physical, and earth sciences.


669 Advanced Methods of Teaching English in the Secondary School (3:3:0). Prerequisites: Successful completion of EDCI 569. Students must be enrolled in Internship in Secondary Education, (EDCI 790-C) or have permission from the instructor. Continuation course in methods (See EDCI 569). Guides students in working effectively with national and local standards for teaching secondary English.

672 Advanced Methods of Teaching Mathematics in the Secondary School (3:3:0). Focuses on the learning processes fundamental to the development of mathematical thinking from a problem-solving perspective. Introduces students to national (NCTM) and state (SOL) standards regarding the nature of the content and methodologies appropriate for the teaching of school mathematics. Examines a variety of instructional strategies and materials and relates them to the broad scope of mathematical content in the secondary curriculum. Field experience is required for those seeking initial teacher certification.

673 Advanced Methods of Teaching Science in the Secondary School, Part II (3:3:0). Prerequisite: EDCI 573. Provides advanced study of teaching and curriculum development based on research and current issues. Emphasizes integrating science and technology, adapting instruction to the needs of diverse learners, and promoting safety.

675 Advanced Methods of Teaching Science in Middle Education (3:3:0). Prerequisite: EDCI 608. Provides advanced study of science teaching and curriculum based on research and current issues. Emphasis is on national, state, and local science standards; integrating science and technology; adapting instruction to the needs of diverse learners; and promoting laboratory and environmental safety. Field experience in public schools is required.

676 Advanced Methods of Teaching Social Studies and the Humanities in Middle Education (3:3:0). Prerequisite: EDCI 529. Provides advanced study of teaching social studies and the humanities in middle education. Continues the focus on the design and delivery of an integrated curriculum centered on knowledge and skills from history, geography, and the visual arts for citizenship education through the development of instructional units for the middle grades (4–8). Emphasis is on economics, civics, and performing arts. Field experience in public schools is required.

684 Advanced Methods of Teaching Foreign/Second Languages in PK–12 Schools (3:3:0). Prerequisite: EDCI 516 or student is currently in a teaching position. Blends theoretical knowledge and practical application. Provides advanced study of second language pedagogy and teaching trends. Topics include multiple learning styles, alternative forms or assessment, and teaching diverse populations. Field experience is required.

705/EDIT 705 Instructional Design (3:3:0). Prerequisite: Teaching experience. Helps students analyze, apply, and evaluate the principles of instructional design to develop education and training materials spanning a wide range of knowledge domains and instructional technologies. Focuses on a variety of instructional design models, with emphasis on recent contributions from cognitive science and related fields.

710 Technology and the Culture of Schools (3:3:0). Corequisite: EDIT 711. Explores the relationship between human inventions and social, political, cultural, and epistemological constructions. Examines the history of technology, the relationship between technology and human behavior, and theories of social change and technology. Focuses on the ways technological and social changes influence and shape the goals and outcomes of the K–12 educational process. Included in the broader discussion of technology, change, and education is a consideration of the linkages between technology and educational reform, the ways technology is associated with the educational reform movement, and the ways educators can take leadership roles in facilitating the intersection of educational reform and technology.

712 Technology and Learning (3:3:0). Corequisite: EDIT 713. Explores ways of knowing and theories of learning as they are reflected in and influenced by technology. Covers analysis, application, and evaluation of current theories such as constructivism, multiple intelligences, the role of symbolization in human cognition, the development of problem-solving and critical thinking strategies, and the conditions of learning. Covers the relationship between technological forms and the nature and structure of human cognition, especially as it influences K–12 educational practice. Explores the relationship between technology and the nature of individual learner attributes, of learners in context, of special needs learners, of culture and of multiple cultures and issues of access, equity, and values.

714 Methods of Integration (3:3:0). Corequisite: EDIT 715. Engages students in consideration of curriculum design strategies that facilitate the integration of technology. Includes examples of curriculum design strategies, readings, discussions, and design of lessons or units appropriate to students’ various contents. This first course in the sequence focuses on disciplinary standards (i.e., NCTM, NARST, Virginia’s SOL), the role of a variety of technology applications in support of these standards, and strategies for curriculum design, such as the learning cycle,

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thematic design, interdisciplinary/transdisciplinary approaches, and writing across the curriculum.

716 Principles of Integration (3:3:0). Prerequisite: EDIT 717. Engages students in a continued consideration of curriculum design strategies appropriate for the integration of technology. Includes examples of curriculum design strategies, readings, discussions, and design of lessons or units appropriate to students' various contexts and contents. This second course in the sequence builds on previous student learning and focuses on technology's role in problem-based learning, problem-centered curriculum design, authentic instruction, and rationales and processes for implementing authentic assessment strategies.

723 Assessment and Guiding Behavior in Early Childhood Education (3:3:0). Prerequisite: Admission to the Graduate School of Education; corequisite: EDCI 790-A. Examines strategies and techniques for guiding young children's behavior. Guidance principles, communication strategies, parent conferencing, and behavior management techniques are presented, analyzed, and applied in classroom settings. Also covers the administration and interpretation of informal and formal evaluation tools.

737 Observing, Assessing, and Guiding Behavior in Middle Education (3:3:0). Prerequisite: Admission to the Graduate School of Education; corequisite: EDCI 790-B. Examines strategies and techniques for guiding the behavior of students in middle education. Guidance principles, communication strategies, parent conferencing, and behavior management techniques are presented, analyzed, and applied in classroom settings. Also covers the administration and interpretation of informal and formal evaluation tools.

777 Research to Practice (3:3:0). Prerequisites: All other program courses except EDRS 590 and elective, or permission of instructor. Provides a culminating experience that synthesizes and applies the essential elements of second language teaching and learning. Emphasizes the use of a change agent through critical inquiry into practice. Aims to promote collaboration between ESL and grade-level teachers to advance the achievement of English language learners and language minority students.

781 Advanced Seminar in Early Childhood Education (3:3:0). Prerequisite: Completion of graduate program except for seminar, or permission of program coordinator. Applies graduate course work to instructional situations through discussion, projects, and reports related to practice and/or research.

782 Advanced Seminar in Middle Education (3:3:0). Prerequisite: Completion of graduate program except for seminar, or permission of program coordinator. Applies graduate course work to instructional situations through discussion, projects, and reports related to practice and/or research.

783 Symposium in Secondary Education (3:3:0). Today's dictionary defines symposium as a "meeting or conference for discussion of some subjects, or a collection of opinions expressed, and information contributed, by several persons on a given topic or subject." The Greeks described it "as a convivial meeting for conversation and intellectual entertainment and stimulation." The secondary faculty believes the word accurately reflects what occurs in the course.

784 Capstone Seminar in Early Childhood Education (3:3:0). This is a culminating seminar devoted to analyzing and synthesizing knowledge and skills gained through graduate course work as it applies to early childhood education.

790 Internship in Education (6:6:0). Provides intensive, supervised clinical experience for a full semester in an accredited school. Students must register for the appropriate section.

795 Science Education Research (3:3:0). Prerequisite: EDCI 891. Explores science education research, theory, and practice, including sources and methods of study. Students review and report on research literature and teaching practices on topics of current and individual interest.

796 Science Education Curriculum (3:3:0). Prerequisite: EDCI 891. Explores science education curriculum from preschool through high school, including identifying and evaluating curriculum materials and resources. Emphasizes research-based exemplary materials and use of technology.

797 Advanced Topics in Education (3:3:0). See EDUC 797.

891 Science Teaching and Learning (3:3:0). Explores research, theory, and practice for effective science teaching and learning. Focuses on science education standards at the local, state, national, and international levels. Students review both a common core of research literature and topics of individual interest.

892 Science Education History and Research (3:3:0). Prerequisite: EDCI 891. Explores the history of science education research, theory, and practice, including research on general teaching strategies that are applicable to science instruction. Students review a common historical core of research literature and conduct exploratory research of individual interest.

893 Science Education Staff Development (3:3:0). Prerequisite: EDCI 891. Explores staff development in science education with an emphasis on planning and conducting professional development on key topics in science teaching and learning. Students review a common core of research literature and conduct research of individual interest.

894 Science Education Leadership and Policy (3:3:0). Prerequisite: EDCI 891. Focuses on leadership and policy issues at the local, state, and national levels that affect science education. Emphasizes understanding the decision-making structure and process; current issues; and trends. Students participate in leadership and policy events.

895 Emerging Issues in Curriculum and Instruction (3:3:0). Prerequisite: Admission to the Ph.D. program or permission of instructor. Covers current issues in the fields of curriculum and instruction through individual and group research, discussion, writing, and presentations by experts. Each student conducts a critical analysis of a specific field.

Engineering (ENGR)

School of Information Technology and Engineering

107 Introduction to Engineering (2:2:0). Introduction to engineering profession fundamentals and problem solving. Topics include description of engineering disciplines, functions of the engineer, professionalism, ethics and registration, problem solving and representation of technical information, estimation and approximations, and analysis and design. Es
183 Engineering Computer Graphics (3:2:3). Prerequisite: ENGR 107 or permission of instructor. Fundamentals of engineering drawing, graphic communication, descriptive geometry, multiview projection, and graphical analysis. Computer-aided drafting, visualization, and pictorial views are introduced as well as reading of engineering drawings. 


307 Engineering Thermodynamics (3:3:0). Prerequisites: MATH 213 and PHYS 260. Classical concepts of energy and temperature, first and second laws and their application to closed and open thermodynamic systems. Properties of pure substances, equation of state, and analysis of thermodynamic processes and systems are covered. Presents application to engineering systems. 


400 Principles of Professional Practice in Engineering (3:3:0). Prerequisite: Engineering majors within 30 hours of graduation. Overview of all engineering disciplines focusing on engineering ethics and professionalism, need for life-long learning, and professional licensure. Topic areas also include engineering science and mechanics, material science, electric circuits, chemistry and thermodynamics, engineering economics, and other fundamentals of engineering. This course does not satisfy the requirements for a CEIE technical elective. 

ENG 490 Human Practice of Engineering Design (3:3:0). Prerequisites: Senior standing (at least 90 credit hours) in an IT&E degree program; one of SYST 301, ECE 331, or CS 421; and permission of the instructor. A study of engineering design and innovation emphasizing the human aspects. Students will be directly involved in a project with a client for whom they must produce a measurable innovation supported by an engineering system. Students will prepare for the projects through extensive readings and exercises, from which they will learn how to identify and listen for human concerns, action, breakdowns, and coordination. 

498 Independent Study in Engineering (1-3:3:0). Prerequisite: 60 credits; must be arranged with an instructor and approved by department chair before registering. Directed self-study of special topics of current interest in ENGR. May be repeated for a maximum of 6 credits if the topics are substantially different. 

499 Special Topics in Engineering (3:3:0). Prerequisites: 60 credits and permission of instructor; specific prerequisites vary with the nature of the topic. Topics of special interest to undergraduates. May be repeated for a maximum of 6 credits if the topics are substantially different. 

English (ENGL) 

English 

Three credits of a 100-level English course are prerequisite to all 200-level and above English courses. Three credits of a 100-level English course and six credits of general education literature/humanities courses are prerequisite to all English courses numbered above 302. 

Non-native speakers of English with limited proficiency in the language are encouraged to take ENGL 100 instead of ENGL 101. Students may not receive credit for both ENGL 100 and ENGL 101. 

100 Composition for Non-native Speakers of English (4:4:0). For non-native speakers of English with limited proficiency in the language. Intensive practice in drafting, revising, and editing expository essays of some length and complexity. Study of the logical, rhetorical, and linguistic structure of expository prose, with attention to particularly difficult aspects of the language for non-native speakers. Methods and conventions of preparing research papers. Students must attain a minimum grade of C to fulfill degree requirements. 

101 Composition (3:3:0). Intensive practice in drafting, revising, and editing expository essays of some length and complexity. Study of the logical, rhetorical, and linguistic structure of expository prose. Methods and conventions of preparing research papers. Students must attain a minimum grade of C to fulfill degree requirements. 

201 Reading and Writing about Texts (3:3:0). Close analysis of literary texts, including but not limited to poetry, fiction, and drama. Emphasis on reading and writing exercises to develop basic interpretive skills. Examination of figurative language, central ideas, relationship between structure and meaning, narrative point of view, etc. 

202 Texts and Contexts (3:3:0). Prerequisite: ENGL 201 or permission of department. Study of literary texts within the framework of culture. Examination of texts within such categories as history, gender, sexuality, religion, race, class, and nation. Builds on reading and writing skills taught in ENGL 201. 

203, 204 Western Literary Masterworks (3:3:0). Prerequisite: ENGL 201 or permission of department. Great works of Western civilization. ENGL 203 focuses on writers such as Homer, Sophocles, Euripides, Dante, Cervantes, Machiavelli, and Montaigne. ENGL 204 covers writers such as Moliere, Mme. de Lafayette, Goethe, Ibsen, Flaubert, Dostoyevski, Tolstoy, Mann, Kafka, Borges, and Soyinka. All readings are in modern English. Courses build on reading and writing skills taught in ENGL 201. 

209 EdiT: Enhanced Digital Text (1:1:0). Corequisite: ENGL 201. Four-week linked course that teaches students to use and understand technology in a literary framework. Also provides the skills needed to more effectively use computers in other courses. Different ways of presenting or encountering a text, concentrating on the history and politics of print, the web, and digitization. Hypertext theory and technological enhancements that add to a text without diluting its argument are also addressed. Students will learn the principles of integrating the text, image, and sound. Assumes no prior computer competency. 

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302 Advanced Composition (3:3:0). Prerequisites: Completion of 45 credits, 3 credits of composition, and up to 6 credits of literature (literature requirements vary among degree programs). Intensive practice in writing and analyzing such expository forms as the essay, article, proposal, and technical or scientific reports with emphasis on research related to the student's major field. The Schedule of Classes designates particular sections of ENGL 302 in the following broad areas: business, humanities, natural sciences and technology, social sciences. Students must attain a minimum grade of C to fulfill degree requirements.

309 Introduction to Nonfiction Writing (3:3:0). Not to be taken concurrently with ENGL 399 or 489, and not to be taken by students who have already taken ENGL 489. Advanced practice in analyzing and writing such nonfiction forms as the essay, profile, article, and technical or scientific report, depending on the interests of the individual student. (Not a remedial course.)

311 Writing Ethnography (3:3:0). Study and practice of ethnographic writing. Students conduct ethnographic investigations and practice journal keeping, field note recording, interviewing, transcription, and interpretation. Includes introduction to current issues in ethnographic writing.

325 Dimensions of Writing and Literature (6:6:0). Examines English as a discipline and develops interpretive skills that students will need for further study in the major. All sections cover such issues as form, genre, point of view, figurative language, conventions of close reading and of literary interpretation, and the ways in which culture shapes texts. In addition to regular class meetings, students are required to attend weekly lectures, performances, or readings. Open to all students. Required of those majoring or minoring in English. who should take ENGL 325 before taking other 300- or 400-level literature courses, and who must obtain a minimum grade of C to satisfy degree requirements in the English major or minor.


327 Introduction to Cultural Studies (3:3:0). Introductions to the interpretive practices associated with the field of cultural studies.

332 Introduction to Film (3:3:0). Introduction to film medium as an art form.

333 Folklore of the Americas (3:3:0). Topics include folktales, personal narratives, legends, proverbs, jokes, folk songs, folk art, folk craft, and folk architecture. Consideration of ethnicity, community, family, festival, folklore in literature, and oral history. Discussion of traditions in students' own lives.

334 Literary Approaches to Popular Culture (3:3:0). Emphasis on popular fiction and adaptation of popular prose genres to media that have strong verbal and visual elements. Relationship between verbal and nonverbal elements of such media as film, comics, and radio.

335, 336 Shakespeare (3:3:0). Twenty selected plays. ENGL 335 emphasizes histories and comedies; ENGL 336, tragedies and romances.

337 Special Topics in Myth and Literature (3:3:0). Study of the ways in which the traditional mythologies have been reflected in English and American literature and other texts as themes, motifs, and patterns. May be repeated once for credit when course content is different.

338 Cultural Constructions of Sexualities (3:3:0). Introductory survey of cultural, literary, and theoretical constructions of sexuality that seeks to complicate traditionally fixed categories of identity. Examination of various representations of human sexuality, with particular attention to its intersections with gender, race, ethnicity, nationality, and class.

340 American Visions (3:3:0). Survey of influential and representative American cultural texts that attempt to define the American community and the struggle of subordinate groups for fuller participation in the life of the nation. Emphasis on the close analysis of primary texts, especially literary works, and their relationship to the larger cultural context.

344 Introduction to Digital Writing in the Genres (3:3:0). Prerequisites: ENGL 396 or permission of instructor. Combined workshop and studio course in technological and aesthetic issues of reading and writing hypermedia texts with an emphasis on one of the following: poetry, fiction, creative nonfiction, mixed genre, drama, or performance. Exploration of how a genre meets hypertext and hypermedia in original creative work. Includes techniques in authoring interactive hypermedia projects using a variety of digital media tools. May include reading assignments in hypertext and hypermedia theory.

345 Special Topics: Literary Surveys (3:3:0). Advanced introduction to the major movements and representative figures of two or more centuries or periods of American, British, European, or world literature. May be repeated once for credit when course content is different.

349 Global Voices (3:3:0). Prerequisite: 45 credits, ENGL 100 or 101, and ENGL 201. Study of two cultures (other than contemporary British or American) through the exploration of several textual forms such as written literature, oral literature, film, folklore, and/or popular culture. Specific cultures will vary, but at least one is non-Western. Lecture format.

350 The Idea of a World Literature (3:3:0). Prerequisites: 45 credits, ENGL 100 or 101, and ENGL 201. Examines the history and current status of conceptions of world literature, considering such topics as non-European influences on Western literature, the shifting horizons of comparative literature, the rise of postcolonial literature, the place of translation, and the role of international institutions such as UNESCO and the Nobel Prize. Focuses on the degree to which these initiatives have been successful in promoting a global understanding of literary production.

360, 363 Special Topics in Literature (3:3:0). Study of literature by topics, such as women in literature, science fiction, and literature of the avant garde. Topic changes each time the course is offered. May be repeated when course content is different.

368 Beginnings of African American Literature through 1865 (3:3:0). Concentrating on such poets as Phillis Wheatley, Jupiter Hammon, Lucy Terry, and George Moses Horton, this course examines significant African American literary, social, and political texts produced through 1865. Special attention will be devoted to narrative accounts of enslavement and freedom by Frederick Douglass, Harriet Jacobs, and Olaudah Equiano, the political writings and
orations of David Walker and Soujourner Truth; the fiction of Harriet Wilson and William Wells Brown; and nonwritten cultural artifacts such as slave songs and spirituals.

369 Women and Literature (3:3:0). Exploration of the experience of women as both authors of and subjects in imaginative literature. May be repeated for credit when subtitle is different.


371 African American Literature through 1946 (3:3:0). Focusing on fiction, poetry, drama, and autobiography, this course explores the evolution of African American literature and aesthetics and major social, cultural, and historical movements such as the Harlem Renaissance of the 1920s and the emergence of black naturalism, realism, and modernism in the 1930s and 1940s. Major authors include Zora Neale Hurston, Langston Hughes, Jessie Fauset, James Weldon Johnson, Jean Toomer, Nella Larsen, Margaret Walker, Chester Himes, Richard Wright, and Ann Petry.

372 Contemporary African American Literature (3:3:0). Encompassing a wide array of genres and forms, this course examines black writing from the middle of the 20th century to the present. It will engage textual, critical, political, and theoretical issues related to cardinal literary movements, such as the Black Arts Movement of the 1960s and the Third Renaissance of the 1980s and 1990s. In addition, the course examines how musical forms such as blues, jazz, and rap have contributed to and shaped literary production. Major authors to be investigated include Ralph Ellison, Gwendolyn Brooks, James Baldwin, Lorraine Hansberry, Amiri Baraka, Alice Walker, Ernest Gaines, Gloria Naylor, August Wilson, and Toni Morrison.

380 Recent American Fiction (3:3:0). American short story writers and novelists from World War II to the present, including Mailer, Barth, Cheever, Oates, Gass, Beattie, Updike, and Morrison.

390 Recent American Poetry (3:3:0). Major American poets from World War II to the present, with emphasis on the work of such poets as Roethke, Brooks, Rich, Dickey, Lowell, Ammons, Kizer, Sexton, Clifton, Plath, and Piercy.

396 Introduction to Creative Writing (3:3:0). Introduction to the theory and practice of creative writing. Assignments include writing exercises and original works of poetry and fiction. May also include drama and/or creative nonfiction. Includes reading assignments in covered genres, and may include oral presentations or in-class performance. Original student work is read and discussed in class and in conferences with the instructor.

397 Poetry Writing (3:3:0). Prerequisite: ENGL 396 or permission of instructor. Workshop course in reading and writing poetry. Original student work is read and discussed in class and in conferences with the instructor. Includes technical exercises in the craft of poetry and may include reading assignments.

398 Fiction Writing (3:3:0). Prerequisite: ENGL 396 or permission of instructor. Workshop course in reading and writing fiction. Original student work is read and discussed in class and in conferences with the instructor. Includes technical exercises in the craft of fiction and may include reading assignments.

399 Creative Nonfiction Writing (3:3:0). Prerequisite: ENGL 309 or 396 or permission of instructor. Workshop course in the reading and writing of nonfiction that makes use of literary techniques normally thought of in the context of fiction, such as evoking senses and the use of dialogue. Original student work is read and discussed in class and in conferences with the instructor. Includes technical exercises in the artful creating of nonfiction and may include reading assignments.

400 Literature of the Middle Ages (3:3:0). Selected English narrative, dramatic, and homiletic literature written between 1300 and 1500, exclusive of Chaucer.


404 The Augustan Age (3:3:0). English literature from the late 17th century to the middle of the 18th century. Writers such as Dryden, Rochester, Behn, Defoe, Swift, Pope, and Montagu.

405 The Age of Sensibility (3:3:0). English literature of the later 18th century, the time of the American and French Revolutions, including new developments in the novel, drama, biography, and poetry. Writers such as Johnson, Boswell, Blake, Goldsmith, Sterne, Gray, Cowper, Burney, Godwin, and Wollstonecraft.


407 Prose and Poetry of the Victorian Period (3:3:0). Poetry and nonfiction prose by such authors as Carlyle, Arnold, Tennyson, Elizabeth Barrett Browning, Robert Browning, Ruskin, Mill, and Wilde.

408 Special Topics: British Literary Periods (3:3:0). In depth study of a selected period of British literature. In addition to literary examples, materials may be chosen from the art, philosophy, or popular culture of the time. When subtitle is different, may be repeated once for credit with permission of department.

410 Technical and Report Writing (3:3:0). Prerequisites: Six credits of composition, including ENGL 302, and six credits in humanities or permission of instructor. Intensive study and practice in various forms of technical writing, including formal and informal reports, proposals, and technical correspondence. Emphasis on writing for a variety of audiences, both lay and informed, and on writing within various professional and organizational contexts.

414 Honors Seminar (3:3:0). Prerequisite: Permission of the department. Emphasizing growth in the student's awareness of literary scholarship as a discipline, the honors semi-
nars provide an opportunity for advanced study in literary and cultural criticism. Courses cover a variety of topics, including the consideration of a literary period, genre, author, work, theme, discourse, or critical theory. Course may be repeated for credit.

415 Honors Thesis Writing Seminar (3:3:0). Prerequisite: Permission of the department and ENGL 414 or 416. Course gives students who wish to write an English honors thesis guidance in research methods, while allowing them the opportunity to share and critique one another's works in progress in a workshop format. Students may take the thesis seminar concurrently and in coordination with another approved course offered by the English Department. In this case, the thesis of about 30 pages explores an area covered by the second course, and the instructor in that course serves as a reader and advisor to the thesis. Students receive credit for both the thesis seminar and the second course; however, thesis work may substitute for some assigned work in the second course by arrangement of the instructors of the thesis seminar and the second course.

416 Honors Independent Study (1-3:0:0). Prerequisites: Admission to the honors program in English and permission of the instructor. An intensive writing course. Honors students concentrating in nonfiction writing and editing may use English 416 to replace English 414 as their first course in the honors program. Honors students concentrating in creative writing may use English 416 to replace 415 as their second course in the honors program.

421 Topics in Film History (3:3:0). Advanced studies of the development of film language, both as a cultural practice and as a medium for formal innovation. Topics might include studies of national cinemas, historical periods, genres, or individual directors. May be repeated once for credit when topic is distinctly different.

422 Topics in Film Theory (3:3:0). Advanced studies of theories about various aspects of the production, distribution, and reception of film-mediated experiences. Topics might include theories of the spectator, semiotics, feminist film theory, theories of narrativity, structuralist film theory, and/or deconstruction. May be repeated once for credit when topic is distinctly different.

423 Colonial and Federalist American Literature (3:3:0). Works of the first 200 years of American literature, including Edwards, Franklin, Irving, Cooper, and Bryant.

425 Literature of the American Renaissance (3:3:0). Major writers of the American Renaissance (1830-1865), with emphasis on the works of Emerson, Thoreau, Hawthorne, Melville, Whitman, Poe, Stowe, Douglass, and Dickinson.

429 Special Topics: American Literary Periods (3:3:0). In-depth study of a selected period of American literature. In addition to literary examples, materials may be chosen from the art, philosophy, or popular culture of the time. May be repeated once for credit when topic is different, with permission of department.

431/HIST 431/FRLN 431 Medieval Intellectual Topics (3:3:0). May be taken for credit by English or history majors. Examination of a selected topic in the intellectual history of the Middle Ages. Specific topic may vary. Primary emphasis is literary or historical, depending on the discipline of the instructor. Relevant material drawn from philosophy, theology, and art may be considered.

436 19th-Century Continental Novels in Translation (3:3:0). Selected European novels in translation. Course focus is the continental novel from the 18th century to the end of the 19th century and includes works of such writers as Balzac, Goethe, Gogol, Stendhal, Turgenev, Flaubert, Dostoievski, Tolstoy, and Chekhov.

437 20th-Century Continental Novels in Translation (3:3:0). Course focus is the continental novel from the beginning of the 20th century to the present and includes such writers as Proust, Mann, Gide, Kafka, Joyce, Beckett, Calvino, and Garcia Marquez. Attention to the influence of this literature on the novel in English. (Offered in cooperation with the Department of Modern and Classical Languages.)

439 Special Topics: Non-British or American Literature (3:3:0). Study of selected topics, periods, genres, or authors in commonwealth or in Asian literatures. May be repeated once for credit when subtitle is different, with permission of department.

440 English Renaissance Drama (3:3:0). Major dramas and dramatists of the English Renaissance, such as Jonson, Lyly, Marlowe, Middleton, Webster, and Ford.

443 Restoration and 18th-Century Drama (3:3:0). Restoration comedy of manners, sentimental comedy, and neoclassical and bourgeois tragedy. Theories of drama and conventions of staging. Writers such as Wycherley, Behn, Congreve, and Cowley.

445 English and Irish Drama of the 20th Century (3:3:0). Study of selected plays, periods, or playwrights such as Glaspell, O'Neill, Miller, Williams, Fornes, and Albee.

447 American Drama of the 20th Century (3:3:0). American drama of the 20th century with special attention to playwrights such as Glaspell, O'Neill, Miller, Williams, Fornes, and Albee.

448 Modern Drama (3:3:0). Representative plays of the major and most influential European and American dramatists, with emphasis on dramatic styles such as realism, expressionism, epic, and existentialism. Authors such as Chekhov, Ibsen, Strindberg, Brecht, and Beckett are studied.

449 Special Topics in Drama (3:3:0). Study of selected topics, periods, or playwrights. May be repeated once for credit when subtitle is different, with permission of department.

450 English Novel of the 18th Century (3:3:0). English novel from its beginnings through the turn of the 19th century. Works by such authors as Behn, Defoe, Haywood, Richardson, Fielding, Sterne, Burney, Smollett, and Austen.

452 Development of the American Novel to 1914 (3:3:0). Major American novels of the pre-World War I period with emphasis on the work of Brown, Cooper, Hawthorne, Melville, Twain, Howells, James, Crane, Dreiser, Norris, and others.

453 English Novel of the 19th Century (3:3:0). Works by such authors as Dickens, Thackeray, the Brontes, Eliot, Trollope, and Hardy.
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454 Development of the American Novel since 1914 (3:3:0). Works by such authors as Fitzgerald, Hemingway, Faulkner, Dos Passos, Wolfe, Bellow, and Nabokov.

456 English Novel of the 20th Century (3:3:0). Works by such authors as Conrad, Forster, Lawrence, Joyce, Woolf, Greene, Lessing, Spark, and Fowles.

458 Advanced Fiction Writing Workshop (3:3:0). Prerequisites: ENGL 398 or equivalent and permission of instructor. Students must submit a typed manuscript at least one week before registration. Workshop course. Intensive practice in creative writing and study of the creative process. Intended for students already writing original creative work. By permission of instructor, may be taken a second time for credit.

459 Special Topics in Fiction (3:3:0). Study of selected topics, periods, or authors. May be repeated once for credit when subtitle is different, with permission of department.

462 English Poetry of the 20th Century (3:3:0). Emphasis on work of Hardy, Yeats, Lawrence, Graves, Auden, Thomas, and Hughes. Work of fiction employing poetic techniques, such as Joyce's Ulysses, may also be studied.

463 American Poetry of the 20th Century (3:3:0). Emphasis on the work of Robinson, Frost, Stevens, Williams, Pound, Crane, Eliot, and Lowell. Work of fiction employing poetic techniques, such as Faulkner's The Sound and the Fury, may also be studied.

464 Advanced Poetry Writing Workshop (3:3:0). Prerequisites: ENGL 397 or equivalent and permission of instructor. Students must submit a typed manuscript at least one week before registration. Intensive practice in the craft of poetry and study of the imagination in the creative process. Intended for students already writing original poetry. At the discretion of the instructor, technical exercises and assigned reading may be required. By permission of instructor, may be taken a second time for credit.

468 Special Topics in Poetry (3:3:0). Study of selected topics, periods, or poets. May be repeated once for credit when subtitle is different, with permission of department.

471 Chaucer (3:3:0). Major works of Chaucer, with emphasis on The Canterbury Tales.

472 Spenser (3:3:0). Poetry of Edmund Spenser, with central emphasis on The Faerie Queene.

473 Special Studies in Shakespeare (3:3:0). Study of one aspect of Shakespeare's art or critical issues surrounding his work. May be repeated once for credit when subtitle is different, with permission of department.

474 Milton (3:3:0). Milton's major poetic works, with emphasis on Paradise Lost.

477 Special Topics: British Authors (3:3:0). Study of one or two major figures in British literature. May be repeated once for credit when subtitle is different, with permission of department.

478 Special Topics: American Authors (3:3:0). Study of one or two major figures in American literature. May be repeated once for credit when subtitle is different, with permission of department.

489 Advanced Nonfiction Writing (3:3:0). Prerequisite: ENGL 309 or 399, or permission of instructor. Workshop course. Intensive practice in advanced nonfiction writing; emphasis on writing for publication. Occasional special topics sections in such forms as autobiography and scientific writing.

490 Special Topics in Film (3:3:0). American and foreign films selected by type, period, or director with the emphasis varying from year to year. Required viewings, student discussion, and written critiques. May be repeated with permission of department.

491 Special Topics in Folklore (3:3:0). Exploration of various aspects of folklore and folklife such as folklore and literature, folk arts, folk song, and material culture. May be repeated once for credit when subtitle is different, with permission of department.

492 Science Fiction (3:3:0). Major works of science fiction in terms of mode, themes, and narrative techniques, especially the role of hypothesis in science fiction. Focus on novels and short stories from the early 19th century to the present.

493 Special Topics in Popular Literature (3:3:0). Study of a specific topic or theme in popular literature. May be repeated once for credit when subtitle is different, with permission of department.

494 Special Topics in Criticism (3:3:0). Study of a selected approach to literary criticism, as announced, with exercises in critical analysis. Includes new criticism, structuralism, psychoanalysis, and Marxism. May be repeated with permission of department.

495 Literary Modes (3:3:0). Theory and practice of such modes as tragedy, comedy, tragicomedy, romance, and satire, considered in separate semesters and drawn from a variety of periods ranging from biblical times to the present, with examples from drama, poetry, and fiction. May be repeated with permission of department.

496 Special Topics: British or American Literature (3:3:0). Study of a selected literary topic, period, or genre, as announced. May be repeated with permission of department.

497 Special Topics in Creative Writing (3:3:0). Prerequisite: ENGL 396 or equivalent and permission of instructor. Students must submit a typed manuscript at least one week before registration. Workshop course. Intensive practice in creative writing and study of the creative process. Concentrates on a specialized literary type other than the short story or poetry (for example, playwriting, screenwriting, children's literature, travel literature, autobiography, the gothic novel, translation). The concentration is announced in the department's Course Description Booklet before pre-registration. Intended for students already writing original creative work. By permission of instructor, may be taken a second time for credit.

498 Internship: Special Topics (1-3:0:0). Prerequisites: 60 credits including 3 credits of a 100-level English course, 6 credits of 200-level English courses, 3 credits of English 302, 6 additional credits of upper-level English courses (English majors), 3 additional credits of upper-level English courses and 3 credits of upper-level courses in the major (non-English majors). Internships are unpaid, approved work-study positions at specific sites arranged by interested students and their advisors. A student, under supervision of a faculty advisor, works as an intern with a site supervisor in an agency of the student's choosing (given...
advisor’s permission). For three hours of credit, students work 120 hours on site and write 3,500 words, or the equivalent, given their contracts with their advisors. Contact the English Department one semester prior to enrollment. No more than three credits can be counted in a concentration or the English minor. May be repeated for credit once with permission of department.

499 Independent Study (1-3:0:0). Prerequisites: Permission of department and permission of instructor. Open only to English majors with 90 credits and 15 credits in 300- and 400-level courses. Intensive study of a particular author, genre, period, or critical or theoretical problem in literature or linguistics, to be conducted by an individual student in close consultation with an instructor. Student produces at least one substantial piece of written work during the semester on the findings of his or her research. (By permission of department, the course may be taken twice for a maximum of six credits.)

With permission of department, qualified undergraduates may enroll in 500-level courses for either undergraduate or reserved graduate credit.

503 Theory and Practice of Editing (3:3:0). Prerequisites: Six credits of English courses numbered above 300, including one advanced writing course—309, 311, 396, 397, 398, 410, 458, 464, 489, 497—or permission of department. Instruction in revising, editing, and preparing specialized writing for printing. Emphasis on methods of achieving clarity, accuracy, and completeness. Lecture and discussion on editing and printing techniques, practical exercise in revision, layout, and production.

504 Internship in Writing and Editing (3:3:0). Prerequisite: Open to senior English majors and graduate students pursuing the M.A. in English or the M.F.A. Contact the English Department one semester prior to enrollment. Internships are approved work-study positions in writing or editing established by the English Department with specific employers. Variable credit. Variable prerequisites.

505 Computer-Assisted Publications Writing and Design (3:3:0). Theory and practice of using computer programs to design and produce publications including brochures, fliers, newsletters, and small magazines. Course work includes readings, writing papers, and producing and editing copy and original publications.

506 Research for Narrative Writing (3:3:0). Prerequisite: ENGL 565 or 566 or permission of instructor. Course combines the study of basic research tools with field work and the writing workshop experience. Helps students develop the techniques and skills necessary for writing a research-dependent project of sufficient complexity to be of book or long essay length. The emphasis is on finding the story behind the facts using material from numerous sources of differing lengths.


511 Styles and Modes in Literary History (3:3:0). Prerequisites: 15 credits of advanced undergraduate English courses and permission of department, or a baccalaureate degree. Historical consideration of some of the principal styles, modes, and intellectual paradigms in literary and cultural texts.

512/PHIL 512 Issues in Literature and Philosophy (3:3:1). Prerequisites: Graduate or senior standing, six credits of upper-level English, six credits of philosophy, and permission of instructor. Interdisciplinary seminar that offers students an opportunity to arrive at a personal synthesis of work previously done in philosophy and literature. Topic changes yearly but focuses on themes or methodologies common to both disciplines.

513 Advanced Special Topics in English (3:3:0). Prerequisites: 15 credits of advanced undergraduate English courses and permission of department, or a baccalaureate degree. Intensive study of selected topics involving literary and/or other texts (e.g., film, television, opera, folklore). May be repeated for credit with permission of department.

514/CL 514 Theories of Comparative Literature (3:3:0). Prerequisites: CL 300 and senior standing, or baccalaureate degree, or permission of instructor. Intensive study of the major theories of comparative literature with special emphasis on the development and redefinition of the comparative outlook, from Great Books and the Western Canon to transnationalism, multiculturalism, and intercultural studies.

520 Descriptive Linguistics (3:3:0). See LING 520.


551 Literary Criticism (3:3:0). Studies in selected critical theories pertinent to textual and cultural analysis.

564 Form of Poetry (3:3:0). Prerequisites: ENGL 464 or equivalent and permission of instructor, except for M.F.A. students in the concentration. Students wanting permission must submit a typed manuscript of original poetry. Intensive study of and practice in the formal elements of poetry through the analysis of models and weekly or biweekly writing assignments. Intended for students already writing original poetry. Students study rhyme, meter, rhythm and other musical elements of poetry, lineation, stanza pattern, traditional and experimental forms, free verse and open-form composition, lyric, narrative, and dramatic modes.

565 Forms of Nonfiction (3:3:0). Prerequisites: ENGL 489 or equivalent and permission of instructor, except for M.A. and M.F.A. candidates in English. Intensive study of and practice in various forms of nonfiction writing through the analysis of models and weekly or biweekly writing assignments. Forms to be studied include biographies, documentaries, editorials, interviews, reports, reviews, and essays.

566 Forms of Fiction (3:3:0). Prerequisites: ENGL 458 or equivalent and permission of instructor, except for M.F.A. students in the concentration. Students wanting permission must submit a typed manuscript of original fiction. Intensive practice in the formal elements of fiction, through the analysis of models and weekly or biweekly writing assignments. Intended for students already writing original fiction. Students study description, narration, plot, dialogue, voice, point of view, style, epiphany, and antifiction techniques.

581 Psycholinguistics (3:3:0). See LING 581.
582 Second Language Acquisition (3:3:0). See LING 582.

591 Special Topics in Folklore (3:3:0). Exploration of various aspects of folklore and folklife such as folk narrative and storytelling, folklore and literature, and folk song and folk arts. May be repeated once for credit when subtitle is different, with permission of department.

592 Historical Studies of the English Language (3:3:0). Either (1) a chronological survey of the development of English from Old and Middle English to Modern English and American English or (2) an intensive study of the grammar and syntax of Old English as a literary language in representative texts of the period. May be repeated for credit with permission of the department.

604 Internship in Folklore (1-6:0:0). Prerequisites: One undergraduate or graduate course in folklore, which may be taken concurrently. Internships are unpaid, approved work-study positions at specific sites arranged by interested students and their advisors. A student, under supervision of a faculty advisor, works as an intern with a site supervisor in an agency of the student's choosing (given advisor's permission). For three hours of credit, students work 120 hours on site and write 3000 words, or the equivalent, given their contracts with their advisors. Contact the English Department one semester prior to enrollment.

610 Proseminar in Teaching the Reading of Literature (3:3:0). Methods of teaching literature. Includes study of methods of literary analysis and ways of developing student responses to literature, with some classroom practice. (Does not satisfy Virginia certification requirement in diagnostic or developmental reading.)

611 Studies in Rhetoric (3:3:0). Reading and discussion of several major texts that address patterns of discourse, communication, and other issues of rhetoric. Content varies. Recent offerings include 20th-century rhetoric, collaborative writing, and computers and rhetoric. May be repeated for credit with permission of the department.

612 Cultures of Professional Writing (3:3:0). Students work as ethnographers, studying selected sites where people write professionally and analyzing the ways in which the production and reception of writing both contribute to and result from the local culture of each site. Lecture and workshop format.

613 Technical and Scientific Writing (3:3:0). Prerequisite: ENGL 565 or permission of department. Intensive study of theory and practice of technical and scientific writing, with emphasis on writing for a variety of audiences. Focus on writing and evaluating formal reports, articles for lay as well as technical audiences, proposals, theses, manuals, and other forms of technical prose.

614 Internship in the Teaching of Writing (1-3:0:0). Internships provide experience working in a teaching program such as in a school or writing center. Students, under the direction of a faculty member, must secure the cooperation of the on-site supervisor. Students work a minimum of three hours per week per credit to be awarded, keep a weekly reflective and analytical log, and communicate regularly with the faculty director. May not be repeated for credit.

615 Proseminar in Composition Instruction (3:3:0). Methods of teaching expository writing. Includes consideration of planning of courses, practice in teaching and in grading papers, and study of recent developments in the teaching of writing.

616 Nonfiction Writing Workshop (1-6:1-6:0). Prerequisites: ENGL 563, which may be taken concurrently, and permission of instructor, except for M.F.A. students in the concentration. Intensive practice in the craft of nonfiction and study of the creative process. Intended for students already familiar with traditional and contemporary nonfiction and already writing original nonfiction. At the discretion of the instructor, reading may be required. May be repeated for credit with permission of department.

617 Poetry Writing Workshop (1-6:1-6:0). Prerequisites: ENGL 564, which may be taken concurrently, and permission of instructor, except for M.F.A. students in the concentration. Intensive practice in the craft of poetry and study of the creative process. Intended for students already familiar with traditional and contemporary poetic modes and already writing original poetry. At the discretion of the instructor, reading may be required. May be repeated for credit with permission of department.

618 Fiction Writing Workshop (1-6:1-6:0). Prerequisites: ENGL 565, which may be taken concurrently, and permission of instructor, except for M.F.A. students in the concentration. Intensive practice in the craft of fiction and study of the creative process. Intended for students already familiar with traditional and contemporary fiction and already writing original fiction. At the discretion of the instructor, reading may be required. May be repeated for credit with permission of department.

619 Special Topics in Writing (3:3:0). Prerequisite: Two graduate writing courses and/or permission of instructor, except for M.F.A. students in the concentration. Workshop course. Intensive practice in creative writing and study of the creative process. Concentrates on a specialized literary type other than the short story (i.e., essay, playwriting, film writing, children's literature, travel literature, autobiography, the graphic novel, translation); the concentration is announced in the department's Course Description Booklet. Intended for students already writing original creative work. May be repeated for credit with permission of department.

625 British Medieval (3:3:0). Selected literary author(s), works, or movements from between 1300 and 1500, studied in Middle English. Content varies. May be repeated twice for credit with permission of department.

630 Early Modern (3:3:0). Selected literary author(s), works, or movements of the English Renaissance. Content varies. May be repeated three times for credit with permission of department.

635 Eighteenth-Century British (3:3:0). Selected English literary author(s), works, or movements of the 18th century. Content varies. May be repeated twice for credit with permission of department.

640 Nineteenth-Century British (3:3:0). Selected English literary author(s), works, or movements of the 19th century. Content varies. May be repeated twice for credit with permission of department.

645 Twentieth-Century British (3:3:0). Selected English literary author(s), works, or movements of the 20th century. Content varies. May be repeated twice for credit with permission of department.
650 Seventeenth-Century American (3:3:0). Selected literary author(s), works, or movements of the "new world" before 1800. Content varies. May be repeated once for credit with permission of department.

655 Nineteenth-Century American (3:3:0). Selected American literary author(s), works, or movements of the 19th century. Content varies. May be repeated twice for credit with permission of department.

660 Twentieth-Century American (3:3:0). Selected American literary author(s), works, or movements of the 20th century. Content varies. May be repeated for credit with permission of department.

670 Visual Culture: Theories and Histories (3:3:0). Prerequisite: Introductory film course or permission of instructor. Advanced study in histories of visual representation (including film, television, and video) and in theories of the production and circulation of meanings in visual culture. May be repeated once for credit with permission of department.

675 Feminist Theory and Criticism (3:3:0). Seminar designed to present a historically based introduction to the major debates within feminist theory and criticism. Stressing the role of gender in literature and its interpretation, the course explores the diverse collection of feminist interpretive practices.

676 Introduction to Cultural Studies (3:3:0). An advanced introduction to the theoretical practice now known as "cultural studies," with particular attention given to its role in textual studies. Part of the interdisciplinary cultural studies Ph.D. program, as well as the M.A. in English.

685 Selected Topics, Movements, or Genres of Literature in English (3:3:0). Content varies. May be repeated for credit with permission of department.


690 Generative Phonology (3:3:0). See LING 690.

691 Theories of Language (3:3:0). See LING 691.

692 Phonology II (3:3:0). See LING 692.

695/EDUC 695 Northern Virginia Writing Project Inservice Program (1,2,3:0:0). Prerequisite: Admission to the graduate program or permission of department. Offered at the request of a school division or other education agency to assist teachers in improving student writing and the use of writing to learn. Content varies. May be repeated once for credit with permission of department.

696/EDUC 696 Northern Virginia Writing Project Teacher/Research Seminar (3:0:0). Prerequisite: ENGL 695/EDUC 695 or NWP Summer Institute. Designed to acquaint classroom teachers with current findings related to the composing process and methods of studying writing in a school setting. Focus on development of a proposal investigating some aspect of the composing process. Teachers who have developed a proposal before enrolling will conduct the research during the course.

697/EDUC 697 Theory of Composition (3:3:0). Prerequisite: ENGL 613, ENGL 695/EDUC 695, or equivalent. Designed to acquaint classroom teachers with current theory relating to writing and the teaching of composition. Focus is on making explicit the theories of the participants, on reading the works of leading theorists, and on developing a statement describing the implications of theoretical consistency in the teaching of writing.

699 Workshop in English (1-3:0:0). Prerequisite: Admission to the graduate program or permission of department. Concentrated workshops, educational tours, independent studies, and special seminars dealing with selected topics in writing, linguistics, film, the electronic media, and literature written in English. All tours are optional and may be replaced by specified work conducted on campus. May be repeated for credit with permission of the department, but no more than six credits of ENGL 699 may be applied toward a master's degree in English. No more than three credits of 699 may be applied to the literature requirement for an M.F.A. degree.

701 Literary Scholarship (3:3:0). Introduction to research in English, including practice in library methods, the writing of a critical bibliography, the evaluation of issues and problems in the discipline, and a survey of scholarly activities in the department.

705 Literary Theory and Criticism (3:3:0). Major theories of literature and methods of analyzing and evaluating literary works. Content varies. May be repeated once for credit with permission of the department.

750 Advanced Workshop in Poetry Writing (3:3:0). Open to M.F.A. students only. Intensive practice in the craft of poetry for experienced writers. May be repeated for credit with permission of the department.

751 Advanced Workshop in Fiction Writing (1-6:1-6:0). Open to M.F.A. students only. Intensive practice in the craft of fiction for experienced writers. May be repeated for credit with permission.

752 Advanced Workshop in Nonfiction Writing (1-6:1-6:0). Open to M.F.A. students only. Intensive practice in the craft of nonfiction for experienced writers. May be repeated for credit with permission.

785 Semantics and Pragmatics (3:3:0). See LING 785.

786 Syntax I (3:3:0). See LING 786.

787 Syntax II (3:3:0). See LING 787.

790 Seminar in English/Cultural Studies (3:3:0). Prerequisite: Nine credits of graduate English courses including 701 or permission of department. Analysis of historical shifts in literary and cultural discourse. Major research paper required. Specific topics vary. May be repeated once for credit with permission of department.

791 Seminar in English/Cultural Studies (3:3:0). Prerequisite: Nine credits of graduate English courses including 701 or permission of department. Analysis of relationships between literary and nonliterary elements of a culture within a specific historical moment. Major research paper required. Specific topics vary. May be repeated once for credit with permission of department.

798 Directed Reading and Research (1-3:0:0). Prerequisite: Open only to degree students who have completed 15 credits including ENGL 701 and have registered. Reading, research, and writing on a specific project under the direction of a department member. Oral or written report required. M.A. students may repeat once for credit with permission of department. M.F.A. students may present up to 12 hours of ENGL 798 for graduation, but no more
than 3 of these may count toward completing the literature requirement.

799 Thesis (1-6:0:0). Students who take ENGL 798 to develop a thesis topic and then elect the thesis option receive three credits for ENGL 799 on completion of the thesis. Students who do not take ENGL 798 or who take it to work on a project unrelated to their thesis receive up to six credits for ENGL 799 on completion of the thesis. Graded S/NC.

800 Studies for the Doctor of Philosophy in Education (variable credit). Prerequisite: Admission to the Ph.D. in Education program to study in English. Program of studies designed by student's discipline director and approved by student's doctoral committee that prepares the student to do research and writing in the current area of interest of the discipline director. Enrollment may be repeated.

801 New Developments in English (3:3:0). Designed for students in the Doctor of Arts in Community College Education program. Focus is on major original texts that have influenced the discipline of English in the late 20th century. Readings are from literary studies, composition/writing theory, and linguistics.

**Enterprise Engineering and Policy (EEP)**

School of Public Policy

601 Introduction to Enterprise Engineering: Engineering and Policy (3:3:0). Prerequisite. Co-requisite: INFS 614 or equivalent. This course provides an overview of extended enterprise integration using modern standard software solutions and tools. The focus is on the integration and management aspects of extended enterprise solutions. Topics include enterprise resource planning and e-business extensions. Students must demonstrate complete proficiency in a modern implementation methodology and supporting tools.

602 Decision Support for Enterprise Integration (3:3:0). Prerequisite: EEP 601. Lectures focus on the use of "business intelligence" to enhance competitive advantage, developing an information-driven set of controls to improve profitability, and the creation of a balanced business with aligned corporate direction and strategic intent. Solutions provided within enterprise resource planning systems are examined.

603 Supply Chain Integration and Management (Business-to-Business Electronic Commerce) (3:3:0). Prerequisite: EEP 601. Lectures focus on two issues: supply chain integration from an information technology perspective and supply chain management from a decision support perspective. The motivation for the course is the merging of enterprise computing with operations research, primarily through customer/supply chain management systems. Topics include enterprise resource planning/web integration, advanced planning and scheduling, and CPFR.

604 E-Commerce Architectures (Business-to-Consumer Electronic Commerce) (3:3:0). Prerequisite: EEP 601. Introduction to the network and system architectures that support high volume business-to-consumer web sites and portals. Course provides insight into the structure of the modern web-enabled storefront. Critical business and technology issues include storage area networks, server clustering, load balancing techniques at the server and network level, fault tolerance, and recovery of database and application servers.

605 Economics of Electronic Commerce (3:3:0). Prerequisite: EEP 601. Lectures focus on gaining competitive advantage through electronic commerce implementation; the identification and growing of new market opportunities, as well as the electronic enabling of existing business relationships; business-to-consumer relationships and the economics of strategic procurement; enterprise resource planning hosting; customer relationship management; catalog hosting; portal operations; and supplier management.

606 Customer Relationship Management (3:3:0). Prerequisite: EEP 601. Lectures focus on the "front office" and its integration with the "back office." The modern world of e-commerce extends intra-enterprise integration, as implemented in enterprise resource planning systems, to include external constituents, such as customers, partners, and suppliers. The course is focused on modern system support for the demand chain and the value creation process that results from integrating the "front office" systems with the "back office" systems.

607 Critical Information Technology Infrastructures (3:3:0). Prerequisite: EEP 604. Lectures focus on the design and implementation of high-speed network and application services in support of modern enterprise resource planning (ERP) systems. Critical technologies include high-speed data communication, switched vs. routed data flow, workflow engines, business rule and web application servers, and load balancing technologies. A large-scale web enabled ERP system architecture will be examined in detail.

608 Optimization of Supply Chians (3:3:0). Prerequisites: MATH 203, MATH 213, and graduate standing. Course focuses on both supply chain optimization from an enterprise-wide perspective and supply chain optimization from a business-to-business e-commerce perspective. Thus it is concerned with optimizing the value of goods and services and assuring a reasonable return on such sales. The course describes both heuristic and exact algorithms for scheduling, production, inventory management, logistics, and distribution. New software that enables such optimization is presented, and manufacturing and service examples from the public and private sectors are outlined. New techniques to handle risk, quality of data, and robustness of solutions are presented. Students perform case studies using state-of-the-art software.

**Environmental Science (EVSC)**

Environmental Science and Policy

101 Field Techniques in Environmental Geochemistry (2:0:2). Introduction to field techniques used to observe, measure, sample, and describe surficial geological material related to preliminary environmental site assessments.

110 Introduction to the Ecosphere (4:3:3). Study of the components and interactions that make up the natural systems of our home planet. The course teaches basic concepts in biological, chemical, physical, and earth sciences in an integrated format with a combination of lecture, laboratory, and field exercises. This course is the first semester of a two-semester lab sequence that can fulfill the general
environmental science requirements for B.A. students in the College of Arts and Sciences.

111 Introduction to the Ecosphere (4:3:3). Prerequisite: EVSC 110. Study of the components and interactions that make up the natural systems of our home planet. The course teaches basic concepts in biological, chemical, physical, and earth sciences in an integrated format with a combination of lecture, laboratory, and field exercises. First semester of a two-semester lab sequence that can fulfill the general education science requirement for B.A. students in the College of Arts and Sciences.

205 Environmental Science I (4:3:1). Investigations of scientific principles directly related to environmental problems, with emphasis on the causes of environmental mismanagement, development of natural resources, land-use problems, and the interaction of geochemistry and problems of human health.

206 Environmental Science II (4:3:1). Investigations of ecosystem chemistry and population dynamics, geochemical resource management, chemistry of water and air pollution, hazardous wastes, and urbanization.

301 Remediation of Groundwater and Soil Contamination (3:3:0). Prerequisite: CHEM 313, GEOL 306 or 313, or permission of instructor. Analysis of remediation technologies for groundwater and soil cleanup at chemically contaminated sites. Emphasis is on assessments of technology performance and cost effectiveness.

454 Applied Environmental Geochemistry (3:3:0). Prerequisite: CHEM 313, GEOL 305 or 306, or permission of instructor. Lectures on the chemistry and geochemistry of processes and pathways in the environment, including how geochemical processes operate naturally and how they have been perturbed by human activities. Courses include field trips to sites of geochemical interest and/or past and present environmental contamination.

Environmental Science and Public Policy (EVPP)

110 The Ecosphere: An Introduction to Environmental Science I (4:3:3). Study of the components and interactions that make up the natural systems of our home planet. Teaches basic concepts in biological, chemical, physical, and earth sciences in an integrated format with a combination of lecture, laboratory, and field exercises. First semester of a two-semester lab science sequence that can fulfill the science requirements for B.A. students in the College of Arts and Sciences.

111 The Ecosphere: An Introduction to Environmental Science II (4:3:3). Prerequisite: EVPP 110. Study of the components and interactions that make up the natural systems of our home planet. Teaches basic concepts in biological, chemical, physical, and earth sciences in an integrated format with a combination of lecture, laboratory, and field exercises. Second semester of a two-semester lab science sequence that can fulfill the science requirements for B.A. students in the College of Arts and Sciences.

377 Applied Ecology (3:3:0). Prerequisite: 60 credits, including 8 credits of biology, geology, or chemistry, or permission of the instructor. Introduction to ecosystem concepts and their applications to natural and managed ecosystems.

503 Field Mapping Techniques (3:0:6). Prerequisites: MATH 105 or equivalent; EVPP 110. GEOL 102 or GEOL 101 or equivalent. Basic techniques for collecting, recording, and plotting spatial field data, including the use of topographic maps, compass, transit, alidade, and global positioning systems. Includes field work.

505 Selected Topics in Environmental Science (1-4: 1-3:0-6). Prerequisite: A course in ecology or permission of instructor. Topic depends on instructor's specialty.

543 Tropical Ecosystems (4:3:3). Prerequisites: Course in ecology and permission of instructor. Emphasizes marine biology of estuarine and coastal habitats of the Chesapeake Bay region and factors affecting distribution and abundance of organisms. Lab provides training in field measurement of physical and chemical parameters and collection and identification of local organisms. Extended field trips to mid-Atlantic sites.

546 Estuarine and Coastal Ecology (4:3:3). Prerequisites: Course in ecology and permission of instructor. Emphasizes marine biology of estuarine and coastal habitats of the Chesapeake Bay region and factors affecting distribution and abundance of organisms. Lab provides training in field measurement of physical and chemical parameters and collection and identification of local organisms. Extended field trips to mid-Atlantic sites.

550 Waterscape Ecology and Management (3:3:0). Prerequisite: One course in chemistry and one course in ecology. Study of the physical, chemical, and biological components of freshwater ecosystems with emphasis on streams, rivers, and lakes, links between watersheds and freshwater ecosystems; and the impact of human management.

555 Lab in Waterscape Ecology (1:0:3). Prerequisite: EVPP 550 or permission of instructor. Field and laboratory approaches to freshwater ecology with emphasis on study design, sampling methods, laboratory and data analysis, and report writing.

576 Microbial Ecology of Soils (3:3:0). Prerequisite: A course in microbiology or permission of instructor. Survey of the microbial ecology in surface and subsurface soils. The organisms, their function, and their interaction are described.

577 Biogeochemistry: A Global Perspective (3:3:0). Prerequisite: A course in ecology and a course in chemistry, or permission of instructor. Structure and function of ecosystems, their interactions as components of landscapes, and their contributions to the global environment. Emphasizes biogeochemical cycles of natural, disturbed, and managed ecosystems, and their integration at the landscape and global level as related to current ecological problems such as transfer of nonpoint source pollutants, atmospheric deposition, stratospheric ozone depletion, and global change.

607 Fundamentals of Ecology (3:3:0). Overview of concepts in physiological, population, community, and ecosystem ecology restricted to graduate students with little or no background in ecology.

610 Bioremediation: Theory and Applications (3:3:0). Prerequisites: Courses in microbiology and either organic chemistry or microbiology, or permission of instructor. Provides the basis for understanding the proper application of bioremediological technologies to treatment of hazardous wastes. Includes evaluation of data to determine successful treatment.
622 Management of Wild Living Resources (3:3:0). Prerequisites: 8 credits of ecology including BIOL 648, or permission of instructor. Through lectures, case studies, and discussions, this course examines the management of different types of wild living resources, animal and plant, aquatic and terrestrial. Reviews the present status of the resources, analyzes the factors that have led to the present situation, and considers what may be required to achieve effective and sustainable management.

626 Environment and Development in South and East Asia (3:3:0). Prerequisites: Course work in policy process, international development, and ecology, or permission of instructor. Through lectures, guest lecturers, assigned reading, class discussions, and oral and written case studies, this course examines environment and development in selected countries of south and east Asia. Reviews the relationship between environment and development, considers the background and history leading up to the present, analyzes the factors that have led to the present situation, and considers what may be required to achieve more effective and sustainable results.

627 Environment Policy in Latin America (3:3:0). Prerequisites: Course work in policy process, international development, and ecology, or permission of instructor. Through lectures, guest lecturers, assigned reading, class discussions, and oral and written case studies, this course examines environmental policy in Latin America. Reviews the evolution of environmental policy and the relationship between environment and development, considers the background and history leading up to the present, analyzes the factors that have led to the present situation, and considers what may be required to achieve more effective and sustainable results.

628 Environment and Development in Africa (3:3:0). Prerequisites: Course work in policy process, international development, and ecology, or permission of instructor. Through lectures, guest lecturers, assigned reading, class discussions, and oral and written case studies, this course examines environment and development in sub-Saharan Africa. Reviews the relationship between environment and development, considers the background and history leading up to the present, analyzes the factors that have led to the present situation, and considers what may be required to achieve more effective and sustainable results.

630 Methods and Logic of Social Inquiry (3:3:0). Prerequisite: Undergraduate statistics and research methods, or permission of instructor. Emphasizes the gathering, interpretation, and evaluation of scientific evidence. Develops critical-thinking skills and covers the logic of scientific inquiry, including various data collection methods such as experiments, observational research, and Q methodology.

636 Gender, Race and the Natural World (3:3:0). Advanced study of the links among gender, race, and nature using a social-psychological framework, original sources, and seminar and discussion. A critical analysis of the ideologies that underpin the interlocking narratives of gender, race, and nature, and an examination of the role of science in the production of these ideologies.

641 Environmental Science and Public Policy (3:3:0). Prerequisite: Course in ecology or permission of instructor. Effects of human activities on the environment. Air-borne, waterborne, and solid waste material are considered with respect to sources, control, and effect on ecosystems.

643 Microbial Ecology (4:3:3). Prerequisite: A course in microbiology or permission of instructor. Study of relationships between microorganisms and their natural environment, and methodology for observing their natural environment and their biochemical activities in that environment.

644 Wetland Ecology and Management (4:3:3). Prerequisite: Course work in ecology, chemistry and physics, or permission of instructor. Structure and function of wetland ecosystems. Emphasizes biogeochemical and hydrological processes, the effects of disturbance, and management implications.

645 Freshwater Ecology (3:3:0). Prerequisite: EVPP 550 or permission of instructor. Study of biotic and abiotic interactions that affect the structure and composition of freshwater ecosystems. Emphasis on the research literature and experimental and theoretical approaches.

648 Population Ecology (3:3:0). Prerequisite: Course in ecology or permission of instructor. Survey of ecological models and theory. Topics include population growth and regulation, competition, predator-prey relationships, and models of community structure.

650 Environmental Analysis and Modeling (4:3:3). Prerequisite: Course in ecology or permission of instructor. Students learn to conceptualize ecological systems, represent these conceptualizations mathematically, and develop and test models against field data. Multivariate models and dynamic simulation models are emphasized.

675 Environmental Planning and Administration (3:3:0). Interaction of man and ecological systems; causes of damage or deterioration in the environment; content, oversights, and externalities in the management decision processes that affect the environment and the effectiveness of plan implementation; means of assessing environmental impact; and administrative approaches for minimizing environmental impact.

677 Applied Ecology and Ecosystem Management (3:3:0). Prerequisites: EVPP 607 or equivalent. Use of ecological principles to manage natural resources. Emphasizes hierarchical levels of organization within ecological systems and the management of ecosystems to conserve biodiversity, natural resources, and the environment.

692 Master's Seminar in Environmental Science and Public Policy (1:1:0). Exploration of selected topics in environmental science and public policy using lectures, guest lectures, student presentations, and discussions of current literature. Topics vary. May be repeated for credit.

693 Directed Studies in Environmental Science and Public Policy (1-8:0:0). Prerequisite: Permission of instructor and chair. Study of topic not otherwise available in graduate program. May involve any combination of reading assignments, tutorials, lectures, papers, presentations, or lab or field study determined in consultation with the instructor. Short study plan required. May not be used to fulfill explicit undergraduate prerequisites for graduate work.

741 Advanced Topics in Environmental Science and Public Policy (1-4:1:3:0-6). Prerequisite: 8 credits of graduate course work in environmental science and public
policy or permission of instructor. Study of selected advanced topics in environmental science and public policy using lectures, guest lectures, student presentations, or laboratory exercises. Topics vary, but each offering has a coherent theme. May be repeated for credit if topics are significantly different.

745 Environmental Toxicology (3-3:0). Prerequisites: A course in ecology and a course in physiology, or permission of instructor. Study of the nature, distribution, and interaction of toxic chemicals released into the environment. Emphasizes effects on nonhuman biota.

793 Research in Environmental Science and Public Policy (1-3:0:0). Prerequisites: 8 graduate credits in EVPP and permission of instructor and chair. Library, laboratory, or field investigation under the supervision of the instructor. Short proposal required. May be repeated for a total of 6 credits.

798 Master's Research Project in Environmental Science and Public Policy (1-3:0:0). Prerequisites: Approved project proposal and permission of instructor and chair. Experimental, observational, literature-based, or theoretical research project chosen and completed under the guidance of a faculty member. Proposal is required before enrollment. Comprehensive report acceptable to student's committee is required for completion. Students taking EVPP 798 may receive no more than 6 credits for both EVPP 793 and EVPP 798. Graded S/NC.

799 Master's Thesis in Environmental Science and Public Policy (1-6:0:0). Prerequisites: Approved Thesis proposal and permission of instructor and chair. Experimental, observational, or theoretical research under an instructor's supervision that culminates in the production of a thesis. Thesis work should be potentially publishable. No more than 6 credits of EVPP 793 and EVPP 799 may be applied to the master's degree. Graded S/NC.

894 Supervised Internship (3-12:0:0). Prerequisite: Permission of program director and student's doctoral committee. Training in application of ecological skills to environmental management and policy under the supervision of a qualified environmental scientist at a government agency, consulting firm, industry, or other acceptable organization.

991 Advanced Seminar in Environmental Science (2:2:0). Prerequisite: 8 hours of ecology or permission of instructor. Topics generally address the interface between environmental science and public policy. May be repeated for credit.

998 Doctoral Dissertation Proposal (1-6:0:0). Prerequisite: Admission to doctoral candidacy or approval of doctoral program director. Work on a research proposal that forms the basis for a doctoral dissertation. Graded S/NC.

999 Doctoral Dissertation Research (1-12:0:0). Prerequisite: Approval of dissertation proposal. Research on a basic or applied problem in environmental science and public policy. Graded S/NC.

See additional course work under Biology (BIOL), Chemistry (CHEM), Public and International Affairs (PUAD), School of Public Policy (PUPB), Geography (GEOG), and Geology (GEOL).

Executive Master of Business Administration (EMBA)

School of Management

603 Managerial Economics and the Decisions of the Firm (3-3:0). Develops and applies tools of economic analysis in managerial decision situations. Focus on using economic analysis to understand the competitive environment of a firm.

612 Managing Costs and Evaluating Performance (1-3:1-3:0). Focuses on developing accounting information for use by managers in planning and control activities. Examines traditional and emerging cost management systems. Special emphasis given to information for decision-making, operational control, and performance evaluation.

613 Financial Reporting and Decision Making (3-3:0). Develops a framework of concepts and procedures essential for the interpretation of general-purpose financial statements and internal managerial accounting reports. Emphasis placed on the understanding of basic concepts and the application of selected procedures to problem-solving situations.

623 Marketing Management (3-3:0). Focuses on the firm's planning and decision making procedures to determine which markets are best served by the portfolio of products and services offered by the organization. Issues relevant to consumer behavior, product development, selection of markets, pricing, promotion, and distribution are covered.

633 Statistics for Business Decision Making (3-3:0). Applies statistical methods in the analysis of problems in business decision-making. Topics include descriptive statistics, probability distributions, estimation and hypothesis testing, and linear regression.

638 Operations Management in a Digital World (3-3:0). Integrates the theory and practice of operations management with the mathematical modeling and quantitative techniques of management science. Addresses a wide range of operations management issues, including technology and strategy decisions, systems design issues, project operations, quality control, and inventory planning.

643 Managerial Finance (3-3:0). Introduces the theories of finance and their application to the formulation of business policy. Topics include internal financial analysis, financial forecasting, valuation, risk and return analysis, capital allocation, and capital structure.

653 Organizational Behavior (3-3:0). Examines the development, theories, and practice of management within organizations. Emphasis given to human behavior and how it influences organizational effectiveness.

660 Information Technology Management (3-3:0). Examines computer-based information technologies and their interrelation with management processes, especially problem-solving and decision-making at the individual, work group, and organization levels. Topics include the management information system life cycle with emphasis on the manager's perspective and modeling and analysis to support decision-making.

673 Legal Environment for Management (1-3:1-3:0). Examines interrelationships between organizations, their external environment, and the regulatory process. Emphasis placed on legal and ethical issues as well as the managerial implications.
678 Strategic Management (3:3:0). Integrates concepts of business strategy and policy with functional knowledge developed in other courses and business practice. Issues include formulation of strategy, industry analysis, building core competencies, and strategy implementation.

708 Taxation and Business Strategy (1-3:1-3:0). Examines the influences of taxation on the decisions of firms and the effects of taxes on performance in a competitive setting. Specific coverage of international issues and the role of non-tax costs in tax planning will be emphasized.

709 Global Capital Markets (1-3:1-3:0). Considers emerging topics in finance, with a focus on the links between global markets and strategic firm decisions. Understanding the valuation of strategic investment opportunities and the identification of financing alternatives will be emphasized.

710 Business, Government, and the Global Economy (1-3:1-3:0). Focuses on the modern system of international trade and the opportunities that the global trading environment creates for firms. Attention will be directed toward the roles of national policies, international agreements, and business activities in the development of the system.


715 Special Topics in Accounting (1-3:1-3:0). In-depth examination of advanced topics in accounting.

716 Managing Change (1-3:1-3:0). Focuses on how organizations can successfully adapt and change. Topics include understanding the forces that make change necessary, developing a vision of an appropriate course, aligning the organization behind that vision, and motivating people to achieve it.

717 Corporate Governance (1-3:1-3:0). Investigates the past, present, and future of corporate governance. Focuses on relationships among shareholders, boards of directors, and top-level managers in examining the governance process, with emphasis on the rights and responsibilities of the participants.

724 Integrated Marketing Communication (1-3:1-3:0). Examines the integrative role of marketing in an organization. Investigates the coordination among marketing and other business functions, organization of the marketing function, and management of the marketing process.

725 Leadership and the Role of the General Manager (1-3:1-3:0). Focuses on the role of executive leadership within organizations. Takes an integrative perspective in focusing on the responsibilities and performance of general managers in areas such as creating and communicating a vision, identifying and pursuing goals, responding to adverse developments, and accomplishing change.

727 Applied Macroeconomics (1-3:1-3:0). Examines how the environment of firms is shaped by the state of the economy and macroeconomic policy. Topics include the business cycle, determinants of economic growth, the influence of fiscal and monetary policies, and the use of economic forecasts.

734 Electronic Commerce (1-3:1-3:0). Explores the ongoing transformation of business activities and markets by computer and telecommunications technologies. Examines technology and its application in a variety of functional areas and industry settings.

735 Special Topics in Decision Science (1-3:1-3:0). In-depth examination of advanced topics in decision science.

745 Special Topics in Finance (1-3:1-3:0). In-depth examination of advanced topics in finance.

751 Corporate Strategy and Policy (3:3:0). Examines issues in strategy for firms operating in multiple markets or businesses. Examines topics such as diversification, portfolio approaches to corporate strategy, mergers and acquisitions, corporate alliances and joint ventures, restructuring, and coordinating multibusiness corporations.

755 Special Topics in Management (1-3:1-3:0). In-depth examination of advanced topics in management.

765 Special Topics in Management Information Systems (1-3:1-3:0). In-depth examination of advanced topics in management information systems.

775 Special Topics in Marketing (1-3:1-3:0). In-depth examination of advanced topics in marketing.


798 International Business Environment (1-3:1-3:0). Develops a global perspective through seminars led by university professors and high-level managers, briefings by officials of government and other policy-making organizations, and site visits to production and distribution facilities, research centers, IT units, and other corporate offices.

Exercise, Fitness, and Health Promotion (EFHP)

Graduate School of Education

Prerequisite to all courses: Graduate standing and/or permission of instructor.

500 Workshop in Exercise, Fitness, and Health Promotion (1-3:0:0). Provides concentrated full-time workshops, weekend seminars, and workshops dealing with selected topics in exercise, fitness, and health promotion. May be repeated. No more than 6 credits may be applied for degree credit.

522 Anatomy for the Athletic Trainer: Structure and Function of the Neuromuscular and Musculoskeletal Systems (3:2:1). Prerequisites: BIOL 124 and 125 (or their equivalents) and permission of instructor. Promotes familiarity and proficiency with the anatomy of the neuromuscular and musculoskeletal systems of the body, which relate directly to sports-related injuries.

524 Physiology for the Athletic Trainer Including the Pharmacology of Sports Injuries (3:2:1). Prerequisites: BIOL 124 and 125 (or their equivalents) and permission of instructor. Promotes familiarity with and proficiency in the physiology, pharmacology, and rehabilitation of sports injuries.

526 Athletic Training Perspectives: Evaluation and Prevention of Sports Injuries (3:2:1). Prerequisites: BIOL
124 and 125 (or their equivalents) and permission of instructor. It is recommended that this course be taken concurrently with EFHP 522. Promotes familiarity and proficiency with the assessment and physical examination of sports-related injuries.

528 Advanced Athletic Training (3:2:1). Prerequisites: BIOL 124 and 125 (or their equivalents); EFHP 526; and permission of instructor. Promotes familiarity and proficiency with the assessment and intervention of the neuromusculoskeletal system and other systems of the body that relate directly to sports-related injuries.

598 Special Topics (1-6:0:0). Focuses on projects related to exercise, fitness, and/or health promotion. May be repeated with no more than 6 credits earned.

599 Independent Study in Exercise, Fitness, and Health Promotion (1-3:0:0). Provides study of a problem area in exercise, fitness, and health promotion research, theory, or practice under the direction of faculty. May be repeated. No more than 3 credits may be earned.

606 Foundations of Exercise, Fitness, and Health Promotion (3:3:0). Provides students with insights into the historical and philosophical foundations that guide the exercise, fitness, and health promotion professions. Through assigned readings, group exercises, individual research, and class discussion, students explore the disciplines, professions, and associated philosophical trends and issues that have developed around exercise, fitness, and health promotion.

610 Advanced Exercise Physiology (3:3:0). Provides lecture, demonstration, and seminar experiences in the application of research findings to the understanding of physiological function and the effects of exercise on people.

611 Fitness Assessment: Theory and Practice (3:2:2). Promotes familiarity and proficiency with the methods and instrumentation used in assessing individual fitness and establishing a base for exercise and other lifestyle alterations to improve fitness.


615 Epidemiology and Environmental Health (3:3:0). Covers principles, methods, and application of epidemiology. Reviews the behavioral, psychological, social, and environmental risks to disease distribution. Focuses on lifestyle, exercise patterns, and environmental factors to health and disease conditions.


623 Research Design and Statistical Reasoning (3:3:0). Introduces the techniques of research and the methods of data analysis employed in the fields of exercise, fitness, and health promotion.

630 Exercise, Health, and Fitness Program Development (3:3:0). Covers exercise and health program development related to fitness and health of adult populations. Provides 3 to 6 hours of field experience.

660 Management of Exercise, Fitness, and Health Promotion Organizations (3:3:0). Provides advanced study in management and administration of organizations dedicated to human development and improvement of quality of life. Covers application of theories and practices of management and behavioral sciences, fiscal management, marketing, and evaluation research.

670 Analysis of Teaching in Physical Education (3:3:0). Presents qualitative and quantitative research methods for studying teacher and student behaviors in the physical education setting and for engaging the teacher as researcher. Teaching strategies are revisited, action research projects are developed, and current education reform movements are examined.

680 Ethical Issues in Exercise, Fitness, and Health Promotion (3:3:0). Covers formulation of a coherent framework for ascertaining the good, right, and just, and for assessing evidence and reason underlying positions and arguments. Examines current ethical issues in exercise, fitness, and health promotion.

799 Thesis (1-6:0:0). Explores an exercise, fitness, and health promotion problem using appropriate research methodology under the supervision of graduate faculty member(s).

802 Readings for the Doctor of Arts in Community College Education (3-9:0:0). Prerequisite: Admission to the Doctor of Arts program in the National Center for Community College Education with a physical education specialty. Requires intensive reading in recent scholarship in physical education and related fields. Students must propose a reading list, which must be approved by their faculty advisor, and use the list to prepare a literature review that is potentially publishable.

### Finance (FNAN)

#### School of Management

If a student takes noncore, upper-level business courses before acceptance to the School of Management, those courses will not count on an undergraduate degree application for any major in the School of Management (except as general elective credit). A grade of C or higher must be presented on the graduation application for each upper-level course in the major. Prerequisites are strictly enforced. Degree status is defined as formal admission to the School of Management.

300 Personal Financial Management (3:3:0). Consideration of spending, saving, investing, and borrowing decisions within the household life-cycle framework. Examination of choices among investment alternatives, including assessment of risk exposure and suitability. (Course may not be taken for credit by business majors.) f,s

301 Financial Management (3:3:0). Prerequisite: Completion of at least 48 credits including ECON 103, ACCT 203, and DESC 210. Introduction to the management of a firm's financial resources given a wealth maximization decision criterion. Includes working capital management, fixed-asset investment, cost of capital, capital structure, and dividend decision analysis. Lecture, problems, and discussion. f,s,sum
302 Financial Analysis and Forecasting (3:3:0). Prerequisites: FNAN 301; degree status. Examination of techniques for analyzing, understanding, and applying financial information in decision situations. Topics include financial statement analysis, development of financial models, and financial planning and forecasting. fs

311 Principles of Investment (3:3:0). Prerequisites: FNAN 301; degree status. Introduction to the analysis of the valuation of equity and debt securities given modern capital market theory. Includes a discussion of portfolio analysis as related to the valuation of securities. Lecture, discussion, and computer-assisted research. fs

321 Financial Institutions (3:3:0). Prerequisites: FNAN 301; degree status. Discussion of the basic objectives of financial institutions in light of industry structure and regulatory environment, and the decision variables that management should concentrate on in achieving its objectives. Includes the role that financial institutions play in the allocation of funds within the financial markets. Lecture, discussion, and computer-assisted research. fs

351 Principles of Real Estate (3:3:0). Prerequisites: FNAN 301; degree status. Study of the dimensions and specialties involved in the public control and private development, sale, finance, and management of real estate. Subject areas include land planning, land use control, appraisal, finance, brokerage, property management, and investment. Lecture, discussion, and computer-assisted research. ir

401 Advanced Financial Management (3:3:0). Prerequisites: FNAN 301; degree status. Analysis of decision making within the firm, emphasizing the conceptual structure of problems and the use of advanced analytic techniques. Specific topics include current asset management, capital budgeting, capital structure, dividend policy, long-term financing, mergers, and corporate planning models. Lecture, discussion, and case analysis. fs

411 Investment Analysis and Portfolio Management (3:3:0). Prerequisites: FNAN 311; degree status. Analysis of the modern techniques of portfolio management including the evaluation of standards for the selection of individual securities for inclusion in or deletion from portfolios. Risk-return analysis for portfolios and portfolio performance measures are presented. Lecture, discussion, and computer-assisted research. ir

412 Futures and Options Markets (3:3:0). Prerequisites: FNAN 311; degree status. Introduction to options markets, commodity markets, and financial futures markets as they function to provide pricing mechanisms and alternative investment vehicles. Lecture, discussion, and computer-assisted research. ir

421 Money and Capital Markets (3:3:0). Prerequisites: FNAN 321; degree status. Discussion of how financial markets are organized, their role in the allocation of funds to various market segments, and the interaction between markets. Topics include aggregate flow of funds analysis as well as money markets, government markets, corporate markets, and mortgage markets. Lecture, discussion, and computer-assisted research. ir

440 International Financial Management (3:3:0). Prerequisites: FNAN 301; degree status. Introduction to the management of the contemporary firm's international financial operations. Topics include foreign exchange risk, political risk, returns and risks of international projects, international money and capital markets, financial accounting, capital structure, and the cost of capital. Lecture, discussion, readings, and problems. fs

451 Real Estate Finance (3:3:0). Prerequisites: FNAN 301 and 351; degree status. Study of the mechanisms of real estate finance, sources of funds, loan contracts, principles of mortgage risk analysis, and secondary mortgage markets. Students develop analytical skills including use of the microcomputer and appropriate software. ir

499 Independent Study (1-3:0:0). Prerequisites: Finance majors with at least nine upper-level finance credits; degree status. Research and analysis of selected problems or topics in finance. Must be arranged with an instructor and approved in writing by the associate dean for undergraduate programs before registration. Written report required. May be repeated for a maximum of six credits if topics vary.

Foreign Languages (FRLN)

Modern and Classical Languages

330 Topics in World Literature (3:3:0). Prerequisites: ENGL 101 and 45 credits, or permission of the instructor. Major works of world literature with varying perspectives and topics, such as specific cultures, histories, myths, or music and the arts, as represented in literature. All course work in English. May be taken toward fulfillment of the literature requirement of baccalaureate degrees. May be repeated twice when course content is substantially different, with permission of department.

431/ENGL 431/ HIST 431 Medieval Intellectual Topics (3:3:0). May be taken for credit by English or history majors. Focuses on a topic in the intellectual history of the Middle Ages. Emphasis is literary or historical, depending on the discipline of the instructor. Relevant material may be drawn from philosophy, theology, and art.

510 Bibliography and Research in Foreign Languages and Literature (3:3:0). Prerequisite: Graduate standing or permission of department. Use of basic bibliographical tools and methodologies necessary to do scholarly research in French, German, and Spanish. Taught in cooperation with the university library staff. Conducted in English.

525 Literary Translation (3:3:0). Prerequisite: Graduate standing or permission of instructor. Advanced work in literary translation. The critical approach to and analysis of diverse literary texts ranging from poetry, drama, and essay to excerpts from novels.

550, 551 Special Topics (3:3:0). Themes, periods, or genres vary from semester to semester. Focus is on topics that incorporate one or more of the languages taught in the department, but instruction is in English. May be repeated for credit with permission of department.


572 Integrating Technology into Language Learning (3:3:0). Prerequisites: Graduate standing or permission of department; a language teaching methods course, language
teaching experience, or permission of instructor. Explores the pedagogical and theoretical basis for integrating interactive technologies into language learning programs, and examines their potential for learning, teaching, testing, and research. Includes hands-on analysis and evaluation of materials. Prior experience with technology is not required.

573 Basic Issues in Language Pedagogy (3:3:0). Prerequisite: Graduate standing or permission of department; a language teaching methods course, language teaching experience, or permission of instructor. Explores a number of major issues controversial in language pedagogy. Topics include communicative competence as a pedagogical goal, the role of explicit grammar teaching, the proficiency movement, cultural authenticity, student-centered learning, and the use of technology.

590 Internship and Seminar in Translation (3:3:0). Prerequisite: Admission to the translation certificate program. Internships are nonpaying, work-study positions that focus on the practice of translation. Qualified students are placed with area institutions, interest groups, agencies, or corporations. Placement depends on availability of positions.

600 Workshop in Foreign Languages (1-6:0:0). In-service workshops, tours, and seminars dealing with selected topics in literature, language, bilingualism, culture, methodology, etc. May not normally be applied toward the M.A. in modern and classical languages.

620 Literary Theory and Criticism (3:3:0). Study of the nature of literary work and analysis of contemporary critical approaches to literature. May not be taken for credit by students who previously received credit for FRLN 615.

650 The Teaching of Culture in Foreign Language Programs (3:3:0). Purpose and methods of the study of culture, with emphasis on strategies and techniques for teaching culture in foreign language programs.

660 Approaches to the Study of Language (3:3:0). The discipline of linguistics and its relationship to other disciplines, including study of generative grammar with syntactic problems drawn from commonly taught foreign languages.

670 (570) Foreign Language Learning and Teaching (3:3:0). Theories, methods, and strategies of second and foreign language learning and teaching. May not be taken by students who have completed FRLN 570.

French (FREN)

Modern and Classical Languages

Placement: See Academic Testing section of the Admission chapter.

101 Elementary French I (3:3:1). Designed for students with no knowledge of French. Introduction to French, including elements of grammar, vocabulary, oral skills, listening comprehension, and reading. Lab work required.

102 Elementary French II (3:3:1). Prerequisite: FREN 101, appropriate placement score, or permission of instructor. Continuation of FREN 101. Lab work required.

105 Review of Elementary French (3:3:1). Prerequisite: Appropriate placement score or permission of department. Review for students who have studied French previously. May not be taken for credit in combination with FREN 10.

109 Intensive Elementary French (6:6:2). Equivalent to FREN 101 and 102 taught in a single semester. Recommended for students who desire an intensive introduction to French. May not be taken for credit in combination with 101, 102, or 105. Lab work required.

201 Intermediate French I (3:3:1). Prerequisite: FREN 102, 105, 109, appropriate placement score, or permission of department. Further development of skills in listening, speaking, reading, and writing. FREN 201 and 202 must be taken in sequence. Lab work required.

202 Intermediate French II (3:3:1). Prerequisite: FREN 201, appropriate placement score, or permission of department. Application of language skills to reading, composition, and class discussion. Lab work required.

209 Intensive Intermediate French (6:6:2). Prerequisite: FREN 102, 105, 109, appropriate placement score, or permission of department. Equivalent to FREN 201 and 202 taught in a single semester. May not be taken for credit in combination with FREN 201 or 202. Lab work required.

300 Study Tour in France (1-6:0:0). Prerequisite: FREN 202 or equivalent, or permission of instructor. Directed study tour of cultural and literary points of interest in France. Briefing sessions and a reading selection are given before the trip. All papers and examinations required for credit are due by the end of the summer session.

325 Major French Writers (3:3:0). Prerequisite: ENGL 101 or equivalent, or permission of instructor. Study of the works of major French writers. Writers to be studied vary. Course work in English. May be taken toward fulfillment of the general requirement in literature for baccalaureate degrees. May be repeated for credit with permission of department.

329 Problems of Western Civilization in French Literature (3:3:0). Prerequisite: ENGL 101 or equivalent, or permission of instructor. Basic philosophical, moral, social, and political dilemmas reflected in the literature of major French writers. Course work in English. May be taken toward fulfillment of the general requirement in literature for baccalaureate degrees. May be repeated for credit with permission of department.

350 French Conversation (3:3:0). Prerequisite: FREN 202 or equivalent. Development of conversational proficiency in French. Specifically designed for French majors who need practice in the spoken language beyond the intermediate level.

351 Advanced French Grammar (3:3:0). Prerequisite: FREN 202 or equivalent. Systematic review of French grammar with emphasis on syntax, idiomatic construction, vocabulary building, and literary style. Written and oral exercises.

352 French Composition (3:3:0). Prerequisite: FREN 202 or equivalent. Development of writing skills through written reports on current events and on literary topics. Specifically designed for students concentrating in French who need practice in the written language beyond the intermediate level.

355 Phonetics and Oral Expression (3:3:2). Prerequisite: FREN 202 or permission of instructor. Intensive study of French pronunciation and diction. Practice in discriminat-
366 French (FREN)

Phonetic symbols: Recitation of poems and rhythmic prose. Enrollment limited to 15.

357 Introduction to Translation (3:3:0). Prerequisite: FREN 202 or permission of instructor. Translations from French to English, English to French, of texts selected from current periodicals and newspapers in various fields. Recommended for students who wish to improve language skills.

375 French Civilization: From Ancient Gaul to the French Revolution (3:3:0). Prerequisite: 15 credits of French or permission of instructor. Study of contributions of France to world civilization. Emphasis on development of ideas, arts, sciences, and institutions. Offered in alternate years.

376 French Civilization: From the Revolution to Contemporary France (3:3:0). Prerequisite: 15 credits of French or permission of instructor. See FREN 375.

377 Survey of French Literature: Middle Ages to 1800 (3:3:0). Prerequisite: 15 credits of French or permission of instructor. French literature through the centuries, with reading and analysis of representative texts of the major authors. Offered in alternate years. May be taken toward fulfillment of the general requirement in literature for baccalaureate degrees.

378 Survey of French Literature: 1800 to Present (3:3:0). Prerequisite: 15 credits of French or permission of instructor. See FREN 377.

381 Introduction to Literary Analysis (3:3:0). Prerequisite: 15 credits of French. Structured approach to the reading and analysis of French literary texts.

391 French for the Business World I (3:3:0). Prerequisite: 15 credits of French or permission of instructor. Introduction to study of styles used in commercial, private, and official formats for correspondence and various common business documents. Emphasis on written exercises. Designed to satisfy the needs of students equipping themselves for multinational business and foreign service.

392 French for the Business World II (3:3:0). Prerequisite: FREN 391 or permission of instructor. Continuing study of terminology used in business affairs, with attention to form and style of business documents. Oral and written practice of French used in everyday work situations. Students may use this course in preparation for the Paris Chamber of Commerce certificate in business French.

405 French Literature of the Renaissance (3:3:0). Prerequisite: 18 credits of French or permission of instructor. Development of the humanistic tradition in France during the 16th century, especially as reflected in the works of Rabelais and Montaigne. May be taken toward fulfillment of the general requirement in literature for baccalaureate degrees.

413 French Literature of the 17th Century: Classical Drama (3:3:0). Prerequisite: 18 credits of French or permission of instructor. Study of the dramatic literature of the 17th century. May be taken toward fulfillment of the general requirement in literature for baccalaureate degrees.

414 French Literature of the 17th Century: Prose and Poetry (3:3:0). Prerequisite: 18 credits of French or permission of instructor. Reading and analysis of representative texts of major authors. May be taken toward fulfillment of the general requirement in literature for baccalaureate degrees.

421 French Literature of the 18th Century: Montesquieu and Voltaire (3:3:0). Prerequisite: 18 credits of French or permission of instructor. Study of Montesquieu, Voltaire, and other writers of the first half of the century. May be taken toward fulfillment of the general requirement in literature for baccalaureate degrees.

422 French Literature of the 18th Century: Diderot and Rousseau (3:3:0). Prerequisite: 18 credits of French or permission of instructor. Study of Diderot, Rousseau, and other writers of the second half of the century. May be taken toward fulfillment of the general requirement in literature for baccalaureate degrees.

431 French Literature: 1800–1850 (3:3:0). Prerequisite: 18 credits of French or permission of instructor. Poetry, theater, and novels of the Romantic and Parnassian movements. May be taken toward fulfillment of the general requirement in literature for baccalaureate degrees.

432 French Literature: 1850–1900 (3:3:0). Prerequisite: 18 credits of French or permission of instructor. Poetry, theater, and novels of the Realist, Naturalist, and Symbolist movements. May be taken toward fulfillment of the general requirement in literature for baccalaureate degrees.

441 Twentieth-Century Prose Fiction (3:3:0). Prerequisite: 18 credits of French or permission of instructor. Principal literary trends in contemporary French literature. Emphasis on evolution of the novel from Proust and Gide to Beckett and the "Nouveau Roman." May be taken toward fulfillment of the general requirement in literature for baccalaureate degrees.

442 Twentieth-Century Drama and Poetry (3:3:0). Prerequisite: 18 credits of French or permission of instructor. French drama from Surrealism to the "Nouveau Theater." French poetry from Symbolism to contemporary poets. May be taken toward fulfillment of the general requirement in literature for baccalaureate degrees.

451 Sub-Saharan African Literature (3:3:0). Prerequisite: 18 credits of French or permission of instructor. For non-Western credits. Study of selected writers expressing the culture and civilizations of the French-speaking countries south of the Sahara. May be taken toward fulfillment of the general requirement in literature for baccalaureate degrees.

452 French-Canadian Literature (3:3:0). Prerequisite: 18 credits of French or permission of instructor. Study of the Francophone literature of Canada with emphasis on contemporary works. May be taken toward fulfillment of the general requirement in literature for baccalaureate degrees.

453 Francophone Literature from North Africa (3:3:0). Prerequisite: 18 credits of French or permission of instructor. Study of the Francophone literature of North Africa (the Maghreb) with emphasis on contemporary works. May be repeated once for credit with permission of instructor.

454 Caribbean Literature in French (3:3:0). Prerequisite: 18 credits of French or permission of instructor. Study of selected writers expressing the culture and civilization of French-speaking countries of the Caribbean.

460 Advanced Oral and Written Expression (3:3:0). Prerequisite: 18 credits of French or permission of instructor.

http://catalog.gmu.edu
Intensive course designed to help students obtain fluency in oral and written French. Development of conversational skills and mastery of vocabulary. Class discussions and oral and written reports on current topics.

461 Linguistic Structure of Modern French (3:3:0). Prerequisite: 18 credits of French or permission of instructor. Descriptive analysis of the phonology, morphology, and syntax of modern standard French. Optional lab work.

462 Stylistics (3:3:0). Prerequisite: 18 credits of French or permission of instructor. Analysis of the more complex aspects of the French language and various stylistic processes. Development of writing skills through readings, discussion, and composition.

470 Topics in French Cinema (3:3:0). Prerequisites: English 332 or permission of instructor for Film and Media Studies, 18 credits in French or permission of instructor for French students. Topics in French cinema (such as the early days of French cinema, La Nouvelle Vague, women film directors, Quebecois, African and Caribbean films), selected by type, period, or director, with emphasis varying from year to year. Required viewing, student discussion, and written critiques. May be repeated once with permission of the department or film studies advisor.

480 Special Topics (3:3:0). Prerequisite: 18 credits of French or permission of instructor. Study of a selected literary theme, topic, period, or genre. May be repeated once with permission of instructor.

490, 491 Independent Study (1-3:0:0), (1-3:0:0). Prerequisites: French majors with 90 credits and permission of chair. Research and analysis of a selected problem in literature or linguistics in consultation with a member of the department. Only six credits of independent study may be applied to fulfillment of requirement in the concentration.

497, 498 Senior Honors Tutorial (3:0:0), (3:0:0). Prerequisites: French majors with 90 credits, a cumulative GPA of 3.00, and 3.00 in the major field. Students who meet these requirements are admitted to candidacy on submission of a letter of application to the departmental Honors Committee in the second half of the junior year. A faculty recommendation and an interview by the Honors Committee are also required. First semester involves weekly meetings with a faculty member to discuss readings from a comprehensive list prepared by the French faculty. Second semester requires independent research and completion of an honors essay under the supervision of a member of the French faculty.

515 Medieval French Literature (3:3:0). Intensive study of the outstanding literary works of the Middle Ages. Course work in French.

517 Studies in 17th-Century Literature (3:3:0). Selected writers, works, themes, or trends of French literature in the classical era. Content varies. May be repeated once for credit. Course work in French.

518 Studies in 18th-Century Literature (3:3:0). Selected writers, works, themes, or trends of French literature in the 18th century. Content varies. Course work in French. May be repeated for credit with permission of department.

519 Studies in 19th-Century Literature (3:3:0). Selected works, themes, genres, and authors of 19th-century French literature. Content varies. Course work in French. May be repeated for credit with permission of department.

525 Studies in Modern French Literature (3:3:0). Selected writers, works, themes, or trends of French literature in the modern era. Content varies. May be repeated for credit with permission of department. Maximum of six credits may be earned. Course work in French.

550 Special Topics (3:3:0). Specialized topics relating to French culture and literature. Content varies. May be repeated once for credit. Course work in French.


575 Grammatical Analysis (3:3:0). Study of characteristic features of contemporary French. Examination of spoken and written French, including syntactic analysis, distributional analysis, and generative-transformational grammar. Emphasis on problem areas for the American learner.

576 Advanced Translation (3:3:0). Advanced work in translation of topics selected from the social and political sciences and the humanities. Comparative terminology, sight translation, and precis writing. Importance, function, and techniques of documentation in translation are stressed. Translations from French to English and English to French.


798 Directed Reading and Research (3:0:0). Prerequisite: Open only to degree students who have completed at least 18 credits. Reading and research on a specific project under the direction of a department member. Oral or written report required.

799 Thesis (1-6:0:0). Students who take FREN 798 and then elect the thesis option receive three credits for FREN 799 on completion of the thesis. Students who do not take FREN 798 receive six credits for FREN 799 on completion of the thesis. Graded S/NC. See also FRLN course listings.

Geography (GEOG)

Geography


102 Physical Geography (3:3:0). Interrelated processes affecting the global distribution and character of climate, soils, vegetation, hydrology, and landforms; elements of mapping (natural science credit).

103 Human Geography (3:3:0). Overview of major ideas and approaches to the study of the spatial aspects of human social and behavioral systems. Survey of distribution and movement of human populations, characteristics and distribution of cultural mosaics, patterns of economic interdependence, and the study of forces of cooperation and conflict among people from a global perspective.

110 Maps and Mapping (3:3:0). Introduction to the use of maps and spatial analytic tools and methods, including geographic information systems. Familiarizes students with key geographic concepts and skills through integrating information technology with map-making technology.
300 Quantitative Methods for Geographical Analysis (3:3:0). Prerequisite: 30 credits, including GEOG 102 and 103, or permission of instructor, and permission of department. A comprehensive introduction to quantitative methods employed in spatial analysis with emphasis on solving geographical research problems. Topics include the nature of spatial data; collection of spatial data; preparation of spatial data for mapping, geographic information systems, and statistical analysis; descriptive spatial statistics; areal sampling theory and methods; probability theory and distributions; hypothesis testing; correlation and regression; and areal and point pattern spatial statistics.

301 Political Geography (3:3:0). Prerequisite: 30 credits. Distribution and effects of power on the landscape, particularly on national and global scales.

303 Conservation of Resources and Environment (3:3:0). Prerequisite: 30 credits. Analysis of spatial aspects of world resources and problems resulting from their unequal distribution or unwise use. Population growth, its implications for resource use, and pollution problems are stressed.

304 Geography of Population (3:3:0). Prerequisite: 30 credits. Spatial distribution of population, its causes and effects, and the changing patterns resulting from population mobility. Emphasis on spatial characteristics of variables such as age, sex, race, education, and income.

305 Economic Geography (3:3:0). Prerequisite: 30 credits. Analysis of the pattern of distribution of world economic activity, the spatial economics behind this pattern, and the influence of this distribution on other spatial systems.


308 Field Mapping Techniques (3:0:6). Prerequisites: MATH 105, GEOG 102 or GEOL 101, and 30 credits. Basic techniques for collecting and recording spatial field data, including the use of topographic maps, compass, transit, alidade, and geographic positioning systems. Includes field work.

309 Introduction to Meteorology and Climate (3:3:0). Prerequisite: GEOG 102 or equivalent or permission of instructor. Elements of meteorology; analysis of world distribution of meteorological controls as the bases of regional climatic variations (natural science credit).

310 Introduction to Digital Cartography (4:3:2). Prerequisite: Grade of C or better in GEOG 300 or permission of department. Origins, principles, and methods of thematic map design and production. Principles of graphic design, data compilation, analysis, and display.

311 Introduction to Geographic Information Systems (3:3:0). Fundamental concepts and theories for appropriate use of geographic information systems (GIS). Discusses basic GIS functionality and GIS applications in various fields.

315 Geography of the United States (3:3:0). Prerequisite: 6 credits of geography and/or American studies or permission of instructor. Diversity of physical and cultural landscapes in the United States.

316 Geography of Latin America (3:3:0). Prerequisite: 6 credits of geography and/or Latin American studies or permission of instructor. Regional survey of physical resources, populations, cultural characteristics, and economic activities in Latin America.

320 Geography of Europe (3:3:0). Prerequisite: 6 credits of geography and/or European studies or permission of instructor. Environmental, economic, social, and political factors influencing the regional structure of Europe.

325 Geography of North Africa and the Middle East (3:3:0). Prerequisite: 6 credits of geography and/or courses related to Middle East or permission of instructor. Environmental, economic, and social factors of differentiation of the regional structure and distribution of resources in the North African and Middle Eastern countries.

330 Geography of the Soviet Succession States (3:3:0). Prerequisite: 6 credits of geography and/or Russian studies or permission of instructor. Analysis of the geographic factors involved in the history, economic development, and geopolitical situation of the former Soviet Union.

333 Issues in Regional Geography (1-6:0:0). Prerequisite: 30 credits. Geographical study of a particular region or relevant regional issue. Content varies. May be repeated.

357 Structures in Urban Governance and Planning (3:3:0). Prerequisite: 30 credits. Review of the spatial, policy, and administration principles that guide planning activity in the United States. Outlines differences between theory and practice and provides a set of tools, methods, and perspectives that are commonly incorporated into the practice of urban and regional policy analysis. Provides an orientation to the public-sector economy in general and to urban administration, planning, and policy in particular.

380 Geography of Virginia (3:3:0). Prerequisite: 30 credits. Natural and cultural forces of Virginia. Study of regional makeup and analysis of human and environmental characteristics.

399 Selected Topics in Geography (3:0:0). Prerequisite: 30 credits. Content varies, determined by instructor.

406 Suburban Geography (3:3:0). Prerequisite: 60 credits. Analysis of the spatial aspect of social, economic, and political activities in suburbia. Suburbanization viewed as both an independent force and a component of the larger urbanization process. Northern Virginia is used as a lab for suburban geographical study and student-initiated field work projects.

411 Advanced Digital Cartography (3:3:0). Prerequisite: Grade of C or better in GEOG 310. Design and production of full-color digital maps and information graphics, map cognition and use, and principles of desktop mapping.

412 Aerial Photography Interpretation (3:3:0). Prerequisites: 60 credits and GEOG 102 or 103 or permission of instructor. Methods and techniques of interpreting and using information contained in aerial photography, including applications to various aspects of the physical and cultural landscape.

415 Seminar in Geography (3:3:0). Prerequisites: GEOG 300 and 310. Capstone seminar for geography majors, integrating previous course work into a disciplinary framework. Students produce and present original research papers.
416 Satellite Image Analysis (3:3:0). Prerequisite: 60 credits and GEOG 412 or permission of instructor. Examination of the methods and techniques of interpreting and using information obtained by nonphotographic remote sensing systems, with particular emphasis on space-borne platforms. Includes analysis of imagery for both physical and cultural environments.

420 Physiography of North America (1-3:0:0). Prerequisite: 60 credits, GEOG 102, 3 additional credits of geography or geology, or permission of instructor. Physiographic features of the North American continent, their spatial distribution, and their influence on the cultural, demographic, and economic development of the United States and Canada.

463 Applied Geographic Information Systems (3:3:0). Prerequisites: 2000 or better in GEOG 300 and GEOG 311. Selected applications in geographic information systems (GIS). Topics include automated data capturing and processing, spatial data models and structure, including the object-oriented approach, advanced spatial analytical techniques including raster modeling and network analysis, programming, and algorithm development in GIS. Major purpose of this course is to extend the fundamental theories and concepts in GIS so students are able to conduct research with GIS and on GIS.

480 Internship in Geography (1-3:0:0). Prerequisite: Open only to majors with 90 credits and GPA of 2.500 in geography course work. Internships are approved study programs with specific employers. Credit is determined by department. Contact department one semester before enrollment.

490 Practicum in Geographical Applications (1-6:0:0). Prerequisite: Open only to authorized majors with 90 credits. Application of geographical research tools and techniques in conjunction with faculty instruction and research. Individualized sections taught by arrangement with full-time faculty.

499 Independent Study in Geography (1-3:0:0). Prerequisite: Open only to geography majors with 90 credits and permission of department and instructor. Individual study of a selected area of geography. Direct instruction paper is required.

503 Problems in Environmental Management (3:3:0). Prerequisite: 6 credits of geography, including GEOG 102. Case studies of the effects of human activities on atmospheric, hydrologic, geomorphic, and biotic processes.

505 Transportation Geography (3:3:0). Prerequisite: 6 credits of geography. Structure, principles, location, and development of world transportation. Critical role of transportation in moving people, goods, and ideas at the international, national, regional, and urban levels.

520 Geography for Teachers (3:3:0). Prerequisite: Graduate standing or permission of department. Emphasis on problems and techniques in teaching geography and current developments in research, methodology, and philosophy in the discipline.

533 Issues in Regional Geography (1-6:0:0). Geographical study of a particular region or relevant regional issue. Content varies. May be repeated.

540 Medical Geography (3:3:0). Prerequisite: Course in statistics. Spatial approaches to the study of health and disease. Topics include disease ecology, disease diffusion, and geographic perspectives on improving health care delivery.

550 Introduction to Geographic Information Science (3:3:0). Prerequisite: Graduate standing. Introduces students to topics in geographic information science, emphasizing the concepts and theories of cartography and geographic information systems. Lectures accompanied by hands-on lab exercises to familiarize students with current technology.

551 Thematic Cartography (3:3:0). Prerequisite: GEOG 310 or 550. Analysis of the nature of perceptual organization and visual systems in thematic map communication portrayal, graphic handling, and data analysis.

553 Advanced Geographic Information Science (3:3:0). Prerequisite: GEOG 550 or a course in geographic information systems. Discussion of advanced geographic information science concepts in great detail, including spatial data structure, spatial analysis, and programming. Hands-on exercises demonstrate these concepts. Address selected issues related to data fusion, geographic information systems on the Internet, and database management.

554 History of Cartography (3:3:0). Prerequisite: Graduate standing. History of cartographic portrayal of the earth from ancient times through the 19th century, with emphasis on the interrelation of human culture, technological development, and geographical knowledge as reflected in maps.

562 Photogrammetry (3:3:0). Prerequisite: GEOG 412 or permission of instructor. Treatment of photogrammetric problems, including least squares adjustments, image coordinate refinements, collinearity equation, resection, relative orientation, and analytic aero triangulation.

563 Geographic Information Systems Applications (3:3:0). Prerequisite: GEOG 553 or permission of department. Concentrates on use of geographic information systems (GIS) software and hardware and requires considerable laboratory time to understand the functionality of GIS, its use for various applications, and available digital spatial data.

570 Environmental Hydrology (3:3:0). Prerequisite: Course in physical geography (climatology recommended) or geology. The nature and occurrence of water resources in space and time, and their relationship to Earth's other physical and environmental systems. Explores three areas of water resources geography: climate and hydrology, physical and biological interactions, and water resources planning and management. Both surface water and groundwater are studied. Important regional and topical issues are highlighted. Presents water resources research techniques, analytical tools, and data sources.

575 Reconstructing Past Environments: Seminar in Geoarchaeology (3:3:0). Prerequisites: Permission of instructor and course work in geography, biology, geology, or archaeology. Research seminar examining the intersection of geoarchaeology and paleoecology with cultural ecology. Addresses methods common to these research areas, and the ranges of scales and reliability of evidence used to reconstruct past environments, both natural and cultural. Applied examples cover selected geoarchaeological and paleoecological projects from a variety of geographical regions.

579 Remote Sensing (3:3:0). Prerequisite: GEOG 412 or permission of instructor. Examines use of various types and combinations of electromagnetic energy to obtain spatial information. Concentrates on nonphotographic and space-borne remote sensing platforms and sensors. Exam-
\section*{370 Geography (GEOG) \textbullet Geology (GEOL)}

ines essential operational parameters for existing and future systems and strategies for visual extraction of features.

\textbf{580 Digital Remote Sensing (3:3:0). Prerequisite: GEOG 416 or 579.} Examination of the theory and techniques of using digital remotely sensed data for obtaining geographic information of the Earth's surface, including both image enhancement methods and classification strategies for a variety of physical and cultural features.

\textbf{581 World Food and Population (3:3:0). Prerequisite: Graduate standing.} Topics include malnutrition of population, regional disparities in growth rates and income distribution, food production, and world hunger. Discussion of population policies with emphasis on Third World countries.

\textbf{585 Quantitative Methods (3:3:0). Prerequisite: Previous course work in statistics, GEOG 310 or 550.} Survey of quantitative methods commonly used in geographic research. Emphasis on spatial analysis techniques.

\textbf{590 Selected Topics in Geography and Cartography (3:3:0). Prerequisite: Permission of department.} Students analyze topics of immediate interest. Content varies.

Graduate standing is prerequisite to all 600-level courses.

\textbf{653 Geographic Information Analysis (3:3:0). Prerequisites: GEOG 553 and 585.} Examination of existing and potential capabilities of geographic information systems in conducting spatial analysis and spatial modeling.

\textbf{655 Map Design (3:3:0). Prerequisite: GEOG 310 or 550.} Advanced examination of principles of map design, including discussions of map design research.

\textbf{656 Terrain Mapping (3:3:0). Prerequisites: GEOG 550 and permission of instructor.} Advanced methods of relief and landform portrayal, slope mapping, digital terrain models, and other forms of terrain representation.

\textbf{661 Map Projections and Coordinate Systems (3:3:0). Prerequisite: GEOG 310 or 550.} Development of various map projections and coordinate systems; analysis of their properties, distortions, and applications.

\textbf{664 Spatial Data Structures (3:3:0). Prerequisite: GEOG 310 or 550.} The study of spatial data structures and their application in digital cartography, geographic information systems, and image-processing systems. Raster and vector data structures are examined, as well as attribute schemes and topological models. Data transformation, information loss, data quality, and the role of metadata are included.

\textbf{670 Applied Climatology (3:3:0). Prerequisite: Course in weather and climate or permission of instructor.} Application of climatic concepts to natural and human-modified environments. Analysis of climatic change.

\textbf{671 Applied Geomorphology (3:3:0). Prerequisite: Course in geomorphology.} Examination of interaction among landforming processes, settlement, and land-use patterns. Emphasis on planning and problem solving.

\textbf{674 Environmental Impact Analysis (3:3:0).} Scientific and administrative processes involved in environmental impact analysis and environmental impact statements.


\textbf{690 Advanced Practicum in Geographical Applications (1-6:0:0). Prerequisite: Permission of department.} Application of spatial technologies in conjunction with faculty instruction and research. Individualized sections taught by arrangement with full-time faculty.

\textbf{695 Internship (1-6:0:0). Prerequisite: Permission of department.} Internships are approved study programs with specific employers. Students and employer supervisors must demonstrate relevancy of study program to degree requirements.

\textbf{698 Directed Readings and Research (1-3:0:0). Prerequisite: Permission of instructor and department.} Reading and research on a specific topic under the direction of a faculty member. Written report is required; oral exam and report may be required. May be repeated.

\textbf{750 Advanced Geographical Research Applications (1-6:0:0). Prerequisite: Permission of instructor.} Advanced research employing geographical tools and research techniques. Content varies. May be repeated.

\textbf{785 Geographic Field Work (3:3:0).} Introduction to the nature, scope, and objectives of geographic field methods and techniques, including use of base maps, acquisition of data, and field research design. Taught as much as possible in field situations with students required to develop and carry out relevant field research projects pertaining to both physical and cultural geography.

\textbf{795 Seminar in Regional Analysis (3:3:0).} Analysis and synthesis of physical and cultural elements of geography in a selected region. Should be taken near the end of the master's degree program and should provide an opportunity for the student to apply selective knowledge gained in previous systematic courses to a specific region.

\textbf{799 Thesis (1-6:0:0). Prerequisites: Degree candidacy and departmental approval of thesis proposal.} Graded S/NC.

**Geology (GEOL)**

\section*{Environmental Science and Policy}

\textbf{101 Introductory Geology I (4:3:3).} The Earth, processes that operate within the Earth and on its surface, and human interaction with the Earth. Topics include minerals, earthquakes and seismology, isostasy, igneous processes and rocks, paleomagnetism and plate tectonics, weathering, mass movements, rivers and streams, groundwater, glaciers, and marine processes. May include field trips.

\textbf{102 Introductory Geology II (4:3:3). Prerequisite: GEOL 101.} Earth processes in a historical context. Topics include sedimentary rocks and principles, deformation and metamorphism, mountain building and plate tectonics, geologic time, fossils, and historical development of continents. May include field trips.

\textbf{206 Topics in Geology I (1-3:1-3:0).} Discussion of a particular topic in geology. May include field trips.

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302 Mineralogy (4:3:3). Prerequisites: GEOL 101 and 102, with a grade of C or better, and CHEM 211. Crystallographic, optical, chemical, and physical properties of minerals. May include field trips.

303. Field Mapping Techniques (3:0:6). Prerequisites: 30 credits including MATH 105 or equivalent and GEOG 102 or GEOL 101. Basic techniques for collecting, recording, and plotting spatial field data including the use of topographic maps, compasses, transit, alidade, and global positioning systems (GPS). Includes field work.

304 Sedimentary Geology (4:3:3). Prerequisites: GEOL 101, 102, and a grade of C or better in GEOL 302. Introduction to sedimentation, sedimentary petrology, facies analysis, and stratigraphy. May include field trips. 306 Soil Science (3:3:0). Prerequisites: GEOL 101, BIOL 103 or 213. Composition, classification, physical properties, and origin of soils. May include field trips.

308 Igneous and Metamorphic Petrology (4:3:3). Prerequisites: GEOL 101, 102, a grade of C or better in GEOL 302, and MATH 105 or equivalent. Genesis, classification, and recognition of igneous and metamorphic rocks. May include field trips.

309/BIOL 309 Introduction to Oceanography (3:3:0). Prerequisite: GEOL 101, BIOL 103 or 213. Introduction to physical, chemical, biological, and geological aspects of the oceanic environment. May include field trip.

312 Invertebrate Paleontology (4:3:3). Prerequisites: GEOL 101, 102, or BIOL 103, 104, or BIOL 213, 303, 304. Classification, evolutionary trends, and distribution of the common invertebrate fossils. May include field trips.

313 Hydrogeology (3:3:0). Prerequisites: GEOL 101 or GEOG 102, MATH 113, and CHEM 211. Geological and hydrologic factors controlling the occurrence, distribution, movement, quality, and development of groundwater.

315 Topics in Geology II (1-3:1-3:0). Prerequisites: GEOL 101 and 102. Discussions of a particular topic in geology. May include field trips.

316 Computers in Geology (3:3:0). Prerequisite: GEOL 101, 102, 302, one semester of mathematics, or permission of instructor. Uses of mainframe and microcomputers, with emphasis on geologic applications.

317 Geomorphology (4:3:3). Prerequisites: GEOL 101 and 102, with a grade of C or better, or six credits in GEOG, including GEOG 102; GEOG 412 is strongly recommended. Analysis of processes that occur at the Earth’s surface and the resulting landforms. Labs stress the recognition and evaluation of landforms using maps and aerial photographs and the methods of data collection used in the study of surficial geology. May include field trips.

401 Structural Geology (4:3:3). Prerequisites: A grade of C or better in GEOL 302, and MATH 110, 111, or 113. Igneous, sedimentary, and metamorphic rocks in folded, faulted, and metamorphosed terrains. May include field trips.


403 Geochemistry (3:3:0). Prerequisites: GEOL 101 and CHEM 211 and 212. Stable isotope geochemistry, crystal geochemistry, geochronology, water geochemistry, organic geochemistry, and the geochemistry of rocks.

404 Geological Field Techniques (3:0:6). Prerequisites: GEOG 203, GEOL 101, 102, 302, 304, 308, and 401. Mapping techniques involved in the collection of geological field data. Includes field work.

405 Geology of Mineral and Energy Resources (3:3:0). Prerequisites: GEOL 101, 102, 302, 304, 308, and 401. Topics include metallic and nonmetallic ore deposits, fossil fuels, alternate energy resources, and methods by which each is used. May include field trips.

406. Seminar in Earth and Environmental Science (3:3:0) Prerequisite: 90 credits. Capstone seminar for earth and environmental science majors. Students read and discuss research literature and produce and present original papers.

408, 409 Practicum for Geology Laboratories (1:1:3). Prerequisites: Geology major with 80 credits and permission of department chair. Study of the techniques used to make the geology lab an effective component in geological education. Discussions of the development of testing materials, supplemented by experience in the operation of a lab section of a geology course.

410 Research Proposal Preparation (1:1:0). Prerequisites: Geology or earth science major with 80 credits and permission of department chair. Preparation for research in GEOL 411, to include literature research, initial data collection, and preparation of a research proposal.

411 Geological Research (3:0:3). Prerequisite: GEOL 410. Geological research including data collection and reduction, interpretation, preparation of a written report, and oral presentation of results.

417 Geophysics (3:3:0). Prerequisites: GEOL 101, MATH 113, one year of physics, or permission of instructor. Basic principles of geophysics including gravity, magnetism, and seismic reflection/refraction.

480 Internship (1-3:0:0). Prerequisite: Open only to majors with 90 credits. Internships are approved study programs with specific employers. Contact department one semester before enrollment.

500, 501 Selected Topics in Modern Geology (1-3:1-3:0), (1-3:1-3:0). Prerequisite: Baccalaureate degree in geology or permission of instructor. Lecture/lab/field trip. Topic designated in the class schedule.

503 Special Topics in Earth Science (1-6:1-6:0). Prerequisite: Employment or anticipation of employment as an earth science teacher. In-service course designed to strengthen and update a teacher’s knowledge of earth science. May include field trips.

800 Studies for the Doctor of Philosophy in Education (variable credit). Prerequisite: Admission to the Ph.D. in Education program to study geology. Program of studies designed by student's discipline director and approved by student's doctoral committee that allows the student to participate in the current research of the discipline director and results in a paper reporting the original contributions of the student. Enrollment may be repeated.
German (GERM)

Modern and Classical Languages

Placement: See the Academic Testing section in the Admission chapter.

101 Elementary German I (3:3:1). Designed for students with no knowledge of German. Introduction to German, including elements of grammar, vocabulary, oral skills, listening comprehension, and reading. Lab work required.

102 Elementary German II (3:3:1). Prerequisite: GERM 101 or permission of department. Continuation of GERM 101. Lab work required.

105 Review of Elementary German (3:3:1). Prerequisite: Appropriate placement score or permission of department. Review of elements of German for students who have studied German previously. May not be taken for credit in combination with GERM 102. Lab work required.

201 Intermediate German I (3:3:1). Prerequisite: GERM 102, 105, appropriate placement score, or permission of department. Further development of skills in listening, speaking, reading, and writing. GERM 201 and 202 must be taken in sequence. Lab work required.

202 Intermediate German II (3:3:1). Prerequisite: GERM 201, appropriate placement score, or permission of department. Application of skills to reading, composition, and discussion. Lab work required.

301 Culture and Civilization (3:3:0). Prerequisite: 60 credits or permission of instructor. Development of German civilization from the 18th century to the present. German cultural contributions to world civilization. Taught in English.

310 Conversation and Composition (3:3:0). Prerequisite: GERM 202 or equivalent, or permission of instructor. Development of fluency in speaking and proficiency in writing German through discussion, reports, and compositions based on texts dealing with contemporary events and issues. Not for native speakers.

316 German for the Business World (3:3:0). Prerequisite: GERM 202 or equivalent, or permission of instructor. Introduction to the terminology and structural features of business German. Emphasis on acquiring vocabulary and on developing facility in reading German business articles and correspondence.

318 Translation of Texts (3:3:0). Prerequisite: 12 credits of German or permission of instructor. Introduction to principles and techniques of translation. Translation of texts from the natural and social sciences, current events, and contemporary culture. Translations mainly from German into English.

325 Major Writers (3:3:0). Prerequisite: ENGL 101 or equivalent, or permission of instructor. Works of major German, Austrian, and Swiss writers in translation. Writers to be studied vary. Course work in English. May be repeated for credit with permission of department.

340 Survey of German Literature (3:3:0). Prerequisite: GERM 202 or equivalent, or permission of instructor. Overview of the history of German literature from its beginnings to 1880.

355 Readings in Poetry (3:3:0). Prerequisite: GERM 202 or equivalent, or permission of instructor. Intensive reading of German poetry in its historical context. Study of genre characteristics and development. Types of poetry studied vary. May be repeated for credit when subtitle is different, with permission of department.

365 Readings in Narrative Prose (3:3:0). Prerequisite: GERM 202 or equivalent, or permission of instructor. Intensive reading of German narrative prose, such as autobiographical fiction, fairy tales, and film. Study of genre characteristics and development. Topics vary. May be repeated for credit when subtitle is different, with permission of department.

375 Readings in Drama (3:3:0). Prerequisite: GERM 202 or equivalent, or permission of instructor. Intensive reading of German dramas in their historical context. Study of genre characteristics and development, including performance aspects. Type studied (e.g., historical drama, radio play, epic theater) varies. May be repeated for credit with permission of department when subtitle is different.

415 Advanced Grammar and Style (3:3:0). Prerequisite: 15 credits of German or permission of instructor. Study of syntax, idiomatic features, and levels of style. Extensive practice in different types of written expression.

418 Advanced Composition (3:3:0). Prerequisite: 15 credits of German or permission of instructor. Development of proficiency in writing German through intensive practice in preparing guided and original compositions.

442 The Age of Goethe (3:3:0). Prerequisite: 15 credits of German or permission of instructor. Major works of Enlightenment, Sturm und Drang, Classicism, and early Romanticism. Emphasis on drama and poetry by Goethe and Schiller, with some Lessing and Kleist.

444 The Literature of Romanticism (3:3:0). Prerequisite: 15 credits of German or permission of instructor. German Romantic poetry and prose. Background and some theory included.

450 Modern Literature: 1880–1925 (3:3:0). Prerequisite: 15 credits of German or permission of instructor. Literature of Naturalism, Impressionism, and Expressionism, in Germany, Austria, and Switzerland.

451 Modern Literature: 1925 to the Present (3:3:0). Prerequisite: 15 credits of German or permission of instructor. Literary trends since 1925 in Germany, Austria, and Switzerland.

480 Special Topics (3:3:0). Prerequisite: 15 credits of German or permission of instructor. Special topics on language, literature, or culture by theme, approach, or era. May be repeated for credit with permission of department.

518 Studies in 18th- and Early 19th-Century Literature (3:3:0). Major authors, movements, and themes in 18th- and early 19th-century German literature. Literary theory and practice, historical background, and critical reception. May be repeated for credit with permission of department.

525 Studies in Modern Literature (3:3:0). Writers, themes, or genres of modern German literature. May be repeated for credit with permission of department.

550 Special Topics (3:3:0). Study of a special topic in the area of German language, literature, or culture. Specific
topics are announced in advance. May be repeated for credit with permission of department.

560 History of the German Language (3:3:0). Development of the German language from the eighth century to the present. Phonological, morphological, and syntactic structures characteristic of the various stages of development.

580 Contemporary Germany (3:3:0). Study of contemporary Germany in its political, economic, social, and cultural institutions. Special emphasis on postuniform issues and Germany's place in the European community.

798 Directed Reading and Research (3:0:0). Prerequisite: Open only to degree students who have completed at least 18 credits. Reading and research on a specific project under the direction of a department member. Oral or written report required.

See also FRLN course listing.

Government and International Politics (GOVT)

Public and International Affairs

101 Democratic Theory and Practice (3:3:0). Comparative exploration of contemporary theory and practice of modern democratic states. Topics include contemporary analysis of the meanings of liberty, equality, representation, property rights, voting rights, civil responsibilities, and other key concepts in the theory and practice of democracy.

103 Introduction to American Government (3:3:0). Analysis of American government examined in light of basic concepts and institutions of democracy. Students carry out a "citizenship project," a first-hand observation or participation in, and analysis of, some public activity.

132 Introduction to International Politics (3:3:0). Nature of international politics, approaches to study of international politics, state and nonstate actors in international system, patterns of action and interaction between nation-states, international institutions, and major global issues.

133 Introduction to Comparative Politics (3:3:0). Introduction to the methods and subject matter of comparative political analysis are discussed. Major issues of political systems, politics, participation in politics, government structures, policy-making process, and evaluation of political performance.

149 Global Awareness (3:3:0). Introduction to the study of global systems, with emphasis on basic concepts and ways of thinking about global affairs.


300 Research Methods and Analysis (4:3:1). Required for all majors in government and international politics and in public administration. Students are strongly recommended to take 300 before or during the first semester of enrolling in 300-level courses. Emphasis is on asking clear, researchable questions and using appropriate evidence to answer them. Students are introduced to and learn to use a broad range of evidence including quantitative and qualitative information. Design and analysis of surveys, government archives, case studies, and interpretations of events in journals are studied. The ethical implications of information technologies are examined.

301 Public Law and the Judicial Process (3:3:0). Prerequisite: GOVT 103. American judicial organization and operation, role of the Supreme Court in policy formation, and selected constitutional principles.

305 Contemporary American Federalism (3:3:0). Prerequisite: GOVT 103. Legal, administrative, fiscal, and political dimensions of evolving American federalism.

307 Legislative Behavior (3:3:0). Prerequisite: GOVT 103. Organization, processes, functions, and roles of the legislature and its members in the U.S. Congress. Topics include state legislatures and cross-national comparisons as time and resources permit.

308 The American Presidency (3:3:0). Prerequisite: GOVT 103. Survey of the modern presidency, including constitutional origins of the office, growth and influence of the White House staff, the president's Cabinet, presidential appointees and control of the executive branch, relations with Congress, and domestic and national security policy making.


311 Public Opinion and Electoral Behavior (3:3:0). Prerequisites: GOVT 103 and 300. Study of the actions of voters, candidates, and political parties in relation to the expression of relevant public opinion in a democratic system.

312 Political Parties and Campaigns (3:3:0). Prerequisite: GOVT 103. Characteristics and functions of political parties, influence of parties and other political forces on electoral decisions, and emphasis on parties' inability or ability to hold government accountable to citizens.

318 Interest Groups, Lobbying, and the Political Process (3:3:0). Prerequisite: GOVT 103. The role, internal operations, strategies, and activities of interest groups. The ability of these groups to enable citizens to influence or control government and enhance the democratic process is evaluated. Conditions under which social movements become, or fail to become, effective interest groups are considered.

319 Issues in Government and Politics (3:3:0). Prerequisite: GOVT 103. Study of special issues relevant to government and politics. Topics are announced in advance. Examples include politics and the arts, ethnic conflict and the political system, gender politics, and changing dynamics in political institutions. May be repeated for credit when topic is different, with permission of department.

320 Political Values (3:3:0). Nature of man, origin and nature of the state, basis of political obligation, problems of consent, concepts of power, and sources of political authority as presented in the works of major writers.

322 International Relations Theory (3:3:0). Prerequisite: GOVT 132 or 133. Advanced inquiry into international relations. Theories and concepts of international relations as well as major forces and issues in international politics are studied.

323 Classical Western Political Theory (3:3:0). Exploration through lecture and discussion of developments in the western tradition of political thought from the time of the Greek city-state to late medieval Christendom, focusing.

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on such topics as the nature and the purpose of politics, the relationship between the individual and the state, the political significance of religion and tradition, and the concept of natural law.

324 Modern Western Political Theory (3:3:0). Exploration through lecture and discussion of developments in the Western tradition of political thought from the Renaissance to the middle of the 19th century, focusing on such topics as the rise of individualism in political theory, early developments in social contact theory, theories of radical popular sovereignty, and early criticisms of liberal theory.

327 Contemporary Western Political Theory (3:3:0). Exploration through lecture and discussion of recent developments in the Western tradition of political thought from the middle of the 19th century to today. Different sections of this course will focus on one or another of the various political theories that have been influential during this period, such as liberal, libertarian, conservative, communitarian, Marxist, feminist, and postmodern thought. May be repeated for credit when subject matter is different.

328 Non-Western Political Theory (3:3:0). Prerequisites: GOVT 101 or GOVT 133. Theory and history of political community, governance, and development as understood by various non-Western societies, including China, Japan, India, Africa, and the Islamic World; their relations to the Western tradition; methodology of studying other cultures; postcolonial theories and the cultural politics of contemporary globalization.

329 Issues in Political Theories and Values (3:3:0). Study of special issues relevant to theoretical and value aspects of government and politics. Topics are announced in advance. Examples include ethics and politics, ethics and environmental policy, changing perspectives on civil rights and liberties, religion and politics, and changing views of public space. May be repeated for credit when topic is different, with permission of department.

331 Government and Politics of Latin America (3:3:0). Prerequisite: GOVT 132, 133, or 149. Contemporary political systems of Latin America, with emphasis on institutions, political processes, and political behavior. Case studies of several key Latin American polities are presented. Problems of political development in Latin America are discussed.

332 Government and Politics of the Middle East and North Africa (3:3:0). Prerequisite: GOVT 132, 133, or 149. Societies of the Middle East and North Africa and their response to the impact of internal sociocultural-political determinants and external forces. Focus is on their contemporary politics, ideologies, popular manifestations, institutions, and operations.

333 Government and Politics of Asia (3:3:0). Prerequisite: GOVT 132, 133, or 149. Government structures and political processes of Asian countries. Patterns of conflict and cooperation, and issues of economic development and political reform in a rapidly changing world are examined.

334 Government and Politics of Europe (3:3:0). Prerequisite: GOVT 132, 133, or 149. Contemporary democratic political systems of Europe, with emphasis on political processes, institutions, and behavior. Case studies of key European polities are presented. Problems of multiparty systems, coalition governments, Eurocommunism, and stability and change in postindustrial societies are discussed.

335 Government and Politics of Canada (3:3:0). Prerequisite: GOVT 132, 133, or 149. Survey of governmental and political systems of Canada, including political parties, the parliamentary system, the federal system, and specific policy issues of importance to Canadian politics.

336 Political Development and Change (3:3:0). Prerequisite: GOVT 132, 133, or 149. Process of political development and change in the context of modernization and industrialization. Patterns of political development, with emphasis on the developing world, are examined.

337 Ethnic Politics in Western Europe and North America (3:3:0). Prerequisite: GOVT 132, 133, or 149. Study of the resurgence of ethnic nationalism in the industrial democracies of Western Europe and North America, and the comparative analysis of policy issues related to ethnonationalism. Case studies are drawn from the industrial democracies.

338 Government and Politics of Russia and Central Eurasia (3:3:0). Prerequisite: GOVT 132, 133, or 149. Overview of Soviet domestic politics and foreign policy before the breakup of the Soviet Union and an examination of the evolving political systems in the newly independent states as well as their international relations.

339 Issues in the Politics of Advanced Industrial Societies (3:3:0). Prerequisite: GOVT 103 or 133, or permission of instructor. Study of selected current political issues in the industrial democracies of Western Europe and North America. Specific topics are chosen each semester to reflect contemporary political concerns in these countries, but the political process in advanced industrial countries is the organizing principle throughout the course.


343 International Political Economy (3:3:0). Prerequisite: GOVT 132, 133, or 149, or permission of instructor. Introduction to international political economy (IPE). Examines the interplay of economics and politics, and applies these to different issues included in IPE. Focus is on issues that have contemporary significance, with attention to historical issues and basic political and economic concepts.

344 American Foreign Policy (3:3:0). Prerequisite: GOVT 132, 133, or 149. Central issues surrounding the conduct of America's foreign relations, with special emphasis on structural and constitutional questions, national policy objectives abroad, and the conduct of foreign policy in a democracy.

347 International Security (3:3:0). Prerequisite: GOVT 132. Explores both enduring security problems and new developments in the field of international security. Examines the effects of the international system on defense policies of states, and especially the tensions of a world caught between emerging interdependence and national demands. Course asks students to draw policy implications because it encourages development of critical-thinking and group and oral presentation skills.

348 Competencies for the Global Arena (1-3:0:0). Prerequisite: GOVT 149 and 60 credits, or permission of instructor. Proficiency-based course that engages students in acquiring skills and competencies that are important for
a professional operating in a global society. Consists of a series of self-paced exercises conducted under the supervision of departmental faculty.

349 Issues in the Analysis of Global Systems (3:3:0). Prerequisite: GOVT 149 or permission of instructor. Overview of global systems (e.g., technology, environment, communications) with emphasis on the political subsystem and its interactions with other global systems.

351 Administration in the Political System (3:3:0). Prerequisite: GOVT 103. Administrative structures and processes in the political setting of public management. Presents organization and administrative theory, critiques current practices, and examines the impact of changes in the social, political, and economic environment on these concepts and models.

355 Public Personnel Administration (3:3:0). Prerequisite: GOVT 351. Analysis of techniques and tools used in human resource management including the merit system, classification, compensation, evaluation, recruitment, and labor relations. Emphasis is placed on current legal and policy issues in personnel administration, such as diversity and privatization.

356 Public Budgeting and Finance (3:3:0). Prerequisite: GOVT 351. Tools and techniques used in budgeting and financial management in governments in the United States, including the management of public financial institutions, the budgetary process, budgetary reform, and the relationship of public budgeting to national economic policy.

357 Urban Governance and Planning (3:3:0). Prerequisite: GOVT 351. Framework, subject matter, uses, methods, administration, and future of public planning. Emphasis is on setting goals, defining objectives, and choosing between program alternatives. Political and bureaucratic constraints and problems of implementation are discussed. Illustrations of planning may be drawn from various levels of government.

358 Nonprofit Financial Planning (4:3:1). Prerequisite: 60 credits or permission of instructor. Provides an understanding of the social mission and entrepreneurial cross pressures underlying financial planning and accounting in the nonprofit sector. Topic include revenue sources, revenue projections, entrepreneurial techniques, and cost analysis for nonprofit and nongovernmental entities. Lecture and student case studies.

359 Computers in Public Management (3:3:0). Prerequisite: GOVT 300. Application of computers and computer-based analytical techniques to management information needs in the public sector. Focus is on both mainframe and microcomputer applications.


365 State and Regional Public Policy (3:3:0). Examines public policy decisions that affect local and state jurisdictions in the context of a federal system of government. Context, substance, and impact of such policies as housing, transportation, land use, crime prevention, service delivery, and health care are examined.

366 Public Policy Analysis (3:3:0). Prerequisite: GOVT 300. Methods of public policy analysis, evaluation, and research. Design and development of alternative courses of government action and evaluation of results, and problems in applying systematic analysis to political issues are studied.

376 Collective Bargaining in the Public Sector (3:3:0). Collective bargaining and the broad concept of labor relations as involved in selection and hiring, seniority, promotions, and training. Examines labor relations and the bargaining process extending from initial hiring to retirement.

399 Research Practicum in Public and International Affairs (1-3:1-3:0). Prerequisites: GOVT 300 and permission of instructor. Application of research methods in the context of assisting with faculty research. Individualized sections are taught by arrangement with full-time faculty. Methods adopted vary, but generally include library research, data collection, data analysis, and report construction.

400 Political Research and Data Analysis (3:3:0). Prerequisite: GOVT 300. Methods of research and data analysis used in research about politics. Examines ways to design research to answer questions, select appropriate techniques for data collections, and use statistics to organize and interpret data. Students also learn to carry out data analysis using microcomputers and programs such as SPSS to process data and compute statistics.

407 Law and Society (3:3:0). Prerequisite: ADJ 100 or GOVT 301. Exploration of the relationship between law and society, including the concept of law, the origin, development, and role of law in society, and the relationship between law and social change. Different approaches to the study of law and society are considered and different methodologies assessed.

409 Virginia Government and Politics (3:3:0). Prerequisite: GOVT 103. History of politics in Virginia and examination of some current political issues. Particular attention is given to the changing dynamics of the political parties, key legislative issues, and the policies of recent administrations.


414 Politics of Race, Gender, and Age (3:3:0). Prerequisite: GOVT 103. Examination of the political, economic, and social impact of public policies insofar as they have implications for race, gender, and age.

416 Political Persuasion and Propaganda (3:3:0). Prerequisite: GOVT 103. Techniques and processes of political argument and persuasion as used in campaigns, public education, and political debate. Topics include propaganda in both domestic and international arenas, and political persuasion, myths, and symbols used to induce conformity and form unified polity. Films and tape supplement examples of classic political speeches.

420 American Political Thought (3:3:0). Prerequisite: GOVT 103. Major political values and theories in America from the formation of the American republic to the present. Covers changes in American political values in crisis periods and contemporary American political theory.
ing pluralism, elite theories of democracy, and empirical political theory.

421 Comparative Political Ideologies (3:3:0). Study of political ideologies that shape the values, beliefs, and actions of contemporary regimes and political movements. Topics include liberalism, conservatism, socialism, communism, and fascism in theory and in contemporary practice, and problems of totalitarianism and nationalism in postindustrial and developing societies.

422 Constitutional Interpretation (3:3:0). Prerequisite: GOVT 103. Examination of the Supreme Court's interpretation of the constitutional powers of the Congress, the presidency, and the judiciary. Includes an examination of major decisions concerning state regulation, taxation, and interstate relations.

423 Constitutional Law: Civil Rights and Liberties (3:3:0). Prerequisite: GOVT 103. Study of the First Amendment freedoms of speech, press, assembly, association, and religion; the right to privacy; and Fourteenth Amendment equal protection.

424 Constitutional Law: Criminal Process and Rights (3:3:0). Prerequisite: GOVT 103. Study of constitutional law pertaining to the rights of the criminally accused from the stages of investigations and evidence through attorney trial, and punishment stages at federal and state levels.

430 Comparative Political Leadership (3:3:0). Prerequisite: GOVT 132, 133, or 149. Comparative political leadership, relationships between political cultures and types of leadership, patterns of leadership recruitment, and linkages between political elites and citizenry.

432 Political Change and Social Development in Sub-Saharan Africa (3-3:0). Prerequisite: GOVT 132, 133, or 149. Examination of the relationship between culture, history, ethnicity, and religion and contemporary political and socioeconomic developments in Africa. Special attention is given to the implications of ethical conflict for nation-building in the post-Cold War period and to strategies for resolving conflicts.

433 Political Economy of East Asia (3:3:0). Prerequisites: GOVT 133 and 60 credits, or permission of instructor. Political economy of East Asia is commonly referred to as a miracle. Analysis and critique of this description by focusing on the historical background, social structure, role of the state, way of politics, and ever-changing realities in the political and economic life of China and Japan.

434 Democracy in Global Perspective (3:3:0). Prerequisite: GOVT 133. Comparative study of the structures and performance of democracies around the world since 1975. Examination of growing influence of global forces (for example, economy media, culture) in the process of democratization. Examination of select current elections.

444 Issues in International Studies (3:3:0). Prerequisite: GOVT 132, 133, or 149. Major issues in the international system, including international political economy and security. May be repeated for credit when topic is different, with permission of department.

446 International Law and Organization (3:3:0). Prerequisite: GOVT 132, 133, or 149. Nature, sources, and subject of the law of nations; the law and the individual; territorial questions; nature, sources, and functions of international organizations; international transactions and organizations; war and the present and future status of international law.

447 Comparative Revolutions (3:3:0). Prerequisite: GOVT 133. Historical overview of modern revolutions as well as the different theories about the causes and consequences of revolutions. Special attention is paid to Marxist-Leninist, Arab nationalist, and Islamic revolutions.

448 Ethics and International Politics (3:3:0). Prerequisites: 60 credits and GOVT 132 or PHIL 151. Ethics and international politics ask students to wrestle with dilemmas raised by a desire to behave morally in an international system in which consensus about ethical matters is absent. Distributive justice and the use of force are two overarching themes. Students also develop, apply, and justify their own perspectives on an ethical problem using philosophical theory, history, and social science research.

449 Senior Seminar in International Studies (3:3:0). Prerequisite: Open only to senior majors. Integrative seminar that provides in-depth study of a current international issue. Format varies, but involves the student in the current literature, research techniques, and major issues of the field.

452 Administrative Law and Procedures (3:3:0). Prerequisite: GOVT 351. Law of public office. Studies the procedures followed by and the legal limits on the administrative agencies and their officers and employees.

459 Information Decisions and Management in Government (3:3:0). Prerequisite: GOVT 300. Information and knowledge systems in government. Information applications, decision-modeling under risk and uncertainty; high-technology development, management, and use; and sociotechnical systems are discussed.

460 Surveillance and Privacy in Contemporary Society (3:3:0). Prerequisite: ADJ 100. Philosophical perspectives, historical context, technological developments, and institutional changes that surround controversies about privacy and surveillance in contemporary society. Explores the public and private institutions doing surveillance, how they calculate and manage risk, and legal constraints on surveillance activities.

464 Issues in Public Policy and Administration (3:3:0). Prerequisites: GOVT 103 plus 60 credits. Analysis of selected policy issues in administering public policies. Topics are announced in advance. Examples include environmental policy, government regulation, federal mandates, state policy, and regional policy. May be repeated for credit when topic is different, with permission of department.

480 Internship (3-6:9:0). Contact the department one semester before enrollment. Approved work-study programs with specific employers. Students develop individual contracts defining the learning and competencies they plan to gain from the experience.

490 Seminar (1-3:3:0). Prerequisite: Open to Public and International Affairs majors with 60 credits. May be repeated for credit. Course can be one, two, or three credits. Subject varies. Readings, individual or group projects, and discussions of seminar papers constitute the content and format.

491 Honors Seminar (3:3:0). Prerequisite: Admission to the Public and International Affairs Department honors
496 Directed Readings and Research (1-3:0:0). Prerequisites: Open to majors in Public and International Affairs with 90 credits and permission of instructor and department. Reading and research on a specific topic, under the direction of a faculty member. Written report is required; an oral examination over the research and report may be required.

500 Research Methods in Political Science (3:3:0). Introduction to research methods and data sources for the study of political science and the practice of government. Topics include measurement of political concepts, research design, archival research techniques, survey research and case study development, and data analysis with elementary statistics.

510 American Government and Politics (3:3:0). Examination of the institutions and processes of American government, including the separate institutions of power in the national government, the theory and practice of the federal system, the role of interest groups and political parties, and the effects of the media and public opinion on electoral behavior and policy making. Conducted as a seminar and examines normative and empirical research.

520 Political Theory (3:3:0). Analysis of selected major works of ancient, modern, and/or contemporary political theory that illuminate basic problems and questions for people engaged in political or civic life. Examines topics such as justice, liberty, equality, autonomy, rights, obligation, participation, and the nature of politics.

540 International Politics (3:3:0). Focuses on the changing structure of international politics, post-cold-war security issues (nuclear proliferation, international terrorism, ethnic conflict, clash of civilizations), the effect of a globalized economy and the information technology revolution, the enhanced role of global corporations and nongovernmental organizations, and the rise of nonsecurity issues in the emerging international agenda (human rights, humanitarian intervention, North-South gap, resource limitation, and environmental degradation).

605 Seminar in Congress and the Presidency (3:3:0). Surveys the major institutions of public policy formulation and implementation at the national level in the United States with an emphasis on how public preferences are translated into public policy. The politics, procedures, and personnel of Congress, the presidency, and executive branch bureaucracies are the main focus.

606 Federalism and Changing Patterns of Governance (3:3:0). Prerequisites: GOVT 510. Examines broad trends in governance, including both the theory and practice of key governance choices, with a particular focus on intergovernmental relations and the changing roles of federal, state, and local governments. Specific governance choices examined may include privatization, devolution, mandates, regulatory reform, and comprehensive federalism reform.

631 Seminar in Comparative Politics and Institutions (3:3:0). Examines the theories and practices of governance, development, and conflict resolution in comparative national settings. Covers issues such as elections in presidential and parliamentary democracies, institutional forms, political cultures, and ideologies. Theories of comparative analysis and research reflecting alternative analytic perspectives are brought to bear on the institutions and political processes of nations and regions.

641 Seminar in Global Systems (3:3:0). Prerequisites: Completion of all core courses. Application of the systems approach to an understanding of global politics. Emphasizes the properties and functions of global systems, such as population, food, disease, energy, trade, and so forth, and how the world's political systems interact with them. Discusses how governance at municipal to national to international levels is affected by global systems. Examines the role of nongovernmental organizations in global affairs.

703 Seminar in the Courts and Constitutional Law (3:3:0). Analysis of the role, influence, and effects of the U.S. courts in creating constitutional legal norms and interpreting them. Special attention is paid to the First and Fourteenth Amendments as well the Commerce Clause. Instruction by lecture and discussion with students expected to read and analyze leading court cases.

715 Statistical Methods in Political Science Research (3:3:0). Prerequisites: GOVT 500. Common statistical techniques employed in political science research including OLS regression, logistic regression, probit, factor analysis, multidimensional scaling, discriminant analysis, cluster analysis, and analysis of variance. Sampling and inferential statistics.

725 Democratic Theory and Democratization (3:3:0). Prerequisites: GOVT 520. Examines democracy in terms of definitions of liberalism, theories of social capital and civic participation, and discourses about civil, political, and human rights. Deals with the following questions: How is democracy conceptualized both normatively and empirically? What underlying economic, social, and cultural conditions promote democracy? What role do institutions play in creating and sustaining a stable democratic society? Takes a broadly comparative perspective, focusing not only on the United States, but also on a variety of established and emerging democracies from around the world. Serves as an elective for students specializing in American government or in international politics and comparative governments.

731 Advanced Seminar in Comparative Politics (3:3:0). Prerequisites: GOVT 540. Addresses theoretical and methodological issues central to the study of comparative politics by focusing on a specific topic (international development, race and ethnicity, social movements) or region (Latin America, Asia, Middle East, Europe/European Union, Africa, Russia). Assumes basic proficiency in comparative analysis (as provided in GOVT 540) and focuses on advanced modes of inquiry through in-depth analysis and discussion of selected issues and themes. May be repeated for credit when the topic is different and with permission of the department.

741 Advanced Seminar in International Politics (3:3:0). Prerequisites: GOVT 540. Examines theoretical and methodological issues central to the study of international relations by focusing on a specific topic: American foreign policy, diplomacy, international law and organization, international relations theory, international ethics, human rights and humanitarian intervention, the environment, and others. May be repeated for credit when the topic is different and with permission of the department.
743 International Political Economy (3:3:0). Prerequisite: GOVT 343 or equivalent. Examines the interplay of international politics and economics. Discusses theoretical perspectives and analytical tools available in the academic field of international political economy and applies these theories and tools to issue areas such as trade, investment, exchange rates, development, regionalization, and globalization. Explores how international economic and political forces increasingly shape domestic interests and how domestic politics in turn affect international political economy.

745 Issues in International Security (3:3:0). Prerequisites: GOVT 540. Examination of issues of topical interest in the general area of international security. Possible topics include nuclear strategy, arms control, U.S. defense policy, ethics and international security, and international terrorism.

Health Education (HEAL)

Graduate School of Education

110 Personal Health (3:3:0). Focuses on individual and family well-being through the integration of such topics as fitness, nutrition, human sexuality, consumer health, drug education, and mental health.


220 Dimensions of Mental Health (3:3:0). Focuses on the integration of behavioral and sociocultural factors in the study of mental health.

310 Drugs and Health (3:3:0). Analyzes drug use, with an emphasis on its positive aspects, and presents alternatives to drug misuse and abuse.

312 Health and Wellness Choices (3:3:0). May be taken by nonmajors. Actively involves students in becoming managers of their personal health and well-being throughout the life span. Consistent with Healthy People 2000 goals for the nation. Emphasizes lifestyle activity and fitness, behavioral change, and maintenance.

314 Community Health Issues and Strategies: Drugs and Alcohol (3:3:0). Emphasizes applications of theories underlying health promotion and risk reduction, with primary attention to drug and alcohol abuse. Focuses on applied strategies in a range of community settings, including schools (K-12) and colleges, the workplace, social services, health care providers, citizen groups, and related services.

323 Program Leadership and Evaluation (3:3:0). Covers leadership and evaluation of health, fitness, and recreation programs. Students use computer technology to study the evaluative aspects of program planning and administration.


327 Women’s Health (3:3:0). Examines health issues unique to women, including health care, food and exercise, reproductive and gynecological issues, chronic diseases, and issues of violence.


350 Interventions for Populations and Communities at Risk (3:3:0). Identifies culturally, physically, emotionally, mentally, and demographically diverse populations and communities at risk; covers implications for the development of innovative programs and the role of HFRR interventions.

370 Health Determinants and Status (3:3:0). Focuses on the determination of a person’s health status and health behavior change strategies. Covers skills acquisition in health risk appraisal, screening, and related instruction.

372 Health Communication (3:3:0). Applies research-based models and theories of health assessment and health promotion at the individual, organizational, agency, and community levels. Uses communication approaches and skills within the context of behavior change strategies, including policy and program development.

405 Teaching Methods in Health Education (K-12) (3:3:0). Prerequisite: BSED status. Covers content, methodology, and resource materials in teaching health education for physical education teaching majors. Field experience is required.

430 Seminar on Contemporary Health Problems (3:3:0). Provides overview of contemporary and often controversial health issues with analysis of selected problems of current concern to society.

450 Epidemiology and Environmental Health (3:3:0). Covers the incidence, distribution, and causes of diseases and injuries in human populations. Emphasizes essential diagnostics and planning for community health problem solving with environmental consideration.

470 Community Health Systems (3:3:0). Examines the complexities of community health and community health system infrastructure. Focuses on planning and navigating the multi-system agency environment, which includes a focus on population and sub-population health.

480 Special Topics (1-3:3:0). Presents selected health issues and/or problems. Focuses on the application of information to education programs.

490 Internship (12:0:0). Prerequisite: 90 credits. Provides directed experience in observing and participating in health promotion and exercise science programs at community agencies, health care centers, and private sector organizations. Graded Pass/Fail.

499 Independent Study in Health Education (1-3:0:0). Prerequisites: 90 credits and permission of instructor. Provides study of a problem area in health education research, theory, or practice under faculty direction. May be repeated, but no more than 3 total credits may be earned.

Health Science (HSCI)

College of Nursing and Health Science

150 Global Issues in Health, Nutrition, and Culture (3:3:0). This course examines cross-cultural values in health and nutrition. It explores the health- and nutrition- related
problems that afflict populations throughout the world, and the efforts being made to achieve optimal health for all. Students are introduced to the nutrition and health concerns from a variety of cultures around the world. Population dynamics, vital statistics, global disease patterns, and cultural variations are considered. Teaching strategies include lecture/discussion, guest lecturers, video presentations, oral presentations, web research.

250 Holistic Health Perspectives (3:3:0). Allows each student to survey health and wellness issues related to his/her personal profile. Students define his/her health within the context of family, environment, culture, society, and life span. Motivational strategies for improving and maintaining health will also be stressed. The health of individuals will be considered in relation to the larger community as well as national health goals.

295 Nutrition for Health Professionals (3:3:0). Prerequisite: One semester of science or permission of instructor. Introduction to nutrition science. Emphasizes roles of macro- and micro-nutrients in the body, digestion, energy metabolism, weight loss, fitness and nutrition, prevention of chronic diseases, nutrition therapy, and nutritional assessment. Problem solving and critical thinking methodologies are utilized in group presentations that address nutrition-related case studies. In-class activities, outside readings, and class discussion are designed to re-enforce concepts. Students use computer-based diet analysis to evaluate personal dietary intakes.

302 Health Care Finance (3:3:0). Introduces finance in health care organizations. Reviews issues in reimbursement structures, regulatory mechanisms, cost control, and related factors affecting the financial management of health service organizations (including financial decision support skills).

303 Strategic Health Management and Planning (3:3:0). Introduces past and present interventions that affect the supply and demand for health care at the community, state, regional, and national level. Health planning and regulatory entities are presented and strategic and program planning in the context of current economic and market conditions are discussed.

307 Assisted Living Philosophy and Management (3:3:0). This course provides an overview of the growth of the assisted living industry, its role in the health care continuum, current and/or proposed regulatory environments, and differences between assisted living and other forms of senior health care/senior living services. Specific instruction is provided in both the philosophy and day-to-day management of assisted living communities, including resident care, operations, finance/budgeting, human resources/staffing, and successful marketing and community relations. The course also examines the future of the industry, including cutting-edge programs/technologies and approaches to creating the next generation of assisted living services.

332/NURS 332 Concepts of Health Promotion and Disease Prevention Throughout the Life Span (3:3:0). Introduces the student to the concepts of epidemiology, health promotion, disease prevention, and their impact upon the health status of culturally diverse and vulnerable individuals, families, small groups, and communities. Focus is upon health problems and potential interventions throughout the life span and incorporates the principles of teaching/learning and the process of critical thinking as they apply to the health professional.

334 Role Development for Health Science Majors (3:3:0). This course provides the opportunity to explore career opportunities that build on their basic education in a health science field. Includes historical perspectives on current ethical, legal, political, social, and cultural issues related to health care policy and research. Multidisciplinary collaboration among health care providers will be explored.

341 Practicum in Health and Wellness Coordination (3:1:5). Provides a field experience in which students design, implement, and evaluate a project with individuals, families, or small groups who are at risk to or experiencing physical, psychological and/or social health problems in a variety of settings across the life span. Students receive opportunities to apply principles of health promotion and disease prevention. Risks are identified and a program is planned that will reduce risks and promote optimal function.

343/NURS 343 Pharmacology (3:3:0). This course provides the student the opportunity to study the principles of pharmacokinetics, the pharmacodynamics of selected drug classifications, and nursing responsibilities related to drug administration to individuals throughout the life span.

344 Health and Risk Appraisal (3:2:2). Provides exposure to a number of models of health appraisal and risk assessment through multiple technological means. Students implement a model of their choice in their practicum site.

378 Health Care Delivery in the United States (3:3:0). Survey course that introduces the history and current structure and function of health care delivery in the U.S. Students explore the major components and subsystems of health care and the socio-political (public and private) context that shapes the system and impacts access to health care and delivery of health services.

402/NURS 505/NURS 505 Case Management (3:3:0). Prerequisite: Bachelor's degree or permission of instructor. Open to seniors. Survey course on the state of case management programs and practice for health and human service professionals. Special emphasis is placed on comparing the nature, process, and outcomes for baccalaureate and graduate students guided by the objectives.

420 Strategies for Nutrition Education (3:3:0). Prerequisite: HSCI 295 or permission of instructor. This course examines methods and techniques for educating individuals about nutrition. It addresses nutrition education issues from a variety of populations with respect to culture, age, religion, and specific disease states.

421 Community Nutrition (3:2:1). Prerequisite: HSCI 295 or permission of instructor. This course focuses on nutrition and health problems of specific community settings, and examines the practices of nutrition services in various communities.

422 Nutrition Throughout the Life Cycle (3:3:0). Prerequisite: HSCI 295 or permission of instructor. This course focuses on the nutrient needs and food habits throughout the life cycle. Emphasized are the nutrient needs prior, during and after pregnancy, and the nutritional requirements of infants, children, adolescents, adults, and the elderly.

423 Nutrition and Chronic Illnesses (3:3:0). Prerequisite: HSCI 295 or permission of instructor. This course...
examines the nutrient needs related to specific chronic illnesses including cardiovascular disease, cancer, obesity, and diabetes. It focuses on the principles of nutritional therapy and prevention.

436/NURS 436 Leadership and Management of Health Care (3:3:0). Introduces the leadership and management of health-related organizations. Reviews administrative issues in health-related services with particular emphasis on developing organizational strategies for effective interfacing of medical, nursing, allied health, and administrative staff.

440/NURS 440 Community Health and Epidemiology (3:3:0). Addresses population-focused health care. Emphasis is on primary, secondary, and tertiary prevention of health problems. Concepts of community, public health, and health policy affecting culturally diverse and vulnerable populations are examined.

453/NURS 453 Research in Nursing and Health Science (3:3:0). Introductory research course designed to present basic concepts and methods of research. The research process is examined as a foundation for scholarship. Emphasis is placed on critique and use of current nursing and health science research in clinical practice.

465/NURS 465 Professional Transition and Role Integration (3:3:0). Capstone seminar assisting students in synthesizing the varied dimensions of their role as a health professional. Special emphasis is placed on collegiality, professional role transition, and responsible membership within the health professions and society. (Writing-intensive course.)

480 Health Maintenance and Health Aspects of Aging (3:3:0). Studies physiological and psychological factors that influence health and have implications for preventive measures in disease and health disorders in the aging. Nutrition, the nature of health problems, and methods of assessing physical and psychological needs are examined.

492 Death, Dying and Decision Making (3:3:0). Interdisciplinary examination and analysis of clinical care of dying persons provides the focus of this course along with psychosocial issues related to the processes of death and dying. Special emphasis is on the application of ethical principles in resolution of complex problems for individuals with life threatening illnesses and their families as caregivers and/or decision makers. Decision makers models provide a basis for clinical case discussions related to dying. Questions of futility are examined with associated care issues. Current professional and lay literature is discussed in the context of socially changing norms and mores surrounding end-of-life decisions. Hospice and alternative palliative care models are explored for terminally ill patients.

495 Health Systems Management Practicum (10:15.2:24-39). Capstone course consisting of a two hour weekly seminar and a working practicum in a health related organization. Working under the supervision of practicum faculty and an assigned agency preceptor, the student conducts an independent administrative project for the agency. Students utilize organizational assessment information and explore organizational structure, roles, and functions within the organization. Critical thinking, project planning and management, communication and analytic skills are integrated in the performance of the practicum and development of the project product.

496/NURS 496 Violence in Society (3:3:0). The interdisciplinary lecture/discussion course examines the magnitude of the problem of violence globally and more specifically within the United States. Discussion and reflective activities engage students in the learning process.

497 Health Care Coordination Practicum (10:2:18 mobility track, 15:2:28 traditional track). Provides for a variety of applied experiences in the student's chosen area of concentration under the direction of program faculty and a preceptor in the field agency. Critical thinking, project planning and management, communication and analytic skills are integrated in the performance of the practicum and development of the project product. Students may receive credit for experiential learning by portfolio evaluation.

505/HSCI 402/NURS 505 Case Management (3:3:0). Prerequisite: Bachelor's degree or permission of instructor. Open to seniors. Survey course on the state of case management programs and practice for health and human service professionals. Special emphasis is placed on comparing the nature, process, and outcomes for baccalaureate and graduate students guided by the objectives.

508/NURS 508 Psychopharmacology (3:3:0). Surveys therapeutic effects and side effect profiles of psychopharmacological drugs, including psychotropic and recreational drugs. Emphasis on understanding mechanisms of actions, drug interactions, and subject variables that influence drug effects.

520/NURS 520 Rehabilitation Theory and Practice (3:3:0). Explores rehabilitation theory and research and their application to the practice of today's healthcare professional and to the care of specific client populations. Rehabilitation theory will be evaluated as a new paradigm for healthcare delivery.

530/NURS 534 Nutrition: A Global Perspective (3:3:0). Directed at students from a variety of disciplines, this course examines what malnutrition is and how it occurs by looking at several situations from around the world. It looks at the impact of how nutrition can affect a society and community and examines the benefits of a well-nourished population.

542/NURS 542 Health Policy (3:2:1). Explores issues surrounding the development of public health policy and the influence of policy of health care delivery, nursing, and other health professions. Classroom and field experience.

543/NURS 543 Global Health: Trends and Policy (3:3:0). Surveys health challenges in the world today; their social, economic, and epidemiological causes; and the role and likely success of high-tech medicine, primary preventive health care, social manipulation, and aid in alleviating the problems.

544/NURS 544 The Washington Internship in Health Policy (1:0:2). Prerequisite: Annual Health Policy Institute. Undergraduate requires permission of instructor. This course provides a one-week (40 hours) exposure to an organization with a public policy agenda in health. Placement may be in a Capitol Hill office, a federal health agency, a national association, or other policy organization.
tion. Interns will engage in a variety of field experiences related to the legislative process, including network development of policy-interested contacts, and skill development to expand a student's ability to impact the health policymaking process.

546/NURS 546 Leadership Strategies in Health Policy (3:3:0). This course examines the leadership process from a policy, personal, and organizational perspective to expand the student's ability to impact the health policymaking process.

547 Regulatory Requirements for Health Care Systems (3:3:0). This course is designed to help health care professionals understand the linkage between the infrastructures of the organization and the regulatory/accreditation processes for health care organizations. An overview covers the major accrediting agencies, their roles, the accreditation principles, and the survey process. Applications will focus on hospitals, with reference to ambulatory care, managed care organizations, rehabilitation centers, laboratories, home health and long-term care facilities. Emphasis will be placed on the requirements of the Joint Commission on Accreditation of Healthcare Organizations (JCAHO) and the regulations mandated by the Health Care Finance Administration (HCFA).

550/NURS 585 Entrepreneurship in Health Care (3:3:0). Presents an overview of models of entrepreneurship in health care. Opportunities for collaborative problem solving to support business development, entrepreneurial behavior, and leadership are provided. Innovative approaches to and alternatives for nursing practice and health care delivery are explored.

571/NURS 571 HIV/AIDS: Concepts, Principles and Interventions (3:3:0). Provides an overview of all aspects of HIV disease to include retrospective and current concepts and analyses of the epidemic, global, and societal impact, and cutting-edge research. Examines the development of therapeutic tools and skills to educate, reduce risks, control infection, and affect the care and healing of client, family, and community, as well as issues of increasing dilemma for health care professionals.

577/NURS 577 Comparative Health Care Systems in the World (3:3:0). A comprehensive review of selected national health care systems within the World Health Organization's designated regions. Health care systems are analyzed, compared, and contrasted. Issues are discussed in relationship to national governments and global health.

578/NURS 578 Cultural Competence and Diversity in Health Care (3:3:0). Cultural competence and diversity in health are examined. A number of models are explored, including but not limited to, organizational culture competence, cultural competence training models, and anthropological and sociological models. Students develop skills in cultural competence. This course is open to health care providers and all related fields. Lecture, seminar, guest lecture.

580 Alternative Health Care Practices (3:3:0). Explores the proliferation of alternative health care therapies in society and the role of the various professions in collaboration and participation. Cultural traditions and the scientific study of these therapies are evaluated. Lecture, discussion, seminar, and observation.

583/NURS 583 Food and Culture: Biocultural Perspectives on Food and Nutrition (3:3:0). Prerequisite: HSCI 295 or permission of instructor. This course examines food and eating behaviors, diet, and nutrition from a cross-cultural perspective. It focuses on how and why people choose what to eat, the range and significance of cross-cultural variability in diet, how diets have changed in the evolutionary and recent past, and the health and social implications of those changes. Teaching strategies include lecture/discussion, guest lecturers, video presentations, audio/visual aids, student presentations, case study analyses.

585 Care Management of Persons with Alzheimer's Disease and Related Disorders (3:3:0). Focuses on the care of persons with dementing illnesses in acute, community and long term care settings. Strategies for managing and evaluating care provided by family caregivers and allied health personnel also are discussed.

594/NURS 594 Special Topic in Health Care (3:0:0). Presents selected topics analyzing specialized areas in health care. Content varies. Lecture, seminar, laboratory/workshops.

603 Advanced Clinical Nutrition (3:3:0). Explores advanced principles of sound nutrition and the application of these principles in clinical settings. Nutritional assessments are explored for the adult patients with chronic conditions.

615 Molecular and Clinical Genetics in Health Care and Research (12:0:36). Prerequisites: Graduate nursing student, advanced practice nurse, or nursing faculty. This course provides a foundation in molecular and clinical genetics, supporting both clinical practice and laboratory research. Basic concepts and principles of genetics (molecular, clinical and biochemical, and cytogenetics) are covered. A case-based approach and the use of published research is used to integrate the concepts and principles of genetics, and to provide an understanding of genetic testing, detection of genetic disease, and how this information can be used for counseling individuals and families.

626 Health Care Informatics and Computer Systems (3:3:0). Studies information and data management in nursing and the application of computer systems to solve problems on nursing practice, education, administration, and research. Focuses on generic concepts of information science and the use of computers to manage nursing health care data, incorporating computing skills for using specific software packages.

635/CONF 738 Research Seminar in Health and Conflict Analysis (3:0:0). This capstone seminar is the final course in the graduate certificate program in conflict resolution for health professionals. It involves conducting research and analyzing a specific conflict situation in depth. The course builds on theory, research, and practice learned in previous courses for this certificate.

637 Gerontological Nursing: Normal Aging and Health Deviations (3:3:0). Examines the biopsychosocial aspects of aging. Emphasis is on examining the effects of age changes and health deviations on the functional capacity of older persons, and on interventions and promotion of the elderly's capacity for self-care.

640/NURS 640 Dimensions of Communications in a Technologically Enhanced Health System (3:3:0). Examines the effects of technological innovation on the commu-
### Health Science (HSCI)

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Description</th>
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<tbody>
<tr>
<td>HSCI 659</td>
<td>Health Care of Aging Persons with Chronic Illnesses (3:3:0)</td>
<td>Focuses on the biological, psychological, and sociocultural aspects of aging and chronic illness. Emphasis is focused on examining the functional capacity of persons and the capacity for self-care.</td>
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<tr>
<td>HSCI 670</td>
<td>Quality Management in Health Care (3:3:0)</td>
<td>Explores issues, trends, and methodologies in health care quality management within a systems framework with emphasis on law, ethics, principles, tools and techniques, cost, strategic directions, and evaluation. Roles and responsibilities of the various levels of health care managers are addressed.</td>
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<tr>
<td>HSCI 678</td>
<td>Introduction to the U.S. Health System (3:3:0)</td>
<td>Course is required as a prerequisite to all other certificate courses, for students who do not have familiarity with all aspects (financing, providers, care systems) of the U.S. health care system and recent working experience. Explores the structure, function, and financing of the health care delivery systems in the U.S. Designed to familiarize students with the development of the various sub-systems of care and the ways in which public, private, and social forces influence the politics of healthcare, shape the system, and impact public health. Includes analysis of systems infrastructure and the socio-political context of the U.S. health care system.</td>
</tr>
<tr>
<td>HSCI 690</td>
<td>Independent Study in Health Science (1-3:0)</td>
<td>Prerequisite: Admission to a graduate program and permission of associate dean for academic programs. In-depth studies of a selected area of health science theory, research, or practice under the direction of faculty. May be repeated, but total credits earned may not exceed three.</td>
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<tr>
<td>HSCI 698</td>
<td>International Health Care: Theoretical and Practical Dimensions (3:3:0)</td>
<td>International health organizations and programs are studied in relation to comparative health care systems analysis. Theoretical conceptualizations, research approaches, and methodological issues in the development of international health are emphasized.</td>
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<tr>
<td>HSCI 699</td>
<td>Practicum in International Health Care (3:1:8)</td>
<td>Prerequisite or corequisite: HSCI 698. Practicum in international health in a selected international health agency. Health care programs are analyzed using a health care systems framework.</td>
</tr>
<tr>
<td>HSCI 701</td>
<td>Quantitative Decision Making in Health Systems Management (3:3:0)</td>
<td>Survey course using an epidemiological framework to explore selected quantitative methods in addressing management problems and decisions in health care delivery systems. Managerial applications in the use of analytic techniques as employed to support decision making in health care systems related to cost-benefit analysis, reducing clinical variability, program and decision analysis using system and population based data. Application of forecasting, linear programming, network models and selected biostatistical techniques as applied in health systems management are also included.</td>
</tr>
<tr>
<td>HSCI 702</td>
<td>Managerial Accounting in Health Care Organizations (3:3:0)</td>
<td>Practical examination of the controllership function in health care organizations and systems (profit and not for profit) with emphasis on policy formulation and evaluation of performance, including cost methods and systems, measurement criteria, and managerial planning methods, and techniques.</td>
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<tr>
<td>HSCI 703</td>
<td>Financial Management of Health Systems (3:3:0)</td>
<td>Prerequisites: HSCI 555 or admittance to a graduate nursing degree program (M.S.N. or Ph.D.) or Health Systems Management M.S. degree program, and working knowledge of the health care industry. Examines the tools and methods of financial management in health care organizations and systems with emphasis on allocation and use of funds. Analysis of costs and constraints of alternative source of funds and the application of financial decision instruments and their effect on operational management and market value of the entity is covered.</td>
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<tr>
<td>HSCI 704</td>
<td>Contemporary Issues in Health Systems Leadership and Management (3:3:0)</td>
<td>Analyzes management theory and practice from recently evolving works that identify, analyze, and resolve strategic organizational problems and issues in health care systems. Applied leadership strategy to effectively manage a variety of critical issues in health care systems, such as organizational development, change management, human relations and diversity, quality management for organizational and clinical effectiveness, technology, competing priorities, conflicting constituencies, delivery system redesign, and health services research.</td>
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<tr>
<td>HSCI 705</td>
<td>Strategic Management and Marketing in Health Care (3:3:0)</td>
<td>Develops executive skills for strategic decision making through the use of marketing-based tools and techniques as applied in health care systems. Strategic planning, market research and opportunity/risk analysis, customer assessment, market segmentation and life cycle assessment for health care services in managed care and nonmanaged care environments are covered.</td>
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<tr>
<td>HSCI 706</td>
<td>Integrated Health Systems Management (3:3:0)</td>
<td>Explores emerging structures for financing and delivery of comprehensive health services in integrated health systems. Successful development and management of alliances, provider hospital organizations, and managed care systems with an emphasis on strategies for vertical integration, community partnering, contract negotiation, governance, and management of antitrust situations.</td>
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<tr>
<td>HSCI 707</td>
<td>Health Care Management Policy, Law, and Ethics (3:3:0)</td>
<td>Survey course that prepares health care executives to understand selected legal and ethical principles as applied to complex decision making and policy analysis in the management of health care organizations and systems. Legal relationships (torts and contracts) and ethical reference are used for selective managerial application in the analysis and management of organizational and clinical dilemmas, statutory and regulatory trends, and the management of scarce resources and interdisciplinary teams in health systems.</td>
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<tr>
<td>HSCI 708</td>
<td>Operations/Quality Management of Health Services (3:3:0)</td>
<td>Examines the operations and quality management functions of a health care/service organization from a strategic viewpoint. Explores the contributions of operations research and quality management to improve delivery and production of health services and business processes from the perspective of the health care manager. Explores contemporary performance measures (quality and productivity) useful for improving process performance and selected decision support system methods from operations management.</td>
</tr>
</tbody>
</table>
709 Health/Medical Informatics for Health System Managers (3:3:0). Introduces health/medical information systems with emphasis on systems analysis and design to support managerial and clinical communications and decision making. Explores trends and innovations in information technology and systems, focusing on the managerial oversight of health/medical information systems. Includes review and analysis of the issues and uses of databases and database management systems for clinical and managerial transactions and decisions in health care organizations and integrated health systems.

710 Health Management Practicum and Capstone Seminar (3:2:6). Prerequisite: All course work. Team-based field practicum in health management, problem analysis, and project management in a health care/service organization. Learning teams define a complex problem in the assigned facility and conduct an analysis of the problem with recommendations for management decision action. Analysis of the problem provides the context in which theoretical concepts and management skills are applied to conduct the project. Practicum seminar uses case study analyses to explore problem-solving approaches in a variety of situations and health care/service organizations.

712 Health Service Research (3:3:0). Prerequisite: HSCI 701. Students learn the role of health services research in policy and in evidence-based management and clinical practice. Students learn to formulate a problem, to conduct online searches of published literature to describe the state of knowledge in the field, to conceptualize the research project, to conduct analysis of secondary data, to design an experiment, and to conduct evaluation research. Students learn to organize presentation of research and methods of feedback. Courses include analysis of secondary data.

714 Telehealth Applications (3:3:0). Prerequisites: HSCI 678 or recent work experience in the U.S. health system. This course provides an overview of current and emerging telehealth applications. Content focuses on uses and evaluation of telemedicine in rural and urban settings. Telehealth programming, staffing, funding, and reimbursement are addressed. Challenges of managing regulatory, ethical and international policy considerations will be addressed.

715 Health Economics (3:3:0). Emphasizes health care managers an understanding of economic efficiency in the U.S. health system. Microeconomic methods are used to examine markets and resources in health care. Health care is examined as a commodity, and the demand for health and medical care services, provider behavior, and the function and behavior of insurance markets is explored. Selected topics include: government role, financing arrangements, insurance reform, rationing, price regulation, and provider competition.

720 Health Databases and Data Integration (3:3:0). Students learn to manipulate large databases, create link table queries, write SQL application programs, understand sources of data conflicts, and identify methods of integrating ODBC databases with legacy data. Students learn concepts of data warehousing, methods of analysis of large databases including Bayesian belief networks and machine learning in the health care context. Course involves a semesterlong data integration group project.

722 Electronic Commerce and Outline Market for Health Services (3:3:0). Students explore the development of online health services, the organization of online businesses, online marketing, online financial and clinical transactions, and venture capital and IPO process. In addition, students learn about creating and maintaining web pages and online databases. The course reviews the literature on impact of computer services on patient care and health care organizations, and examples of successful and bankrupt technology firms in health care. Students, in groups, draft a business plan and develop early version of the service they are proposing.

730 Clinical and Managerial Optimization in Health Care (3:2:1). Prerequisites: HSCI 701, 709, 768. Students learn techniques to develop protocols of care from judgment panels of experts and risk adjustment measures for client populations. Applications relevant to organizing measuring and evaluation satisfaction with care are discussed. Methods to establish and use protocols of care to institute clinician practice patterns and other organization-wide change are also taught. Students are exposed to analytic and data management methods for administrative and clinical databases, necessary to construct episodes of care, severity of illness, and evaluation scenarios for health related outcomes. Students conduct projects that evaluate specific clinical and administrative processes through practical and case study assignments.

750/NURS 750 Legal Issues Relevant to Health Care Administration (3:3:0). Provides students with a general understanding of the United States legal system and sources of law, with a particular emphasis on laws that govern or are applicable to the health care industry and general administration. Students examine the changing health care models and delivery systems and the laws affecting such systems.

762 Aging and Health Care Policy (3:3:0). Prerequisite or corequisite: HSCI 637, SOCI 599, or NURS 659 or permission of instructor. Focuses on a policy perspective in relation to older adults in the community and in long-term care facilities. Students analyze policy issues and health care delivery systems as they affect the older adult through lecture/discussion, field trips, projects, and policy analysis papers.

800 Multivariate Statistics and Data Analysis I (4:3:2). Prerequisite: A graduate-level bivariate statistics course. Covers in detail multiple analysis of a variance (ANOVA, ANCOVA, and factorial design), exploratory factor analysis, and multivariate regression analysis. Emphasizes application and interpretation over formula derivations and mathematical calculations with emphasis on applying multivariate tests to health science data bases using structural packages with an emphasis on SPSS.

801 Multivariate Statistics and Data Analysis II (3:3:0). Prerequisite: HSCI 800 or an equivalent multivariate statistics course. Examines discriminant analysis, canonical correlation, structural modeling (LISREL and pathanalysis), and confirmatory factor analysis. Emphasis is placed on applications and interpretations in the analysis of health science data. The use of SPSS is stressed.

830 The Scholarship of Writing (3:3:0). Boyer's framework for scholarship explores the presentation of theory related to writing for scholarship. Students apply research in composition to inform writing for a variety of scholarly purposes, including overall conceptualization of research papers and proposals, writing for publication, and writing...
for scientific, creative, quantitative, and qualitative research. Seminar and intensive writing.

855 Ethics in Health Care Administration (3:3:0). Prerequisite: Admission to Ph.D. program or permission of instructor for other (non-Ph.D.) students. Philosophical foundations of health care ethics. Students analyze specific ethical dilemmas faced by administrators in health care settings.

866/NURS 866 Health Care Public Policy (3:2:1). Focuses on the process of formulating health care policy and analyzing its implications for nursing, administration in nursing, and education and nursing service. Current and impending health issues, the legislative process, and program implementation evaluation are examined.

920/NURS 920 Qualitative Research in Nursing and Health Care (3:3:0). Prerequisites or corequisites: NURS 955/HSCI 960 and a multivariate statistics course (HSCI 800 or equivalent); familiarity with e-mail and computers. Analysis of the philosophical foundations and approaches to qualitative research in nursing and health care administration, health care policy, and health care ethics within the scholarship of discovery, integration, application, and teaching. Computer analysis is required.

925/NURS 925 Methodological Issues in Nursing and Health Care Qualitative Research (3:3:0). Prerequisite: NURS 920/HSCI 920 or an equivalent course and permission of the instructor. Explores, analyzes, and synthesizes conceptual, methodological, and ethical issues in qualitative research within the scholarship of discovery, integration, application, and teaching. Seminar.

930/NURS 930 Quantitative Methods in Nursing and Health Care (3:3:0). Prerequisites: NURS 955/HSCI 960 and a multivariate statistics course (HSCI 800 or equivalent). Examines advanced principles and special problems in quantitative research methodology. Emphasis is on measurement as it relates to nursing and health care administration, health care ethics, and health policy research. Computer analysis is required.

955/PHIL 955 Philosophical Bases of Inquiry (3:3:0). Prerequisite: Admission to nursing doctoral program or permission of instructor. Examines philosophical bases of the discipline and practice of health related disciplines within the scholarship of discovery, integration, application, and teaching. Comparison of nursing and health science philosophy with relevant discipline philosophies is examined.

History (HIST)

100 History of Western Civilization (3:3:0). History of Western civilization from its ancient Mediterranean origins through the medieval and modern development of Europe to the contemporary world. Students may not receive credit for HIST 101 if they have taken either HIST 101 or 102.

101 Foundations of Western Civilization (3:3:0). Evolution of Western culture from the ancient Mediterranean world to the formation of modern Europe in the 17th century. Students may not receive credit for HIST 101 if they have taken HIST 100.

102 Development of Western Civilization (3:3:0). History of Western institutions and ideas from the 17th century to the present. Students may not receive credit for HIST 102 if they have taken HIST 100.

120 U.S. History (3:3:0). Examination of American society from its founding documents, values, institutions, and peoples to the present. Experience in historical analysis is required. Students cannot receive credit for HIST 120 if they have taken either HIST 121 or HIST 122.

121 Formation of the American Republic (3:3:0). Social, political, economic, and intellectual growth of American institutions from colonization through Reconstruction. Students may not receive credit for HIST 121 if they have taken HIST 120.

122 Development of Modern America (3:3:0). History of the United States since 1877. Students may not receive credit for HIST 122 if they have taken HIST 120.

125 Introduction to World History (3:3:0). Analytical approach to a world history overview that surveys major features of the principal existing civilizations of the world, as they were originally formed and as they have been altered during the past two to four centuries by key global processes including the "forces of modernity."

130 History of the Modern Global System (3:3:0). Aims to provide an understanding of the processes that have shaped the modern world. Beginning in 1500, it traces developments that reorganized peoples, reshaped cultures, and generated new economies in the interaction between Western and non-Western societies. Focus of the course will be on Western and non-Western regions of the world, and their participation in the global networks resulting from mercantile expansion, the industrial revolution, imperialism, nationalism, and their legacies in the postcolonial period.

150 Freshman Seminar (3:3:0). Prerequisite: Freshman standing. Focuses on the skills and methods of learning, as well as subject matter, as a way of introducing the discipline of history. Topics vary.

251, 252 Survey of East Asian History (3:3:0). HIST 251 surveys the history of China and Japan from prehistoric times to ca. 1600. HIST 252 surveys the history of China and Japan from early modern times (ca. 1600) to the present. HIST 261, 262 Survey of African Civilization (3:3:0). HIST 261 surveys African history from earliest times to the decline of Western Sudanic states in the 16th century. HIST 262 surveys African history from the beginnings of interaction with Europe in the 15th century to the recent emergence of new states.

271, 274 Survey of Latin-American History (3:3:0). HIST 271 surveys the colonial era to 1825. HIST 272 surveys the development of an independent Latin America since 1825. Emphasis on interactions between the United States and Latin America.

281, 282 Survey of Middle Eastern Civilization (3:3:0). Survey of Middle Eastern history from the rise of Islam to the present, with an emphasis on processes that led to the emergence of the economic, cultural, social, and political institutions that characterize the region today. HIST 281 surveys the period from the rise of Islam in 570 to the medieval period (ca. 1258). HIST 282 surveys the medieval period (ca. 1258 to present).
298 History and the Web (1:1:0). Introduction to techniques and methods of creating historical web sites. Overview of historical resources on the web, including Internet archives, hypertext scholarly articles, and online exhibits. Examines new narrative and interpretive possibilities for doing history that have been opened by the World Wide Web. Combination of lecture and lab.

299 Databases for Historians (1:1:0). Introduction to techniques and methods of creating historical databases. Overview of World Wide Web, CD-ROM, and personal databases helpful for historical research. Examines a database both as an electronic archive and an interpretive and analytical tool. Combination of lecture and lab.

300 Introduction to Historical Method (3:3:0). Prerequisite: History majors with 45 credits; ENGL 302; and COMM 100, 101, or 104. Open to minors with approval of department. Introduction to historical writing, research techniques, and critical evaluation of primary and secondary sources. Topics vary according to instructor. A grade of C or better is required to graduate with a B.A. in History. Not offered in the summer.

301 Classical Greece (3:3:0). Political, social, economic, and cultural history of classical Greece from development of the city-state through the fifth century.

302 Classical Rome (3:3:0). Political, social, economic, and cultural history of classical Rome from the founding of the city through the fall of the Roman republic.

304 Western Europe in the Middle Ages (3:3:0). Survey of the development of European society from the collapse of Roman rule in the 5th century to the advent of the Black Death in the 14th century. Emphasis is on the political, social, cultural, and intellectual growth of a society that developed from Roman, Catholic, and Germanic roots.

305 The Renaissance (3:3:0). Survey considering the Renaissance as a phenomenon rather than a chronological period. Emphasis on growth of humanism in Italy in the 14th and 15th centuries, development of new political concepts, and laicization of society. Includes transmission of these developments to transalpine Europe in the late 15th and 16th centuries.

306 The Reformation (3:3:0). Late medieval ecclesiastical conditions and reform movements; late scholasticism, Protestant Reformation, Catholic Reformation, dynastic rivalries, and religious wars. Concludes with the Peace of Westphalia.

308 Nineteenth-Century Europe (3:3:0). History of Europe from Congress of Vienna to outbreak of World War I.

309 Europe in Crisis: 1914–1948 (3:3:0). Prerequisite: 45 credits or permission of instructor. Two world wars, the Great Depression, and political and cultural revolutions transformed Europe as never before. Explores the causes and consequences of these tumultuous events and concludes with a consideration of the reconstruction that caps the period.

314 History of Germany (3:3:0). Political, diplomatic, economic, social, and cultural development of Germany from the dissolution of the Holy Roman Empire to the present.

321 Early Modern England (3:3:0). History of England from the late 15th to the mid-18th century, focusing on the social, political, economic, and cultural changes of the period with particular attention to the English Reformation and the causes and consequences of the English Civil War.

322 Modern Britain (3:3:0). History of Britain from the mid-18th century to the present. Focus on the social, political, and economic transformations of industrialization, the culture of 19th-century industrial society, the problems of late 19th-century economic competition and imperialism, the creation of the welfare state, and the experience of post-World War II political, social, and economic realignments.

328 Rise of Russia (3:3:0). Political, social, and cultural experience of Russia from the appearance of the Kievan state to the mid-19th century. 329 Modern Russia and the Soviet Union (3:3:0). Analysis of Russian civilization from mid-19th through the 20th century. Focus on tsarist society, the revolution, and Soviet politics and the contemporary challenge.

330 The United States since World War II (3:3:0). Examination of major domestic and foreign policy factors that shaped the American experience from World War II to the present. Political, social, and economic forces as they affected the nation's history.

335 The African American Experience in the United States: African Background to 1885 (3:3:0). Prerequisite: Six credits of history or permission of instructor. History of the African American experience in the United States including African origins; the trans-Atlantic slave trade; the development of slavery in the colonial, revolutionary, and antebellum periods; abolitionist movements; and African American participation in the Civil War and during Reconstruction.

336 The African American Experience in the United States: Reconstruction to the Present (3:3:0). Prerequisite: Six credits of history or permission of instructor. History of African American life in post-slavery America and the rise and consequences of racial segregation in the 19th and 20th centuries. Examines the African American response to continued racial inequality and repression. The great migration, urbanization, black nationalism, and the civil rights era, as well as contemporary debates about race, are covered.


345 History of American Foreign Relations (3:3:0). Survey of American diplomacy from the Revolutionary War to the present, with emphasis on 20th-century issues.

350 U.S. Women's History (3:3:0). Prerequisite: 45 credits or permission of instructor. History of women and their changing status and gender roles in American society from the colonial period through the "second wave" of feminism in the 1970s. Explores the images and lives of women of different class, ethnic, and regional origins. Also focuses on women's political, economic, and legal conditions and changes in them.

351 History of the Old South (3:3:0). History of the South to the outbreak of the Civil War, with particular emphasis on the rise of sectionalism. Development of a distinct Southern culture through emergence of economic, political, social, agricultural, and intellectual institutions.
352 The South since 1865 (3:3:0). History of the South during Reconstruction, the Redeemer era, and the New South, with particular emphasis on race relations. Political, economic, cultural, and intellectual development from the aftermath of war.

353 History of Traditional China (3:3:0). Prerequisite: Six credits of history or permission of instructor. China from earliest times to the period of modern Western intrusion. Development of traditional Chinese culture, society, and government.

354 Modern China (3:3:0). Prerequisite: Six credits of history or permission of instructor. China from 1644 to the People's Republic of China. Emphasis on the coming of the West and the various stages of Chinese reaction.


357 Postwar Japan (3:3:0). Prerequisite: 45 credits or permission of instructor. History of Japan from World War II to the present. Examines the Japanese experience of several key moments in this era: Japan’s defeat in the Pacific War, its reconstruction during the U.S. occupation, its rise to economic prominence during the 1960s and 1970s, and its cultural and international identity crisis during the 1980s and 1990s.

364 Revolution and Radical Politics in Latin America (3:3:0). Prerequisite: Six credits of history or permission of instructor. During the 20th century, Latin America has witnessed both peaceful political movements and violent revolutions aimed at achieving social justice. Considers several of these movements in comparative perspective: the Mexican Revolution, the Arbenz government in Guatemala, the Allende regime in Chile, the Cuban and Nicaraguan revolutions, and the Brazilian Worker's Party.

386 Topics in History (3:3:0). Study of historical topics of special interest. Topics announced in advance. May be repeated for credit when topic is different.

387 Topics in Global History (3:3:0). Study of historical topics or periods of special interest in global, Latin American, African, Asian, or Middle Eastern history. Topics announced in advance. May be repeated for credit when topic is different.

388 Topics in European History (3:3:0). Study of historical topics or periods of special interest. Topics announced in advance. May be repeated for credit when topic is different.

389 Topics in U.S. History (3:3:0). Study of historical topics or periods of special interest. Topics announced in advance. May be repeated for credit when topic is different.

391 History of Virginia to 1800 (3:3:0). Discovery and settlement of Virginia. Colonial period with emphasis on development of representative government and race relations, the “golden age” of the Virginia dynasty, and coming of the Civil War.

392 History of Virginia since 1800 (3:3:0). Decision to secede, Civil War and Reconstruction, Readjusters and Populism, disfranchisement and Constitution of 1902, and rise of Senator Harry F. Byrd. Recent developments.

393 Topics in Film and History (3:3:0). Study of historical periods or topics from perspective of feature films and documentaries. Topics available in advance in History Department. May be repeated when topic is different. Maximum of six credits may be applied toward the history major.

401 Colonial America (3:3:0). Intensive study of colonial American history from its European origins through the Revolutionary War.


406 The Civil War (3:3:0). Prerequisite: Six credits of history or permission of instructor. Course, conduct, and consequences of the American Civil War. Emphasis on interconnectedness of political, military, and economic affairs.

409 Between the Wars: The United States, 1919–1941 (3:3:0). Intensive study of political, social, economic, and diplomatic developments in the 1920s and the 1930s.

416 U.S. Urban History (3:3:0). Examination of the process of urbanization in the United States, and the growth of American cities and suburbs from colonial times to the present.

417 History of Metropolitan Washington (3:3:0). Examination of urban and suburban growth in Washington, D.C., and its suburbs in Maryland and Virginia since 1790, in the context of U.S. urban history.

418 Ethnic Groups in America (3:3:0). Exploration of ethnicity and race in American urban society by comparing the experiences of different ethnic groups as migrants to American cities.

426 The Russian Revolution (3:3:0). Prerequisite: 45 credits or permission of instructor. The era of revolutionary activity from the late 19th century to the end of the 1920s, with emphasis on the Russian Revolutions of 1917. Explores why a revolutionary situation developed; the political, social, and cultural issues at stake; why it took the forms that it did; and the revolution’s contribution to the nature of the Soviet state and post-Soviet problems.

431/ENGL 431/FREN 431 Medieval Intellectual Topics (3:3:0). Selected topics in the intellectual history of the Middle Ages. Topics vary, depending on discipline of instructor. May be taken for credit by English or history majors.

435 Society and Culture in Early Modern Europe (3:3:0). Examination of the social and cultural lives of Europeans from the end of the Middle Ages to the Industrial Revolution. Popular, as well as elite, culture is emphasized, as are the bridges and interrelationships between them. Focus on religious, artistic, literary, and recreational behavior. Political activity and riots, strikes, royal receptions, and rituals are also covered.

436 European Society and Culture: 19th and 20th Centuries (3:3:0). Examination of major cultural trends in Europe since the French Revolution. Major themes include romanticism, socialism, Marxism, and the social effect of modernization, science, and societies.
455/COMM 455 History of Print Journalism (3:3:0). Prerequisite: Three COMM or HIST credits. Development of print journalism from its inception to the present, with emphasis on the interaction of technology, audience, and government intervention. Topics include birth of the press; development of the modern newspaper and American development, including the Revolutionary and Civil wars; the rise of the independent press; and the Yellow Journalism period.

459 Pre-Modern South Asia (3:3:0). Prerequisite: 45 credits or permission of instructor. History of South Asia (present-day India, Pakistan, and Bangladesh) from the earliest civilizations along the Indus River to the advent of colonialism. Special attention is given to significant historical events and their effect on the development of political, religious, and economic ideas.

460 Modern Iran (3:3:0). Prerequisite: 45 credits or permission of instructor. Modern Iran, from 1800 to the present, in the context of a number of broad themes: the institutional structure of the state; the role of the great powers in Iran and the Iranian response to the economic, military, technological, and ideological challenge posed by the West; the interaction of religion (and other ideologies) and politics; economic development and its impact on politics and society; and ways in which historians have sought to understand and interpret modern Iranian history.

461 Arab-Israeli Conflict (3:3:0). Prerequisite: 45 credits or permission of instructor. Some knowledge of the history of the Middle East since World War I is strongly advised. Overview of the history of the Arab-Israeli conflict, examining the conflict from various perspectives: as a conflict over land and between competing nationalisms and identities; in terms of the national interests of various states, including both Israelis and Palestinians, as well as other Arab governments and the great powers; and in terms of peace making and conflict resolution.

462 Women in Islamic Society (3:3:0). Prerequisite: Six credits of history or permission of instructor. Survey of the history of women in Islamic society from the rise of Islam to the present day. Examines the historical processes that affected the role and status of women in society, as well as specific topics around which issues of gender status and identity coalesced, especially in the modern period.

465 The Middle East in the 20th Century (3:3:0). Prerequisite: Six credits of history or permission of instructor. Political, social, and cultural history of the Middle East since World War I. Emergence of Israel, Arab nationalism, and political and economic influence of the Middle East in world affairs.

466 Origins of Conflict in Southern Africa (3:3:0). Exploration of the historical origins of conflict in South Africa, focusing on themes of economic change, cultural interaction, and political consolidation over the past five centuries.

480 Alexander the Great (3:3:0). Rise of Persia, the Persian wars with Greece, subjugation of Greece by Philip II of Macedonia, life of Alexander the Great and his conquest of the Persian empire.

490, 491 Honors Directed Readings, Honors Directed Research (3:0:0), (3:0:0). Prerequisite: Admission to the history honors program and permission of instructor. Linked, individualized courses, normally given by the same instructor. HIST 490 involves directed readings; HIST 491 culminates in a research paper related to the subject of the readings. Students must have completed at least one course in the field (or with the professor) chosen for these honors courses. The three credits of readings should normally be taken before the three credits of research, though they may be taken concurrently. Either may be taken concurrently with HIST 499.

496 Internship (1-6:0:0). Prerequisite: History majors with permission of undergraduate coordinator. Approved work-study programs in cooperation with specific organizations including area research units; archives; historic sites; and local, state, and federal agencies. Credit determined by department.

498 Directed Readings/Research in History (1-3:0:0). Prerequisites: History majors with 90 credits and permission of instructor. Readings/research conducted on an individual basis in consultation with instructor. Student may not present more than three credits for graduation credit.

499 Senior Seminar in History (3:3:0). Prerequisite: History majors with 90 credits, HIST 300 and completion of the university IT requirement. Research on a specialized historical topic culminating in a seminar paper. Subject determined by instructor. Student may present not more than three credits for graduation credit. Not offered in the summer.

510 Approaches to Modern World History (3:3:0). Introduction to the historical study of the world beyond Europe and the United States. Students read major theoretical works as well as case studies of particular regions. In addition to examining such topics as imperialism, national identity, and various forms of popular resistance, students become familiar with a range of scholarly approaches, including world-systems theory and subaltern studies.

523 Issues in American History (3:3:0). Discussion of readings and analysis of selected problems in American history, open to advanced undergraduates and graduates. Topic determined by instructor. Course may be repeated when content differs.

524 Issues in European History (3:3:0). Discussion of readings and analysis of selected problems in European history, open to advanced undergraduates and graduates. Topic determined by instructor. Course may be repeated when content differs.


555 Problems in Asian History (3:3:0). Subjects announced by instructor. Discussion of readings and historical interpretations and compilation of a comprehensive bibliography on given theme. Course may be repeated when content differs.

388 History (HIST)

585 Problems in Middle Eastern History (3:3:0). Analysis of selected problems in Middle Eastern history. Emphasis on reading and discussion of historical interpretations and development of bibliography. Course may be repeated when content differs. Prerequisite to 600-level courses: Graduate standing.

601 Themes in U.S. History I (3:3:0). Survey of U.S. history prior to 1877. Designed for individuals entering the graduate program who need to strengthen their preparation in this area or who seek to enhance their knowledge of the latest interpretations in the field. Factual knowledge and its interpretation are stressed.

602 Themes in U.S. History II (3:3:0). Continuation of HIST 601.

605 Themes in European History I (3:3:0). Survey of European history from 1500 to 1815. Designed for individuals entering the graduate program who need to strengthen their preparation in this area or who seek to enhance their knowledge of the latest interpretations in the field. Factual knowledge and its interpretation are stressed.

606 Themes in European History II (3:3:0). Survey of European history from 1815 to present. Designed for individuals entering the graduate program who need to strengthen their preparation in this area or who seek to enhance their knowledge of the latest interpretations in the field. Factual knowledge and its interpretation are stressed.

610 The Study and Writing of History (3:3:0). Methodology of the historian including techniques of research, use of documentation and other sources, development of bibliography, and synthesis of material.


615 Problems in American History (1-6:1-6:0). Readings and discussion of bibliographies, interpretations, and research trends in topics selected by instructor. Course may be repeated when content differs.

616 U.S. Westward Movement (3:3:0). Investigation of continuity and change in the American West, focusing on such topics as economic development, ethnicity, rural and urban life, and the role of the federal government.

617 Topics in the American Civil War Era (3:3:0). Joint project of instructor and students into the various aspects of a common topic in the Civil War era with emphasis on historiography and historical method.

618 The Age of Jackson, 1815–1854 (3:3:0). Survey of the social, cultural, intellectual, economic, and political changes in the United States during a period of rapid growth and expansion. Among the topics studied are the second-party system; the growth of sectionalism, nationalism, and expansionism; industrialization and the spread of the market economy; the rise of romantic reform and evangelical religion; and the growth of abolitionist and proslavery movements.

619 The Constitution, Civil Liberties, and the Supreme Court (3:3:0). Investigation of the evolution of civil liberties in American history and the interaction of the three branches of government in applying the various constitutional guarantees. Students read extensively in Supreme Court decisions as well as in the secondary literature, and undertake independent research.

620 Development of the Early Republic, 1783–1815 (3:3:0). Investigation of the breakdown of the Confederation, the Constitutional Convention, and the role of the revolutionary ideology of republicanism. Leadership and policies of the republic in a hostile international context are discussed. Students read extensively in the monographic literature and prepare a research paper.

621 Virginia and the American Revolution (3:3:0). Detailed examination of Virginia society on the eve of the American Revolution and its role in the events from 1750 to 1789. Combines lectures on and discussion of major themes, ideas, and personalities.

622 American Minds (3:3:0). Advanced introduction to major approaches to and themes in American intellectual history, rather than a survey of the subject. Avoids positing an American mind in the beginning and explores instead the diversity of American thinkers. Focuses on several pivotal decades in American thought and sees American thinkers in their social contexts. Explores how nonelites have shaped American thought. Provides a diverse and multifarious look at who were the important American minds.

623 Recent U.S. History, 1945 to Present (3:3:0). Selected political, social, economic, diplomatic, and cultural forces that shaped the post-World War II American experience.

624 U.S. Diplomatic History (3:3:0). Study of selected issues in American foreign relations and changing historical interpretations of American diplomacy.

626 Approaches to American Culture (3:3:0). Focuses on the various approaches historians for the United States have taken to the history of American culture, the questions they have asked, the assumptions they have made, the disciplinary tools they have used, and the types of materials they have analyzed. Concentration on the patterns of culture these studies have uncovered and what they tell us about the American past and present.

627 Urban Development of the United States (3:3:0). Examination of the growth of cities in the United States, the process of urbanization, and the significance of cities in American history. Students become familiar with major issues and bibliography of American urban history.

628 Immigration and Ethnicity in the United States (3:3:0). Examination of immigration and ethnicity in America since 1840. Consideration of why immigrants came, from where, under what circumstances, and the ways in which they adapted to America. Examination of immigration policy and American attitudes toward immigration and ethnicity. Conducted as a readings colloquium.

629 The Gilded Age and Progressive Era (3:3:0). Examines the history of the United States from 1877 to 1918, with attention both to the history of reform movements and politics, and the social history of the period. Students become familiar with major issues and historical literature of the period.

630 U.S. Women's History (3:3:0). Wide-ranging survey of the burgeoning field of women's history, emphasizing critical evaluation of sources and interpretation. Readings are selected to represent a variety of approaches to the history of women, which may include material culture stud-
ies, medical history, history of sexuality, political history, and social and cultural history.

631 Era of the American Revolution (3:3:0). Examines the history and historiography of the revolutionary era, with a special emphasis on the social and ideological interpretations of the period. Includes the events leading up to the War for Independence, the war itself, and the social and political effects of the war on American society.

633 Reconstruction (3:3:0). Examines the panoply of political, social, economic, and constitutional concerns during the period 1863 to 1880, as the North and South struggled over the outcome of the Civil War. Among the many important questions to be addressed are those of political institutions and power in the postwar North and South, and the place of the former slaves in society, politics, and the economy.

634 Interwar America: 1918-1939 (3:3:0). Considers the history and historiography of the revolutionary era, with a special emphasis on the social and cultural changes of the period. Students write class reports and a larger bibliographic paper.

635 Problems in European History (1-6:1-6:0). Investigation of selected problems in the history of Europe. Readings, discussions, development of bibliographies. Where possible, primary sources are used. Course may be repeated when content differs.

636 Political Culture in 20th-Century Germany and Austria: Continuities and Discontinuities (3:3:0). Recent interpretations of key political events of the 20th century. Asks if there were fundamental continuities in the structure of German and Austrian society that can be observed throughout the period under review.


638 Western Europe in the Post-War Period (3:3:0). Examination of the process of reconstruction, reconciliation, and integration in Western Europe in the 20 years after the Second World War. Conducted as a readings colloquium.

639 Society and Politics in Western Europe, 1750-1914 (3:3:0). Focus on changes in social conditions and their ramifications in political life. Attention to urbanization of workers, changes in the peasantry, growth of middle classes, decline of nobility, as well as major political developments and expansion of liberal reforms.

642 Humanism and the Renaissance (3:3:0). The Renaissance as a unique period in European cultural history from ca. 1350 to 1520. Concentration on the Italian situation as the standard for the Renaissance, with consideration given to the manifestations of the Renaissance in northern Europe, especially Germany, until the Reformation. Focus on recent studies of political, social, intellectual, and religious changes of the period. Students write class reports and a larger bibliographic paper.

643 Religion and Society in the Reformation Era (3:3:0). The Reformation, from approximately 1500 to 1650, was a time of major religious, intellectual, social, and political upheavals in European history. Investigates the reasons for these changes and the effects they had on European society. First half of course focuses on Germany, but major events throughout Europe are studied.

644 Society and Culture in Early Modern Europe (3:3:0). Overview of the most recent historical work on social and cultural history of the pre-modern West, ca. 1400 to 1800. Making full use of theoretical approaches and empirical methodologies of other disciplines—especially social anthropology, sociology, and literary theory—this research sheds new light on topics as diverse as popular culture, class, manners, taste, rituals, religion, language, gender, and the state. This "new" cultural history not only formulates new topics of research and poses new questions about them, it also suggests an entirely new approach to more traditional historical topics, such as politics, religion, and ideas.

645 The Russian Revolution and the Origins of the Soviet State (3:3:0). Period between 1890 and 1924 with concentration on the sources of Bolshevism, problems of the old regime as they led up to the revolutions of 1905 and 1917, and establishment of the new regime and its survival in an environment of foreign and civil war.

690 The Administration of Archives and Manuscripts (3:3:0). Prerequisite: Six credits of U.S. history or permission of department. Introduction to the principles and practices of managing records and administering archival and manuscript collections, public and private. Designed for graduate students with a special interest in historical sources as well as for those specializing in applied history.

691 Museum Studies (3:3:0). Prerequisite: Six credits of U.S. history or permission of department. General introduction to museums of history and museum studies in the United States, intended for the interested citizen as well as for assistance to students in course and career choices. Explores the development, present state, and future possibilities of museums in the United States, with some reference to international developments.

692 Historical Editing (3:3:0). Introduction to the fundamentals of historical editing of documents, including the use of microform, word processing, and computer techniques. Designed for persons seeking an introduction to various areas of applied history and for persons intending to edit historical documents for publication.

693 Historic Preservation (3:3:0). Prerequisite: Six credits of U.S. history or permission of department. General introduction to historic preservation in the United States, intended for the interested citizen and to assist students in course and career choices. Explores the development, present state, and future possibilities of historic preservation in the United States, with some reference to international aspects of preservation.

695 History Symposium (3:3:0). Subject of academic and community interest pursued through discussions and lectures by distinguished guest instructors.

696 Clio Wired: An Introduction to History and New Media (3:3:0). Prerequisites: Students with limited computer competency should consult department before enrolling. Introduction to the changes that new media and technologies are bringing to how we research, write, present, and teach about the past. Students explore theoretical and historical issues as well as learn hands-on skills in digital history.
697 Creating History in New Media (3:3:0). Prerequisites: HIST 696, or permission of instructor. A seminar in which students create original historical projects in digital media.

711 Research Seminar in U.S. History (3:3:0). Prerequisite: HIST 610 or permission of department. Research in specialized topics using primary sources. Maximum of six credits may be earned.

731 Research Seminar in European History (3:3:0). Prerequisite: HIST 610 or permission of department. Research in specialized topics using primary sources. Maximum of six credits may be earned.

751 Research Seminar in Comparative World History (3:3:0). Prerequisite: HIST 610 or permission of department. Research seminar requiring comparative research and analysis. Organized around a significant topic or theme in the field of world history. Topics vary from year to year. A maximum of six credits may be earned.

790 Comprehensive Readings in U.S. History (3:0:0). To be taken in the final semester of the program. Designed to integrate the student's past work in the major field and to fill gaps in this area before the comprehensive exam. After a review of graduate experience, student and instructor design a reading list to round out preparation for the exam.

791 Comprehensive Readings in Comparative World History (3:0:0). To be taken in the final semester of the program. Designed to integrate the student's past work in the major field and to fill gaps in this area before the comprehensive exam. After a review of graduate course work, student and instructor design a reading list to round out preparation for the exam.

792 Comprehensive Readings in European History since 1500 (3:0:0). To be taken in the final semester of the program. Designed to integrate the student's past work in the major field and to fill gaps in this area before the comprehensive exam. After review of graduate experience, student and instructor design a reading list to round out preparation for the exam.

794 Internship in Applied History (3:6:0). Prerequisites: Three credits of applied history in an appropriate area and 12 credits in major field or permission of internship director. All internship placements must be approved by the department to ensure their suitability to the student's program. Introduction to applied history through work and study at a historical museum, site, library archive, editing project, or other approved agency.

796 Directed Readings (1-6:0:0). Independent reading on a topic agreed to by student and faculty member. Maximum of six credits may be earned.

798 Directed Research and Writing in History (3:0:0). Intended for those students in the department's predoctoral track who are not writing a master's thesis. Goal is to produce a substantial and original contribution to historical knowledge on the model of an article in a scholarly journal.

799 Thesis (1-6:0:0). May not be undertaken prior to successful completion of comprehensive examination. Graded S/NC.

800 Studies for the Doctor of Philosophy in Education (variable credit). Prerequisite: Admission to the Ph.D. in Education program to study history. Program of studies designed by student's discipline director and approved by student's doctoral committee, which brings the student to participate in research of discipline director and results in a paper reporting the original contributions of the student. Enrollment may be repeated.

801 New Developments in History (3:3:0). Prerequisites: Doctoral standing or permission of instructor and HIST 610 or equivalent. Survey of current developments in historical analysis and methodology.

802 Readings for Doctor of Arts in Community College Education (variable credit). Prerequisite: Admission to Doctor of Arts in Community College Education program to study history. Intensive reading of the recent scholarship in broad areas of historical study. With their advisors, students develop the readings list and define at least three areas in which to prepare readings courses. May be repeated.

803 Doctoral Readings in History (3:0:0). Independent readings for Ph.D. students on a topic agreed on by student and instructor. Usually taken to prepare a major or minor field.

810 History Doctoral Colloquium (1:1:0). Prerequisite: Doctoral standing. Introduction to an array of scholars and scholarship through discussions of innovative historical events, important theories, and significant methodological breakthroughs in history. May be taken for credit six times. Graded S/NC.

811 Doctoral Research Seminar (3:0:0). Prerequisite: Doctoral standing. Students pursue research projects in their areas of specialization.

998 Doctoral Dissertation Proposal (1-3:0:0). Prerequisite: Advancement to candidacy. Work on a research proposal that forms the basis for the doctoral dissertation. May be taken for a maximum of six credits. Graded S/NC.

999 Doctoral Dissertation Research (1-12:0:0). Prerequisite: Completion of HIST 998. Doctoral dissertation research and writing under the direction of the student's dissertation committee. Graded S/NC.

Honors Program in General Education (HNRS)

College of Arts and Sciences

Only students enrolled in the Honors Program are eligible to take HNRS courses. Because HNRS courses are a part of an integrative program, the courses in one semester are generally prerequisite to the courses in the following semester. ( Exceptions for majors in certain departments have been arranged and are available in the Honors Program Office.)

110 Introduction to Research (4:3:1). Introduces students to basic research and writing skills that will be required in every course in the curriculum. Such questions as how to select a suitable problem or question, how to formulate an argument or thesis, how to find and select evidence to support the argument, how to organize ideas into a coherent essay, and how to write clearly and elegantly are answered.

121 Reading Cultural Signs (3:3:0). Uses methods introduced from cultural studies and communication as well as sociology, economics, and psychology. Explores ways in which contemporary arts, mass media (including advertising), and cultural events, as well as social institutions, reflect and shape personal and social values.
122 Reading the Arts (3:3:0). Prerequisite: HNRS 110. 
121 Uses methods developed in HNRS 121 and introduced from literary study and fine arts. Explores the relationship of the parts to the whole in a work of art, connections among different art forms, and links between art and its historical context.

125 A Liberal Arts Approach to Calculus (3:3:0). Assesses an understanding of basic algebra and functions. Takes liberal arts approach to the subject, emphasizing the history and cultural implications of calculus. At the same time, the important mathematics of infinity is developed, and the principal transcendental functions are introduced.

130 Conceptions of Self (3:3:0). Drawing from appropriate works in the social sciences, arts, and humanities, course examines different conceptions of the self characteristic of different cultures.

131 Contemporary Society in Multiple Perspectives (3:3:0). Prerequisite: HNRS 110, 130. Explores methods and perspectives in the social sciences and humanities to evaluate the contribution of different disciplines to an understanding of significant social issues and their global ramifications.

225 An Introduction to Chaos Theory and Nonlinear Dynamics (3:3:0). Prerequisite: HNRS 125. Builds on an understanding of calculus to analyze topics in the dynamics of systems and how they change over time mathematically and functionally. Topics include many that have an impact on current scientific thinking and our culture: chaos theory, fractals, climate change, and neural networks. Uses computer simulations and illustrates ideas with biological examples.

227, 228 Scientific Thought and Processes I, II (4:3:3). Prerequisite: HNRS 227 is a prerequisite for HNRS 228. Explores and integrates the principles of classical and modern science through the study of such topics as cosmology, evolution, ecology, mechanics, relativity, and quantum physics.

230 Cross-Cultural Perspectives (3:3:0). Prerequisite: HNRS 110. Enables students to broaden cultural horizons and understand human behavior by studying in depth a society different from their own.

240 Reading the Past (3:3:0). Prerequisite: HNRS 110. Considers the construction(s) of historical narratives by examining significant current topics from their origins to the 20th century. Includes visits to area sites to consider public narratives. Provides context for HNRS 253.

253 Technology in the Contemporary United States (3:3:0). Prerequisite: HNRS 110, 240. Analyzes the emergence and the impact of specific technologies on contemporary culture in the United States. Explores such technologies as television, the automobile, newspapers, and the Internet from historical, scientific, political, economic, and global perspectives.

Information Systems (INFS)

Information and Software Engineering

310 Program Structure and Design for Business Applications (3:3:0). Prerequisite: MIS 201, or CS 103 or 161, or equivalent. Teaches structured programming and design using a high-level language. Focus is on program design, coding, debugging, and documentation. A computing lab is included.

311 Database Management (3:3:0). Prerequisite: INFS 310 or CS 112. Study of the logical and physical characteristics of data and their organization in computer processing. Course emphasizes data as a resource in computer applications, and examines database management system (DBMS) software and its design, implementation, and use. Computing lab is included. Lab exercises use one or more DBMSs for business applications.

312 Computer Architecture and Operating Systems (3:3:0). Prerequisite: INFS 310 or CS 112. Introduction to computing system hardware components, architecture, organization, and operating system software concepts. Course provides basic experience in assembly language programming for modern microprocessors and examines techniques for system evaluation and selection. Computing lab is included.

315 High-Level Programming Languages (3:3:0). Prerequisite: INFS 310 or CS 112. Study of the structure and application of high-level languages by stressing the design and implementation of data types, data structures, and algorithms. Computing lab is included. Credit for this course does not count toward the requirements for a major in computer science.

316 Software Systems Engineering (3:3:0). Prerequisite: INFS 310 or CS 211. Study of programming environments, including software tools and control of software development for large information systems engineering projects. Computing lab is included.

462/IT 462: Information Security Principles (3:3:0). Prerequisite: INFS 312 or equivalent. Study of security policies, models, and mechanisms for secrecy, integrity, availability and usage controls. Topics include models and mechanisms for mandatory, discretionary and role-based access controls; authentication technologies; control and prevention of viruses and other rogue programs; common system vulnerabilities and countermeasures; privacy and security policies and risk analysis; intellectual property protection; legal and social issues.

466/IT 466: Network Security (3:3:0). Prerequisite: INFS 312 or equivalent. Symmetric and asymmetric cryptography; encryption, message authentication codes and digital signatures; cryptographic authentication; digital certificates and public key infrastructure; the standards process; cryptographic protocols; SSL, IPSEC and related protocols; secure e-mail; intrusion detection.

498 Independent Study in Information Systems Engineering (1-3:0:0). Prerequisite: 60 credits; must be arranged with an instructor and approved by the department chair before registering. Directed self-study of special topics of current interest in INFS. May be repeated for a maximum of six credits if the topics are substantially different.

499 Special Topics in Information Systems Engineering (3:3:0). Prerequisite: 60 credits and permission of instructor. Topics of special interest to undergraduates. May be repeated for a maximum of six credits if the topics are substantially different.

392 Information Systems (INFS)

for information systems analysis and design including basic set theory and proof techniques, propositional and predicate logic, trees and graphs, finite state machines, formal languages and their relation to automata, computability and computational complexity, formal semantics-operational, axiomatic and denotational approaches. Credit cannot be applied to any graduate degree in IT&E or the B.S. degree in Computer Science.

515 Computer Organization (3:3:0). Prerequisites: Undergraduate courses or equivalent knowledge in structured programming in a high-level language. Computer hardware organization: arithmetic and logical operations; combinational and sequential logic; machine representation of numbers, characters, and instructions; addressing techniques; microprogramming; reduced instruction set computers. Symbolic assembly language and interrupts and input/output organization, are also covered. Credit cannot be applied to any graduate degree in IT&E or the B.S. degree in Computer Science.

590 Program Design and Data Structures (3:3:0). Prerequisite: Undergraduate courses or equivalent knowledge in structured programming in a high-level language. Study of the fundamentals of data structures and algorithms applied in programming solutions to application problems. The course stresses programming in a modern high-level language. Laboratory required. Credit cannot be applied to any graduate degree in School of Information Technology and Engineering.

601 Operating Systems Theory and Practice (3:3:0). Prerequisites: INFS 501, 515, and 590; or equivalent. Fundamental concepts including process synchronization and scheduling, interprocess communication, memory management, virtual memory, deadlocks, security and access-control, file and disk management, performance analysis, and distributed systems. The impact of computer architecture on operating systems is examined. Case studies and comparative analysis of operating systems are presented.

612: Principles and Practices of Communication Networks (3:3:0). Prerequisites: INFS 501, 515, 590 (or equivalent) and the ability to program. This course introduces the principles of computer networks and their applications to the Internet. Details of layering, protocols, performance, resource allocation, management, security and other contemporary issues related to networks are discussed. Examples of the course material are protocols such as HTTP(S), DNS, TCP/IP, RSVP, SNMP, algorithms such as Dijkstra's link state routing, security measures such as firewalls and encryption, principles behind them and analysis of their performance. Lectures are complemented by a programming project and analytical exercises.

614 Database Management (3:3:0). Prerequisites: INFS 501, 515 and 590; or equivalent. Introduction to database systems, emphasizing the study of database models and languages and the practice of database design and programming. Topics include the Entity-Relationship model, the relational model and its formal query languages, SQL, the theory of relational database design, and object-oriented and logic-based databases. Computing lab is required.

622 Information Systems Analysis and Design (3:3:0). Prerequisites: INFS 501, 515 and 590; or equivalent. Integration of computing technologies, systems analysis, system design practices, and management criteria in the design of large-scale information management and decision support systems. Cases and a computing lab are included.

623 Information Retrieval (3:3:0). Prerequisites: INFS 501, 515, and 590; or equivalent. Study of models and methods for storage and retrieval of unstructured information, such as documents. Topics include information retrieval models, automatic indexing, document clustering, statistical thesauri, search techniques, performance measurement, answer visualization, and search engines for retrieval from the World Wide Web.

640 Introduction to Electronic Commerce (3:3:0). Prerequisites: INFS 501, 515, and 590; or equivalent. Electronic Commerce in its broadest sense; information technology support; business support (financial, marketing, resource planning, etc.); ethical, cultural, and policy issues; national and international legal issues; telemedicine, medical and industrial applications; evaluation of quality of service.

641 Group Project in Electronic Commerce (3:6-3:6:0). Prerequisite: Completion of INFS 640. Projects in electronic commerce (EC) selected to illustrate special problems and solutions in development, design, and implementation of EC Systems; designed to need multiple skills in economics, information technology, and business involving ethical, cultural policy, and legal issues; groups therefore selected to have multiple skills. Projects selected from public sector, medical, or industrial application.

650 Object Oriented Applications for Information Systems (3:3:0). Prerequisites: INFS 501, 515 and 590; or equivalent. Principles and applications of object-oriented methods in information systems. The study of a variety of languages and design methods is used for class construction. Higher-level tools for system construction are considered. Applications are investigated through program construction and case studies in varied settings, such as database systems, graphical user interfaces, knowledge-base systems, simulations, and prototyping. Programming projects are required.

697 Topics in Information Systems (1-6:1-6:0). Prerequisite: Permission of instructor. Special topics in information systems not occurring in the regular INFS sequence are presented. May be repeated for credit when distinct offerings of the course differ in subject.

740 Individual Project in Electronic Commerce (3:3:0). Prerequisite: Completion of INFS 640. Projects in electronic commerce selected to illustrate special problems and solutions in development, design, and implementation of EC Systems; designed to need multiple skills in economics, information technology, and business involving ethical, cultural policy, and legal issues. Projects selected from public sector, medical, or industrial application.

750 Application Frameworks for Windowed Information Systems (3:3:0). Prerequisites: INFS 601 and 650. Studies the use of object-oriented visual application frameworks in building event-driven windowed systems. Topics include windowed systems as event-driven systems; central architecture of windowed systems and the encapsulation of windowed architectures by object-oriented frameworks, and analysis and design of windowed applications. The various features of visual application frameworks will be illustrated using a variety of information systems applications. Programming projects.
755 Data Warehousing and Mining (3:3:0). Prerequisite: INFS 614 or equivalent. The course covers techniques for designing and maintaining large data warehouses. Topics covered are OLAP, star schemas, data integration, data cleaning, maintenance of views in the presence of updates to the sources, and query processing of warehouses. The second part of the course focuses on mining data from the warehouses. Topics include data mining techniques such as classification, clustering, association rules, mining of time-series and complex data. The emphasis is on scalability over large data sets.

760 Advanced Database Management (3:3:0). Prerequisite: INFS 614. Study of advanced database models and languages, database design theory, transaction processing, recovery, concurrency, distributed database, security and integrity. Recent developments and research directions are discussed.

762 Information Systems Security (3:3:0). Prerequisite: INFS 601 or permission of instructor. Study of security policies, models, and mechanisms for secrecy, integrity, and availability. Topics include operating system models and mechanisms for mandatory and discretionary controls, data models, concepts and mechanisms for database security, basic cryptography and its applications, security in computer networks and distributed systems and control and prevention of viruses and other rogue programs.

764 Object-Oriented Database Systems (3:3:0). Prerequisite: INFS 614 or CS 650, or permission of instructor. The knowledge of an object-oriented programming language such as C++ is highly desirable. Study of concepts and systems of object-oriented (OO) databases. Topics include OO design, data models, query languages, new data types, and implementation. Also included are a detailed case study and a project performed on a OO-DBMS. Various prototypes, commercially available systems, and emerging standards are surveyed.

765 Database and Distributed Systems Security (3:3:0). Prerequisite: INFS 614 and 762 or permission of instructor. Science and study of methods of protecting data: Discretionary and mandatory access controls, secure database design, data integrity, secure architectures, secure transaction processing, information flow controls, inference controls, and auditing. Security models for relational and object-oriented databases. Security of databases in a distributed environment. Statistical database security. Survey of commercial systems and research prototypes.


767 Secure Electronic Commerce (3:3:0). Prerequisite: INFS 762 or 766. Cryptography review, cryptographic protocols, secure electronic transactions, public key certificates and infrastructures, authentication and authorization certificates, secure credential services and role-based authorization, mobile code security, security of agent-based systems, electronic payment systems, intellectual property protection, secure timestamping and notarization.

770 Knowledge Management for E-Business (3:3:0). Prerequisite: INFS 622 or permission of instructor. This course studies knowledge management within the context of large organizations, particularly those that conduct business on the web and over the Internet. Topics include the knowledge management (KM) process model and lifecycle; case studies of effective KM in organizations, e-business frameworks and models, including business-to-consumer, business-to-business, and net marketplaces; the extensible markup language (XML) and its use in e-business transactions and services; the role of standards in effecting inter-enterprise process models and workflows; the intelligent integration and interchange of information among business partners; web service architectures and standards; and security and digital rights management in e-business environments.

790 Information Systems Policy and Administration (3:3:0). Prerequisites: Completion of all core courses, and preferably taken in final semester prior to graduation. Capstone course that integrates the technical and executive policy issues of information systems. Critical executive issues are examined through case studies and a comprehensive individual project.

796 Directed Readings (3:3:0). Prerequisite: Graduate standing in information systems with at least 12 prior credit hours in M.S. Research and analysis of a contemporary problem in information system development. Prior approval is required by a faculty sponsor who supervises the student's work. Written report or thesis proposal is required. A maximum of 6 hours may be earned.

797 Advanced Topics in Information Systems (3:3:0). Prerequisite: Permission of instructor. Special advanced topics not occurring in the regular INFS sequence. May be repeated for credit when distinct offerings of the course differ in subject.

798 Research Project (3:3:0). Prerequisite: 18 hours of credit applicable towards M.S. Research project chosen under the guidance of a full-time graduate faculty member, resulting in a written technical report. Prior approval required by a faculty sponsor who supervises the student's work.

799 Thesis (1-6:0:0). Prerequisite: 18 hours of credit applicable toward M.S. Original or compilary work evaluated by a committee of three faculty members.

Information Technology (IT)

School of Information Technology and Engineering

Graduate courses listed under the Departments of Computer Science; Electrical and Computer Engineering; Civil, Environmental, and Infrastructure Engineering; Information and Software Engineering; Systems Engineering and Operations Research; and Applied and Engineering Statistics are appropriately considered as courses forming an inherent part of this program.

100 Information Technology in Action (1:1:0). Prerequisite: Permission of instructor. Designed for students pursuing the IT minor. Introduction to current issues as well as career-related opportunities in the IT field. Appreciation of the manifold implications of technological change.

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and motivation for continued, enthusiastic learning in the area of IT.

101 Introduction to Information Technology (3:3:0). Introduces students to the fundamental concepts in information technology that provide the technical underpinning for state-of-the-art applications. A perspective on the range of information technology is presented. Historical development and social implications of efforts in information technology form an integral part of the course.

103 Introduction to Computing (3:1:2). Prerequisite: Knowledge of high school algebra. May not be taken for credit after receiving a grade of C or better in any CS course numbered 112 or higher. An introduction, using both lecture and laboratory practice, to the nature and uses of computers. Widely used applications including word processing, spreadsheets, databases, and presentation software are studied. Laboratory projects are required in these areas. Additional lectures address computer systems organization, computer communications and networking, legal and ethical considerations (including privacy, intellectual property, and appropriate uses of technology), the effective presentation of information, computer security, artificial intelligence and the future of computing and the Internet.

108 Programming Fundamentals (3:2:1). Prerequisite: IT 103. Introduction to programming fundamentals for non-technical majors. Software development process is presented. Students learn to write programs in a high level language. IT&E majors cannot receive credit for IT 108 after receiving a C or better in CS 112. IT 108 does not fulfill any IT&E major requirements. IT minor students may take both IT 108 and CS 112 for credit.

212 How Computers Work (3:3:0). Designed for students pursuing the IT minor. A look inside today's personal computers. Covers, in a nontechnical manner, what makes computers "tick" from transistor basics up to accessing the Internet. Describes all the essential components within a PC and how they interact. Also addresses the latest aspects of computer technology (e.g., DVD) and how they affect computer use and operation. Presentations of actual hardware (VLSI integrated circuits, modems, etc.) are included so that students can visually appreciate the complexity of the circuitry involved.

213 Multimedia and Computer Graphics (3:2:1). Prerequisites: IT 103, 108. Designed for students pursuing the IT minor. Introduces tools to configure graphical user interfaces (GUIs), multimedia authoring systems, graphical and multimedia components, and data types and provide web design principles.

214 Database Fundamentals (3:3:0). Designed for students pursuing the IT minor. Study of relational database systems and their applications. The creation and manipulation of tables and formulation of queries. The use of forms and reports for end-users, with visual element enhancements. Data modeling and the formation of relations. Examination of recent trends in database management, including web applications.


250/STAT 250 Introductory Statistics I (3:3:0). Prerequisite: High school algebra. Elementary introduction to statistics. Topics include descriptive statistics, probability, estimation and hypothesis testing for means and proportions, correlation, and regression. Students use statistical software for assignments. F,s,sum

300 Modern Telecommunications (3:3:0). A comprehensive overview of telecommunications, including current status and future directions. Topics include a review of the evolution of telecommunications; voice and data services; basics of signaling, digital transmission, network architecture and protocols; local area, metropolitan and wide area networks and narrow band ISDN, asynchronous transfer mode and broadband ISDN; and satellite systems, optical communications, cellular radio, personal communication systems, and multimedia services. Examples of real-life networks are provided to illustrate the basic concepts and gain further insight.

331 Web I: Introduction to Web Development (3:3:0). This course introduces the concepts needed to be successful in the web development environment. Discussed are topics such as the similarities and differences in Internet browsers and user computer configurations (connection speed, display settings, etc.). The student learns to develop web pages with a text editor and HTML tags, images, tables, forms, frames and associated attributes. A more powerful WYSIWYG HTML editor. Other topics include introductory Dynamic HTML (DHTML) and Cascading Style Sheets. A graphic development tool is used to allow students to develop graphics files for their projects–png, gif, jpg, and animated gifs. A long-range web development project is begun.


341 Network and Operating System Essentials (3:3:0). Prerequisites: IT 101, 108, 212, or permission of instructor. This course introduces the student to the basics of network security tools, administrative tools, network protocols and fundamentals of TCP/IP, using standard operating systems such as Windows and Unix.

342 Operating Systems for Administrators (3:3:0). This course describes practices and procedures for installing and configuring modern operating systems, including user accounts, file, print and terminal servers, mobile computing, and disaster protection.

350 Introduction to Entrepreneurship (3:3:0). This course introduces the student to the concept of entrepreneurship and the skills, concepts, and information that entrepreneurs use. More specifically students will learn about entrepreneurs and that they are neither super human nor
particularly gifted. The course also examines why and how entrepreneurs start companies and how this is different from the way large companies expand their operations. Finally, the course is designed to help the student build the skills for starting a company. To this end it provides an introduction through readings, lectures, and exercises to all of the concepts and methods needed to do so. After completing this course the student should have the skills needed to develop and write a good first draft of a business plan.

362/STAT 362 Introduction to Computer Statistical Packages (3:3:0). Prerequisite: IT 250/STAT 250 or equivalent. Use of computer packages in the statistical analysis of data. Topics include data entry, checking, and manipulation, as well as the use of computer statistical packages for regression and analysis of variance.

422 Data Communication and Networks (3:3:0). Introduction to concepts in data communication systems. Emphasis on impact of communications technology on information systems.


441 Network Servers and Infrastructures (3:3:0). This course covers networking concepts and practices for using DHCP, DNS, WINS, Public Key infrastructure, routing, remote address services, web servers, and network connectivity between operating systems.

443 IT Resources Planning (3:3:0). This course provides students with essential strategies and procedures for planning, organizing, staffing, monitoring, and controlling the process of designing, developing, and producing a system that will meet a stated IT-related need in an effective and efficient manner.

462/INF S 462 Information Security Principles (3:3:0). Prerequisite: INF S 312 Computer Architecture and Operating Systems or equivalent. Study of security policies, models, and mechanisms for secrecy, integrity, availability and usage controls. Topics include models and mechanisms for mandatory, discretionary and role-based access controls; authentication technologies; control and prevention of viruses and other rogue programs; common system vulnerabilities and countermeasures; privacy and security policies and risk analysis; intellectual property protection; legal and social issues.

466/INF S 466 Network Security (3:3:0). Prerequisite: INF S 312 Computer Architecture and Operating Systems or equivalent. Symmetric and asymmetric cryptography; encryption, message authentication codes and digital signatures; cryptographic authentication; digital certificates and public key infrastructure; the standards process; cryptographic protocols; SSL, IPSEC and related protocols; secure e-mail; intrusion detection.

491 IT Seminar (1:1:0). Prerequisite: 90 credits in the B.S. in Information Technology program. IT ethics, professionalism, the role of the IT professional in society, current IT issues, and employment opportunities.

492 Synthesis I (3:3:0). Prerequisite: Senior standing in the B.S. in Information Technology program. Work includes developing a proposal for a project that can demonstrate the student's preparedness as a practicing IT professional. Oral and written reports are required during the preparation of the proposal and also after the proposal is completed.

493 Synthesis II (3:3:0). Prerequisite: IT 492, preferably in the preceding semester. Implementation of the project for which preliminary work was done in IT 492. Oral and written reports are required during the project and also at the project's completion.

498 Independent Study in Information Technology (1-3:0:0). Directed self-study of special topics of current interest in IT. Topics must be arranged with an instructor and approved by the department chair before registering. Course can be taken for a maximum of 3 credits.

499 Special Topics in Information Technology (1-3:0:0). Prerequisites: Permission of instructor; specific prerequisites vary with the nature of the topic. Topics of special interest to undergraduates. May be repeated for a maximum of 6 credits if the topics are substantially different.

500 Quantitative Foundations for Information Systems Analysis (3:3:0). Prerequisite: MATH 108 or an equivalent. Provides a common background in basic quantitative areas focused on decision making, information processing and telecommunications. Topics include a review of pre-calculus, introduction to matrix algebra, problems in optimization, and introduction to probability and statistics. This course does not fulfill any IT&E graduate degree requirement.

557 Introduction to Network Science (3:3:0). Prerequisites: Bachelor's degree in math, science, or engineering; Math 114 and 351. This course is the first of a sequence of two intended to provide a broad treatment of the principles and technologies of modern telecommunications, combined with computing, that create computer networks. Emphasis is on providing sufficient breadth and depth to allow a technical professional to function as an effective entry-level network engineer. This course includes modules in telecommunications principles, telecommunications carrier systems, data communications, local area networks, and wide area network protocols.

657 Advanced Network Science (3:3:0). Prerequisite: IT 557 or permission of instructor. This course is the second of a sequence of two intended to provide a broad treatment of the principles and technologies of modern telecommunications, combined with computing, that create computer networks. Emphasis is on providing sufficient breadth and depth to allow a technical professional to function as an effective entry-level network engineer. This course includes modules in wireless telecommunications, network security, network management, and advanced network protocols.

746/CSI 776 Calculus of Random Signals (3:3:0). Prerequisite: STAT 652 or CE 630 or 632. Introduction to modern theory of stochastic calculus such as stochastic integrals, martingales, counting processes, diffusion processes, and lto-type processes in general. Presents applications of the methods to engineering and biology. Focus is on developing the necessary concepts rather than mathematical proofs. Suited for graduate students in information technology, electrical engineering, mathematics, operations research, and statistics.

http://catalog.gmu.edu
750/CS 750 Theory and Applications of Data Mining (3:3:0). Prerequisite: CS 681, 687, or 688, or permission of the instructor. Concepts and techniques in data mining and their multidisciplinary applications. Topics include databases, data cleaning and transformation, concept description, association and correlation rules, data classification and predictive modeling, performance analysis and scalability, data mining in advanced database systems including text, audio and images, and emerging themes and future challenges. Term project and topical review required.

776/CSI 778 Real Analysis and Statistics (3:3:0). Prerequisites: STAT 652 or ECE 620, 621, and 630. Advanced calculus and linear algebra needed for doctoral work in statistics and related fields. Topology, vector spaces, attractors, continuity, differentiation, sequences and series of real numbers and real-valued functions, Riemann and Riemann-Stieltjes integrals, and multidimensional calculus. Applications in probability and statistics including response surface methodology are presented.

796, 797 Directed Reading and Research (1-3:0:0). Reading and research on a specific topic in information technology under the direction of a faculty member. May be repeated as needed.

803, 804 Doctoral Tutorial in Information Technology (3:3:0). Individualized intensive study of particular aspects of information technology. May be repeated as needed.

809 Scaling Technologies for E-business (3:3:0). Prerequisites: at least one operating systems and one networking course, and admission to an IT&E doctoral program. This course discusses, from a quantitative point of view, the characteristics of the most important technologies used to support the implementation of e-business sites. The discussion includes topics such as hardware and software architectures of e-business sites, authentication, and payment services, understanding customer behavior, workload characterization, scalability analysis, and performance prediction. A term paper and a project are required.

811 Principles of Machine Learning and Inference (3:3:0). Prerequisite: CS 80, 681, or permission of instructor. Presentation of unifying principles that underlie diverse methods, paradigms, and approaches to machine learning and inference. Reviews the most known learning and inference systems, discusses their strengths and limitations, and suggests the most appropriate areas of their application. Students get a hands-on experience by experimenting with the state-of-the-art learning and inference systems and work on projects tailored to their research interests.

812 Advanced Topics in Natural Language Processing (3:3:0). Prerequisite: CS 680. Advanced treatment of topics in syntax, semantics, and generation of linguistic output. Implementation and applications are also discussed.

814/CSI 801 Foundations of Computational Science (3:3:0). Prerequisite: CS 735 or equivalent. Investigation methods for scientific questions in the presence of teraops computation, gigabyte memory, and gigabit transmission. Mapping of mathematical models to parallel algorithm and architectures, associated data structures, languages, operating systems, networks, and global change demonstrate important scientific accomplishments enabled by computation. Working in teams with scientists and information technologists, students learn the mathematical models, abstract algorithms, and concrete algorithms for these cases, and conduct experiments and simulations with them.

815 Parallel Computation (3:3:0). Prerequisite: CS 635 or IT 816 or CSI 801. Topics illustrating some of the contemporary thinking on architectures, application, development environments, algorithms, operating system related issues, language requirements, and performance for parallel computation.

816 Parallel Architectures, Algorithms, and Applications (3:3:0). Prerequisites: CS 583 and computer architecture course. Familiarization for students in area of parallel architectures, algorithms, and parallel computers. Various algorithms and their applicability to certain architectures are discussed. Comparisons of these parallel algorithms with certain tools are studied, and applications to artificial intelligence, image processing, and database machines are explored.

817 Neural Networks (3:3:0). Prerequisite: CS 688 or permission of instructor. Study of adaptive and competitive principles using distributed and parallel computation. Topics include background from statistics, control, adaptive signal processing, and neurosciences. Basic models, such as those suggested by Grossberg, Hopfield, and Kohonen, are discussed in terms of their analytical characteristics and applications. Neural networks are assessed as universal approximators. Connections to the fuzzy approach are established through the Radial Basis Function approach. Applications to perception, knowledge-based systems, and robotics are presented.


819 Computational Models for Probabilistic Inference (3:3:0). Prerequisite: SIST 664 or 652. Graphical models for encoding conditional independence assumptions in a multivariate discrete probability distribution. Includes computational methods for updating probabilities when evidence is observed on some variables in the model. Algorithms for finding the most probable instantiation of the network. Applications in expert systems and decision analysis.

821 Software Engineering Seminar (3:3:0). Prerequisite: SWE 621. Study of the application of software engineering principles, design methods, and support tools through real-life problems extracted from faculty/industry projects. May be repeated with a change in topic.

822 Software Maintenance and Reuse (3:3:0). Prerequisites: CS/SWE 621 (or equivalent), data structures, principles of modern programming, discrete mathematics, or permission of instructor. Perfective maintenance, reuse of software components and patterns, evolving software systems, principles of object-oriented analysis and development. Issues regarding technologies supporting perfective software maintenance and reuse are presented.

823 Software for Critical Systems (3:3:0). Prerequisites: SWE 620 and STAT 554. Study of software for systems in which failure can be catastrophic. Techniques to construct and analyze software for critical applications and exami-
nations of inherent limitations of such techniques are presented, as well as interaction between techniques used during development and behavior of software during operation. Topics include tolerance of software faults, design redundancy, data redundancy, software safety, formal methods, statistical testing, design for analyzability, and design for testability.

824 Program Analysis for Software Testing (3:3:0). Pre-requisite: CS 540 or CS/SWE 637, or permission of instructor. Different methods for analyzing software are described, primarily for the purpose of testing. Analysis techniques, specific algorithms, tools, and applications. Goals are to explore the current research issues, learn how to build software analysis tools, and understand how these techniques can be applied to software development activities. The primary focus is on applications for testing software, including automatic test data generation, object-oriented testing, and testing client-server applications. Analysis techniques for other software-related activities such as maintenance, reuse, object-oriented development, metrics, and optimization are also considered.

830/ECE 734 Detection and Estimation Theory (3:3:0). Prerequisites: ECE 528, or permission of instructor. Introduction to detection and estimation theory with application to communication applications. Topics include M-hypotheses, Bayes, minimax, Neyman-Pearson criterion, detection of signals in AWGN and ACGN, Bayes estimation, ML estimation of signal parameters in AWGN and ACGN, estimation of Gaussian waveforms in Gaussian noise, linear MSE estimation, and Kalman and Wiener filters.

832/ECE 735 Speech and Image Coding (3:3:0). Prerequisites: ECE 632 and 635. A study of waveform coding concepts and algorithms and their applications to the analysis and design of data compression systems. Specific schemes involving speech and image transmission are discussed. Topics include statistical properties of speech and image signals, rate distortion theory, adaptive and predictive coding techniques, optimum quantization, and bit assignment algorithms.

833/ECE 739 Satellite Communication (3:3:0). Prerequisite: ECE 631. Introduction to the theory and applications of modern satellite communications. Topics include satellite channel characterization, channel impairment and transmission degradation, link calculations, modulation, coding, multiple access, broadcasting, random access schemes, demand assignment, synchronization, satellite switching and on-board processing, integrated service digital satellite networks, and satellite transponder, ground stations, packet switching, and optical satellite communications.

834/ECE 742 Telecommunications Networks (3:3:0). Prerequisites: ECE 528 and 642, or permission of instructor. Open Systems Interconnection Reference Model, analysis and modeling of layered network architectures including transport and higher layers, performance evaluation of System Network Architecture, DEC Network Architecture, and other telecommunication architectures. Protocols and standards for local, metropolitan, and wide area networks are also discussed. Topics include high-speed packet switching, broadband multimedia protocols, and congestion control in broadband integrated networks.

835 Computational Vision (3:3:0). Prerequisites: CS 682 and 686, or permission of instructor. Study of recent advances in development of machine vision algorithms and knowledge-based vision systems. Topics include scale-space, Gabor and wavelet processing, distributed and hierarchical processing using neural networks, motion analysis, active, functional, and selective perception; object and target recognition; expert systems; data fusion; and machine learning. Emphasis is on system integration in terms of perception, control, action, and adaptation. Applications to robotics, intelligent highways, inspection, forensic, and data compression are presented.

836/ECE 836 Special Topics in Detection and Estimation Theory (3:3:0). Prerequisite: ECE 734. Advanced topics in detection, estimation, and signal processing in areas of current research interest. Topics may include spectral estimation, speech recognition, array processing, SAR, underwater acoustics, or higher order spectra.


838/ECE 638 Signal Processing Algorithms and Architectures (3:3:0). Prerequisite: ECE 635 or permission of instructor. Study of recent advances in the development of fast-signal processing algorithms and parallel architectures. Topics include fast transforms, multirate processing of digital signals, adaptive filtering, high-resolution spectral analysis, parallel computational arrays, and mapping of signal processing algorithms into array processors.

840/CS 685/ECE 750/SYST 672 Intelligent Systems for Robots (3:3:0). Prerequisite: SYST 611, ECE 650, CS 580, SYST 555, or equivalent. Review recent developments in the area of intelligent autonomous systems. The applications of artificial intelligence, control theory, operations research, decision sciences, computer vision, and machine learning to robotics are studied as well as correspondence between various fields. Topics include analysis and design of methods, algorithms and architecture for planning, navigation, sensory data understanding, visual inspection, spatial reasoning, motion control, learning, self-organization, and adaptation to the environment.

841/ECE 722 Kalman Filtering with Applications (3:3:0). Prerequisite: ECE 521 and 528 or equivalent, or permission of instructor. Detailed treatment of Kalman Filtering Theory and its applications, including some aspects of stochastic control theory. Topics include state-space models with random inputs, optimum state estimation, filtering, prediction and smoothing of random signals with noisy measurements, all within the framework of Kalman filtering. Additional topics are nonlinear filtering problems, computational methods, and various applications such as Global Positioning System, tracking, system control, and others. Stochastic control problems include linear-quadratic-Gaussian problem and minimum-variance control.

842 Models of Probabilistic Reasoning (3:3:0). Prerequisite: STAT 544 and OR 681. Survey of alternative views about how incomplete, inconclusive, and possibly unreliable evidence might be evaluated and combined. Among
the views discussed are the Bayesian, Baconian, Shafer-Dempster, and Fuzzy systems for probabilistic reasoning.

843/ECE 720 Multivariable and Robust Control (3:3:0). Prerequisite: ECE 620 or permission of instructor. Eigenstructure assignment for multivariable systems, the Smith-McMillan form, internal stability, modeling system uncertainty, performance specifications and principal gains, parametrization of controllers, loop shaping and loop transfer recovery, and the H\textsuperscript{\infty} methodology.

844/ECE 749 Pattern Recognition (3:3:0). Prerequisite: ECE 549 and 620; CS 580 and 688; or equivalents. Study of the fundamentals of statistical pattern recognition, functional and density approximation, and adaptive systems. Topics include the Bayesian approach, non-parametric statistics and neural networks, adaptive fuzzy systems and control, Bayesian nets and Hidden Markov Models (HMM), and evolutionary computation and genetic algorithms. Applications to clustering and recognition, time-series prediction and model-based identification, forensics, and knowledge-mining are presented.

845/ECE 780 High-Frequency Electronics (3:3:0). Prerequisite: ECE 520. Study of devices and circuits used in high-speed communication systems. Topics include microwave bipolar transistors, GaAs MOSFETs, and high-speed integrated circuits; and the design of linear and power amplifiers using S-parameter techniques and computer simulation.

846/ECE 721 Nonlinear Systems (3:3:0). Prerequisite: ECE 521. Nonlinear dynamical systems. Motivating examples. Analysis techniques include basic fixed point theory, implicit function theorem, dependence of trajectories on initial data and parameters. Course also covers computational simulation techniques, stability theory, including Lyapunov's direct method, nonlinear control systems: input-output stability, and absolute stability, strong positive real transfer functions. Feedback linearization of nonlinear systems, nonlinear canonical forms; nonlinear decoupling; sliding control; and applications to adaptive control, neural networks, and robotics are also included.

847/ECE 847 Topics in Photonics (3:3:0). Prerequisite: ECE 565 or permission of instructor. In-depth discussion of specific topics in photonics. Topics include optical storage (disks, holographic, 3D), digital optical computing, integrated optics, photonic switching networks, and optoelectronic devices. May be repeated when covering different topics.

848/ECE 743 Digital Video Communications (3:3:0). Prerequisites: ECE 535 and 642. Coding, transport, and modeling of digital video signals; digital coding of waveforms with emphasis on compression techniques for video signals, transform coding including DCT and rate distortion theory for images, subband/wavelet coding of images, treatment of video signals for different television formats, colorimetry and motion estimation/compensation, general characterization of video traffic, modeling of variable bit rate video codecs, transport protocols for video and multimedia, network-delay compensation for video over ATM, VBR video flow control, and discussion of applications ranging from HDTV/TV over ATM, digital HDTV for terrestrial broadcast, to videoconferencing/desktop multimedia over LAN/WAN.


851 Seminar: Topics in Software Requirements (3:3:0). Prerequisite: SWE 620 or 624, or CS 624. Emphasis on the latest research ideas in the requirements engineering domain. Discusses the current state-of-the-art and state-of-the-practice in requirements engineering. Focuses on the most critical problems and discusses how their resolutions might further the requirements research knowledge base and enhance the quality and productivity of real software and system developments in industry. May be repeated when the topic is different.

852 Graphical Real-Time Simulation (3:3:0). Prerequisite: CS 632 or IT 875. Current research in advanced computer graphics and its applications in realistic real-time simulations. Topics include physically based modeling, real-time simulation, distributed interactive simulation (DIS), network virtual environments (NVE), and virtual reality (VR).

858 Logic Models in Artificial Intelligence (3:3:0). Prerequisite: CS 580. Examination of the relevance of logic theory to artificial intelligence. Familiarizes students with a variety of formal logics that are used in artificial intelligence, as well as ongoing research in new logics. Topics include first-order predicate calculus, resolution and non-resolution theorem proving, nonmonotonic logic, assumption-based reasoning, the relationship between symbolic and quantitative theories of uncertainty, temporal logics, and their application to planning and metareasoning.

860 Software Analysis and Design of Real-Time Systems (3:3:0). Prerequisite: SWE 623. Background for students who want to conduct research in the software engineering of real-time systems. Students gain an understanding of key real-time software system analysis, design concepts and methods, and how they are used in the development of large-scale, real-time software systems. Students also gain an understanding of the potential impact of emerging technologies in this field. Term project in the design and analysis of a complex real-time software system is undertaken.

861 Distributed Database Management Systems (3:3:0). Prerequisite: INFS 614 or equivalent. Topics in distributed database management including transaction management, concurrency control, deadlocks, replicated database management, query processing reliability, and surveys of commercial systems and research prototypes.
862 Computer Security Models and Architectures (3:3:0). Prerequisite: Six credits from INFS 762, 765, 766 and 767. This course covers modern computer security models and architectures in the context of large-scale distributed systems, including cross-enterprise systems. Models for role-based access control, lattice-based access control, and delegated administration are studied and compared with respect to formal and pragmatic criteria. Architectures to implement these models based on public-key infrastructure, trusted servers, and other components are studied.

863 Empirical Methods in Information Technology (3:3:0). Prerequisite: STAT 654. Examination of alternative paradigms of scientific research and their applicability to research in information technology. Topics include empirical nature of scientific investigation, basic principles of experimental design and statistical induction, philosophy of science and its relation to the information technology sciences, and case studies of information technology research.

864 Scientific Databases (3:3:0). Prerequisite: INFS 614. Study of database support for scientific data management. Requirements and properties of scientific databases; data models for statistical and scientific databases; semantic and object-oriented modeling of application domains; statistical database query languages and query optimization; advanced logic query languages; and case studies such as the human genome project and the earth orbiting satellite are covered.

865 Networks and Distributed Systems Security (3:3:0). Prerequisite: INFS 612 or equivalent. A detailed study of network and distributed systems security. Review of basic cryptography and threats and vulnerabilities in distributed systems. Security services and confidentiality, authentication, integrity, access control, nonrepudiation, and their integration in network protocols are covered. Topics also include key management, cryptographic protocols and their analysis; access control, delegation, and revocation in distributed systems; and security architectures, multilevel systems, and security management and monitoring.

867 Intelligent Databases (3:3:0). Prerequisite: INFS 760 or permission of instructor. Study of models and techniques that empower database systems with intelligent and cooperative behavior, with emphasis on subjects such as knowledge-rich databases, logic databases, epistemological queries, intentional answering, and knowledge discovery. Topics include user interfaces cooperative query interfaces, interactive query constructors, graphical interfaces, and browsers; uncertainty representing, manipulating, and retrieving uncertain, imprecise, or incomplete information; and formulating and interpreting vague or incomplete queries.

870 Organizational Informatics (3:0:0). Prerequisite: doctoral status or permission of instructor. An examination of the effects of informatics on national and international policy; setting of international policy on informatics; ethical and social change in governments and organization; shaping of national policy in informatics; industry growth; and research methods from various scientific disciplines.

874 Analysis of Complex Surveys (3:3:0). Prerequisites: STAT 656, 665, and 674 or permission of instructor. Presentation of current theory and methods of statistical analysis of data from complex surveys of finite populations. Includes contingency table analysis and regression analysis; modeling structured populations by multilevel models; and loglinear, logistic, and regression models for stratified and multistage cluster samples. Case studies are used to illustrate the methodology.

875/CSI 803 Scientific and Statistical Visualization (3:3:0). Prerequisite: STAT 554 or CS 651. Presentation of visualization methods used to provide new insights and intuition concerning measurements of natural phenomena and scientific and mathematical models. Case study examples from a variety of disciplines to illustrate what can be done are presented. Topics include human perception and cognition, an introduction to the graphics laboratory, elements of graphing data, representation of space-time and vector variables, representation of 3D and higher dimensional data, dynamic graphical methods, and virtual reality. Students are required to work on a visualization project. Emphasizes software tools on the Silicon Graphics workstation, but other workstations and software may be used for the project.


877/CSI 877 Geometric Methods in Statistics (3:3:0). Prerequisite: STAT 751 or permission of instructor. Develops the foundations of geometric methods for statistics. Topics include n-dimension Euclidian geometry, projective geometry, differential geometry including curves, surfaces, and n-dimensional differentiable manifolds, and computational geometry including computation of convex hulls, and tessellations of 2-, 3-, and n-dimensional spaces. Examples include applications to statistics and scientific visualization.

879 Topics in Stochastic System Simulation (3:3:0). Prerequisite: OR 635 or permission of instructor. Special topics and recent developments in the Monte Carlo simulation methodology for discrete-event stochastic systems. Contents vary and possible topics include statistical analysis of simulation output data, random number and random variable generation, variance reduction techniques, sensitivity analysis and optimization of simulation models, distributed and parallel simulation, object-oriented simulation, and specialized applications. May be repeated for credit when topics are distinctly different.

880 Queuing Modeling of Computer-Communication Networks (3:3:0). Prerequisite: OR 645, 647, ECE 542; or equivalents. Study of analytical modeling of computer and communication networks and performance evaluations. Topics include Markovian systems, open networks, closed networks, approximations, decomposition, simulation, sensitivity analysis, and optimal operation of systems. Local area networks, manufacturing systems, and other applications are presented.

882 Advanced Topics in Combinatorial Optimizations (3:3:0). Prerequisites: OR 641 and 642. Study of problems using the most recent developments. Topics include cutting plane procedures based on polyhedral combinatorics, column-generation procedures for large complex problems.
lems, heuristic approaches (genetic algorithms, simulated annealing, tabu search), the study of special structures, reformulation techniques and bounding approaches. Topics stress the most recent developments in the field. May be repeated for credit when topics are distinctly different.

884 Advanced Topics in Nonlinear Programming (3:3:0). Prerequisite: OR 644. Study of theory and algorithms for solving nonlinear optimization problems. Contents vary, and possible topics include large-scale and parallel-unconstrained optimization, theoretical issues in constrained optimization, duality theory, Lagrangian and sequential quadratic programming methods. May be repeated for credit when topics are distinctly different.

885/ECE 752 Spectral Estimation (3:3:0). Prerequisite: ECE 528 or STAT 652 or permission of instructor. In-depth study of spectral analysis and its application to statistical signal processing. Topics include classical Fourier analysis of deterministic signals and Wiener theory of spectral analysis for random processes; spectral estimation using the Periodogram and the window approaches; maximum entropy spectral estimation and its relation to autoregression modeling; signal subspace approaches for frequency estimation; and the wavelet transform and its relation to the short-time Fourier transform.

886/ECE 751 Information Theory (3:3:0). Prerequisite: ECE 630 or STAT 644 or equivalent or permission of instructor. In-depth study of information theory and its application to communication theory. Topics include measures of information such as entropy, mutual information, and relative entropy; the asymptotic equipartition property; noiseless source coding; Universal Source Coding and the Lempel-Ziv algorithm; channel capacity and the channel coding theorem; the Gaussian channel; and rate distortion theory and quantization.

888/ECE 753 Distributed Estimation and Multisensor Tracking and Fusion (3:3:0). Prerequisite: ECE 734 or SYST 611. Centralized and distributed estimation theory, hierarchial estimation, tracking and data association, multisensor multitarget tracking and fusion, distributed tracking in distributed sensor networks, track-to-track association and fusion, and Bayesian networks for fusion.

890 Special Topics in Urban Transportation (3:3:0). Prerequisite: CEIE 660, 650 or equivalent or permission of instructor. Special topics and recent developments in Urban Transportation. Possible subjects include traffic safety analysis, simulation in transportation, intelligent transportation systems, and advanced public transportation systems. Congestion management, travel demand management, geographic information systems in transportation, innovative refinancing and public/private partnerships in transportation, information technology in transportation. May be repeated for credit when topics are distinctly different.

891 Special Topics in Applications of Information Technology to Urban Systems Engineering (3:3:0). Prerequisites: CEIE 670 or permission of the instructor. Special topics and recent developments in the area of Information Technology as applied to civil engineering. Possible topics include inventive engineering, design engineering, network computing, building and using intelligent agents in engineering, proactive design, etc. May be repeated for credit when topics are distinctly different.

892 Special Topics in Environmental and Water Resource Systems Engineering (3:3:0). Prerequisite: CEIE 601. Special topics and recent developments in environmental and water resources systems engineering analysis and design. Possible topics include studies in waste minimization; pollution prevention; hazardous waste management; wastewater management; air pollution control; solid waste management; environmental decision making; sustainability; water resource and environmental economics; wetlands management, design and construction; groundwater contamination modeling; stochastic hydrology; river basin planning and management and water quality modeling. May be repeated for credit when topics are distinctly different.

894 Design and Inventive Engineering (3:3:0). Prerequisite: SYST 573, CEIE 670, or OR 681 or permission of instructor. Topics include evolution of engineering, design engineering, inventive engineering, general design methodology, conceptual versus detailed design, axiomatic design theory, inferential design theory, engineering method in design, design paradigms, case-based design, proactive design, design evaluation, virtual design studio, Internet and browsers in design, creative problem solving, problem solving methods, and computer tools to support design creativity.

910 Advanced Topics in Artificial Intelligence (3:3:0). Prerequisite: Graduate course in artificial intelligence. Special topics in artificial intelligence not occurring in the regular computer science sequence. Requires substantial student participation. Subject matter may include continuation of existing 600- or 700-level courses in artificial intelligence and/or other topics. May be repeated for credit when subject matter differs.

915 Advanced Topics in Parallel Computation (3:3:0). Prerequisite: IT 815. Discussion of current research topics in parallel computation. Topics vary according to student and faculty interest. Possible topics include formal models of concurrency, specification and design of parallel programming languages, logic programming in a parallel environment, and parallel distributed processing (neural networks).

922 Concurrent Object-Oriented Systems (3:3:0). Prerequisite: IT 822. Comparative study of existing concurrent object-oriented approaches to problem analysis and software construction. Introduces current research issues in concurrent object-oriented systems, concurrency models, and concurrent object-oriented programming languages and development tools.

932/ECE 737 Spread Spectrum Communications (3:3:0). Prerequisite: ECE 731. Fundamentals of spread spectrum communications. Major topics include pseudo-noise spread spectrum systems, acquisition, synchronization, time-hopping, frequency hopping, and multiple access communication.


940 Advanced Topics in Control and Robotics (3:3:0). Prerequisites: ECE 620, 621, 624, and 630. Advanced and newly developed topics in control and robotics. Content
varies depending on current faculty interests and student demand. Topics such as knowledge-based control, intelligent control, hierarchical and distributed control, robust control, and reasoning under uncertainty are included.

941 System Identification and Adaptive Control (3:3:0). Prerequisite: ECE 621 or permission of instructor. Advanced treatment of identification and adaptive control. Topics include identification algorithms, their convergence accuracy, and computational aspects; model reference and self-tuning adaptive control, transients, stability and robustness; and intelligent schemes to improve robustness. Students are also required to study the literature and to complete a computer project.

944 The Process of Discovery and Its Enhancement in Engineering Applications (3:3:0). Prerequisite: IT 842 or permission of instructor. Study of ingredients of imaginative reasoning as it concerns the efficient discovery of new ideas and valid evidential test of them. Topics include different interpretations of Peirce's theory of abductive reasoning, other forms of reasoning, Hintikka's analysis of the process of inquiry, and current attempts to design systems that provide assistance in discovery-related or investigative activities.

945/ECE 945 Advanced Topics in Microelectronics (3:3:0). Prerequisite: IT 845. Current topics of advanced research in microelectronics. Topics include very high speed integrated circuits, monolithic microwave integrated circuits, optoelectronic integrated circuits, novel device structures, and advances in semiconductor device technology. May be repeated with a change in topic.

950 Design and Management Aspects of Information Systems (3:3:0). Prerequisite: INF S 790 or equivalent. Impact of organizations and management of information systems (IS) and vice versa. Topics include problems of introducing IS; the effect on organizational economic and political framework; participative design and new techniques for specification, analysis, design, and implementation of IS; rapid prototyping and expert systems; possible conflicts; methods in life-cycle management; and economic analysis.

958 Basic and Applied Decision Support Systems Technology (3:3:0). Prerequisite: SYST 642. Analysis of tools, techniques, and methods that contribute to the design, development, application, and evaluation of interactive computer-based decision support systems. State of the art and state of the expectation of basic and applied decision support systems technologies like requirements definition, software engineering, analytical methods assessment, and structured evaluation are analyzed.

962 Advanced Topics in Computer Security (3:3:0). Prerequisite: IT 862 or 865, or permission of instructor. Current topics of advanced research in computer security. Content varies depending on faculty interests, research developments, and student demand. Requires substantial student participation. Representative topics include formal models for computer security, multilevel data models, multilevel database management system architectures, secure concurrency control protocols, distributed secure system architectures, integrity models and mechanisms, security policy, and requirements analysis.

972/CSI 972 Mathematical Statistics I (3:3:0). Prerequisite: STAT 652 or equivalent. Focus on the theory of estimation. Principles of estimation are explored, including the method of moments, least squares, maximum likelihood, and maximum entropy methods. Methods of minimum variance unbiased estimation are covered in detail. Topics include sufficiency and completeness of statistics, Fisher information, Cramer-Rao bounds, Bhattacharyya bounds, asymptotic consistency and distributions, statistical decision theory, minimax and Bayesian decision rules, and applications to engineering and scientific problems. af

973/CSI 973 Mathematical Statistics II (3:3:0). Prerequisite: IT 972. Continuation of IT 972. Concentration on the theory of hypothesis testing. Topics include characterizing the decision process, simple versus simple hypothesis tests, Neyman-Pearson Lemma, uniformly most powerful tests, unbiasedness of tests, invariance of tests, randomized tests, and sequential tests. Applications of the testing principles are made to situations in the normal distribution family and to other families of distributions. as

976/CSI 976 Statistical Inference for Stochastic Processes (3:3:0). Prerequisite: IT 746/CSI 776. Modern theory of parameter estimation and hypothesis testing for stochastic processes, counting processes with random intensities, and solutions to stochastic differential equations driven by martingales. Applications to engineering, biology, and economics are considered. as

978/CSI 978 Statistical Analysis of Signals (3:3:0). Prerequisites: STAT 544 and 658 or equivalent. Advanced course in the analysis of discrete- and continuous-time signals using methods of stochastic differential equations and time series. Familiarity with the methods of harmonic analysis and times series modeling is presumed. Topics include state-space modeling and eigen-value processing, non-linear modeling of signals, non-Gaussian stochastic process structure, detection and estimation of vector-valued signals, robust signal detection, with applications to array processing and target tracking.

979/CSI 979 Topics in Statistical Aspects of Information Technology (3:3:0). Prerequisite: STAT 652 or equivalent. Study of statistical science and the body of methods and techniques that convert raw data into information. Contents vary. Such topics as high-interaction statistical graphics, stochastic methods for parallel computing, cryptography and covert communications, order-restricted inference, treatments of imprecision, and the foundations of inference are covered. May be repeated when topics are distinctly different.

980 Advanced Topics in Applied Probability (3:3:0). Prerequisite: OR 645, 647, or permission of instructor depending on the topic(s) for the semester. Special topics and recent developments in the field of applied probability. Contents vary and possible topics include computational probability, stochastic point processes, advanced queueing theory, traffic and transportation models, percolation, processes of random aggregation and coagulation, and Markov decision processes. May be repeated for credit when topics are distinctly different.

981 Advanced Topics in Optimization (3:3:0). Prerequisite: IT 741, 750, 881, 882, or 884. Special topics and recent developments in optimization. Contents vary and may include topics in linear, nonlinear, combinatorial, network, global, or stochastic optimization. Prepares students to perform research in optimization, and
requires active student participation. May be repeated for credit when topics are distinctly different.

983 Advanced Topics in Network Optimization (3:3:0). Prerequisite: OR 643. Recent developments in solving optimization problems on networks. Prepares doctoral students to perform advanced research on network-related problems. Topics include linear, discrete, nonlinear, and stochastic problems. Several aspects of these problems are also studied, including computational complexity, exact algorithms, heuristics, solvable special cases, and computer implementation issues.

990 Dissertation Topic Presentation (1:0:0). Prerequisite: Completion of all course requirements for Ph.D. in IT or permission of instructor. Opportunity for Ph.D. students to present their research proposal for critique to interested faculty and students. Covers the presentation of the research topic for the Ph.D. in Information Technology, and is required of all Ph.D. students. The student will complete a dissertation research proposal. May be repeated with a change in topic, although degree credit is given once.

991 Engineer Project Presentation (1:0:0). Prerequisite: Completion of all course requirements for the engineering degree in information technology, or permission of instructor. Opportunity for engineering degree students to present their project proposal for critique to interested faculty and students. Covers the presentation of the project topic for the engineering degree in information technology, and is required of all engineering degree students. The student will complete a project proposal. May be repeated with a change in topic, although degree credit is only given once.

996 Engineer Project Proposal (1-6:0:0). Work on a project proposal that forms the basis for the dissertation for the engineering degree. May be repeated. No more than 12 credit hours of IT 996 and 997 may be applied to engineering degree requirements.

997 Engineer Project Dissertation (1-6:0:0). Prerequisite: Admission to candidacy. Formal record of commitment to engineer project dissertation under the direction of an advisory committee in information technology. May be repeated as needed.

998 Doctoral Dissertation Proposal (1-12:0:0). Work on a research proposal that forms the basis for a doctoral dissertation. May be repeated. No more than 24 credit hours of IT 998 and 999 may be applied to doctoral degree requirements.

999 Doctoral Dissertation (1-12). Prerequisite: Admission to candidacy. Formal record of commitment to doctoral dissertation research under the direction of a faculty member in information technology. May be repeated as needed.

Initiatives in Educational Transformation—Teaching (IETT)

Graduate School of Education

750 Studies in Language and Culture I (3:3:0). Students have the opportunity to consciously view how language shapes realities, including perceptions of children as learners. At the same time, they explore both the cultural constraints and the transformative possibilities embedded in language.

751 Studies in Language and Culture II (3:3:0). Building on their IETT 750 work, students investigate more closely academic discourses and the ways they frame lived realities. Exploring the theme of how language and culture shape and open interpretations of the world, students research language and culture in their practice.

752 Research in Practice: The Team Project (6:3:0). Concurrent with other courses, student teams refine their research topics and develop projects to investigate those topics. The design of the work-plan contains a detailed strategy involving children as partners rather than as subjects in research. The product of the project is a substantial piece of work submitted together with a plan for its dissemination in the school community.

753 Teaching and Learning (3:3:0). This capstone course aims to help teachers document and reflect on individual growth and transformation while participating in the IET school-based master’s program. Through the development of a portfolio, teachers provide evidence to demonstrate their professional growth and provide documentation about themselves as teachers and learners in the two years of the program. As part of the documentation, teachers present their team research projects in the professional conference organized as the third summer session.
524/EDSE 524 Assistive Technology for Individuals with Learning Disabilities (2:2:0). Focuses on strategies and techniques for implementing software and other technologies in the lives of individuals with learning disabilities from ages 3 to adult. Students have the opportunity to develop and implement plans for assistive technology. A practicum is required as part of this course. Knowledge and awareness components of this course may be delivered via distance education.

525/EDSE 525 Software for Individuals with Special Needs (1-2:1-2:0). Focuses on software evaluation and design for individuals with disabilities. Students have the opportunity to explore existing software resources and identify design features to meet an individual's special needs. Students create a software program for a person with disabilities (Credit 2). Knowledge and awareness components of this course may be delivered via distance education.

526/EDSE 526 Assistive Technology and the Internet (2:2:0). Provides an overview of the World Wide Web/Internet. The focus is on accessibility issues and solutions. Students perform web searches and design and produce an informational web page. Knowledge and awareness components of this course may be delivered via distance education.

530 Scripting and Programming (1-3:1-3:0). Enables students to develop computer-based educational materials using a widely known educational scripting language. Students explore basic authoring capabilities and learn to apply those capabilities by designing and producing materials using the commands, procedures, and functions of the scripting language.

532 Software Evaluation and Curriculum Integration (3:3:0). Teaches students to examine and apply fundamental evaluation criteria to assess the quality and appropriateness of software in light of instructional objectives. Explores techniques for effective curriculum integration of software within a wide range of classroom settings, as well as the means to gauge effective software use to support instructional objectives.

561 Teaching with Telecommunications (1:1:0). Helps students explore and develop expertise with the various aspects of telecommunications tools, as well as model the ways these tools can be used for personal learning and for integration into the teaching/learning process. Addresses e-mail, the Internet, the World Wide Web, and online databases.

562 Teaching with Databases (1:1:0). Helps students explore and develop expertise with the various aspects of databases, as well as model the ways databases can be integrated into the teaching/learning process. Focuses on strategies for searching, sorting, creating, and communicating with information, much of which is structured by a variety of online and offline databases.

563 Teaching with Graphics (1:1:0). Helps students explore and develop expertise with the various graphic programs available for constructing visual images. Addresses draw and paint programs, scanning and editing images, and using visual communication to support K-12 learning.

564 Teaching with TV/Video (1:1:0). Helps students explore and develop expertise with social, cognitive, and learning implications of film, video, and television. Engages students in the process of planning, storyboarding, and filming with video.

565 Teaching with Educational Software (2:2:0). Helps students explore and develop expertise with a variety of educational software, including simulations, problem-solving software, computational tools (calculators, probeware, LOGO, and spreadsheets), and drill-and-practice/integrated learning systems. Emphasizes the ways these programs support the K-12 teaching/learning process.

566 Teaching with Multimedia/Hypermedia (2:2:0). Prerequisite: EDIT 563. Helps students explore and develop expertise with a variety of hypertext/hypermedia and multimedia tools. Emphasizes students' ability to use hypermedia/multimedia tools and then to teach others to use these tools. Covers the ways the integration of hypermedia/multimedia tools in the K-12 curriculum can support learning, and the difference between hypermedia and multimedia.

567 Teaching with Desktop Publishing (2:2:0). Prerequisite: EDIT 563. Helps students explore and develop expertise with a variety of publishing tools, including word processors, desktop publishers, and idea processors. Emphasizes using these tools to communicate. Covers design and layout principles, the appropriate use of images to facilitate communication, and the ways K-12 teachers can design opportunities for students to learn these concepts.

571 Tools for Visual/Graphic Design (1:1:0). Teaches basic knowledge of the tools available for integrating graphics and visual design into computer-based instruction. Exposes students to the latest tools available for the development, integration, and management of visual and graphic display.

572 Tools for Digital Video and Audio (1-3:1-3:0). Provides an overview of digital video and audio software programs and considerations for using these tools in the instructional design process. Gives students an overview of the rationale for using select tools and developing the skills necessary to use them.

573 Project Management Tools (1:1:0). Teaches basic knowledge of the tools available for managing computer-based multimedia and hypermedia projects. Exposes students to the latest tools available for the management, planning, and tracking of large-scale projects. Covers issues related to project management of multimedia.

574 Networking Tools (1-3:1-3:0). Teaches basic knowledge of current networking and telecommunications devices used to enhance the instructional design process. Covers local area networks, telecommunications, and teleconferencing and distance education technologies.

575 Authoring Tools (1-3:1-3:0). Introduces specific authoring tools through hands-on lab instruction, interaction with the software interface, construction of instructional sequences, importing video and audio clips, resource management, and animation. Content is customized to the particular software tool presented.

575-A Authoring Tools: Authorware (1-3:1-3:0). Teaches the basic fundamentals of the Authorware program. The program can be very complex, and only the essential functions of the program are used as a basis for this course. Students develop a basic self-directed design module that includes the major components of the software. Provides the designer with the core foundations for the development of computer-based instructions. Students can...
apply the concepts taught in the Authorware program to other authoring tools.

575-B Authoring Tools: Toolbook (1-3:1-3:0). Introduces object-oriented construction and authoring with Asymetrix’s Multimedia Toolbook. Through hands-on lab instruction, students learn Toolbook’s interface—buttons, fields, palettes, viewer’s hotwords, etc. Teaches advanced concepts of importing video and audio clips, resource management, object-linked and embedding, and path-based animation. An introduction to basic scripting theories prepares students for the next level of Toolbook authoring. Students may apply the concepts taught in this course to other authoring tools.

593 Instructional Hardware Systems (1-3:1-3:0). Teaches students the basic technical features of computer-based hardware systems used in educational settings, including stand-alone computers, peripheral devices, and networking systems.

597 Special Topics in Education (3:0:0). See EDUC 597.

611 Distance Learning via Networks and Telecommunications (3:3:0). Allows students to explore the educational opportunities distance learning affords through electronic networks and telecommunications. Hands-on activities with these technologies focus on planning, implementation, and evaluation. Students discuss emerging applications in distance learning and how new approaches to learning can be integrated into today’s classrooms.

630 Coordinating School-based Educational Technology (3:3:0). Prerequisites: EDIT 532 and 593, or permission of instructor. Examines the responsibilities and knowledge/skill demands of school-based technology coordinators. Addresses broad educational technology issues, as well as resource and facilities management, staff development, curriculum integration, and planning for new technologies.

704 Instructional Technology Foundations and Theories of Learning (3:3:0). Reviews the practical and pedagogical issues related to the design and development of technological instruction. Emphasizes investigating instructional design as a field and community of practice, as well as reviewing core learning theory constructs applicable to the design of instructional technology.

705/EDCI 705 Instructional Design (3:3:0). Prerequisite: Teaching experience. Helps students analyze, apply, and evaluate the principles of instructional design to develop education and training materials spanning a wide range of knowledge domains and instructional technologies. Focuses on a variety of instructional design models, with emphasis on recent contributions from cognitive science and related fields.

711 Teaching with Technology I: Telecommunications and Databases (3:3:0). Corequisite: EDCI 710. Helps students explore and develop expertise with the various aspects of telecommunications and databases, as well as model the ways these tools can be used for personal learning and for integration into the teaching/learning process. Addresses e-mail, the Internet, the World Wide Web, and online and multimedia databases. Also focuses on strategies for searching, sorting, creating, and communicating with information, many of which are structured by a variety of online and offline databases.

713 Teaching with Technology II: Graphics, TV and Video, and Simulations (3:3:0). Corequisite: EDCI 712. Helps students explore and develop expertise with the various graphic programs available for constructing visual images, with the interpretation and creation of video, and with the structure and use of simulations for learning. Addresses draw and paint programs, scanning and editing of images, and use of visual communication to support K–12 learning. Explores the social, cognitive, and learning implications of film, video, and television, and engages students in the process of planning, storyboard, and filming with video. Also focuses on the various categories of simulation, the relationship between simulations and ways of knowing, and strategies for using simulations to promote K–12 learning.

715 Teaching with Technology III: Publishing and Computational Tools (3:3:0). Corequisite: EDCI 714. Helps students explore and develop expertise with a variety of publishing tools, including word processors, desktop publishers, and idea processors. Emphasizes using these tools to communicate. Covers design and layout principles, the appropriate use of images to facilitate communication, and the ways K–12 teachers can design opportunities for students to learn these concepts. Also helps students explore and develop expertise with a variety of tools commonly used as part of “computational science” and mathematical modeling. These tools include programming languages such as LOGO, calculators, spreadsheets, probeware, and graphing calculators.

717 Teaching with Technology IV: Hypermedia and Emerging Technologies (3:3:0). Corequisite: EDCI 716. Helps students explore and develop expertise with a variety of hypertext/hypermedia and multimedia tools. Emphasizes students’ ability to use hypermedia/multimedia tools and then to teach others to use these tools. Focuses on understanding the difference between hypermedia and multimedia. Also examines a range of educational technologies expected to become important applications within the next three to eight years, such as virtual reality and disturbed learning.

720 Leadership Issues in Educational Technology (3:3:0). Examines how educational technology can provide an infrastructure for creating, managing, and evaluating innovative types of teaching/learning environments. Explores new assumptions about learning, instructional technology, and organizational development as a foundation for planning how schools can use technology to evolve beyond conventional approaches.

725 Technology and Diversity (3:3:0). Focuses on the ways technology may be used to support the learning needs of all students, including English as a Second Language (ESL) students, bilingual students, and students with special needs. Emphasizes helping teachers use technology to support learning when faced with such diverse learners in one classroom.

730 Analysis and Design of Multimedia/Hypermedia Environments (3:3:0). Prerequisites: EDIT 732 and knowledge of an authoring tool. Allows students to design, implement, and evaluate technology-based education and training materials using advanced computer-based authoring tools.

732 Advanced Instructional Design: Constructive Methods (3:3:0). Prerequisite: EDCI/EDIT 705. This is the capstone course of a three-course sequence on the theory and practice of instructional design. Helps students apply the ideas developed in prior courses to complete a major
Instructional Technology (EDIT) • International Commerce and Policy (ITRN)  405

Instructional design project. Covers leading-edge ideas in the evolution of instructional design.

750 Emerging Educational Technologies (3:3:0). Prerequisites: EDCI 705 and EDRS 590, or permission of instructor. Examines a range of educational technologies expected to become important applications in the next three to eight years. Assesses the potential of these emerging technologies to improve practice and to alter the mission and content of education, and helps students develop skills in strategic planning.

752 Design and Production of Multimedia and Hypermedia Learning Environments (3:3:0). Prerequisites: EDIT 530, COMM 555, and EDCI 705, or permission of instructor. Allows students to design and produce multimedia/hypermedia applications based on current theory and research in instructional design and cognitive science. Examines user needs, information models, structure, and media selection and uses to inform the design and production of the final project.

771 Introduction to Multimedia/Hypermedia (2:2:0). Provides an overview of the issues and tools used within the field of instructional design. Focuses on the development of skills necessary to implement hypermedia多媒体 ideas into the production process.

772 Web-Based Instructional Tools (2:2:0). Provides an overview of web page development tools. Gives students an opportunity to develop designing principles and skills for publishing documents on the World Wide Web. Students interact with a variety of web publishing software programs and work with general design principles to develop a series of web pages based on a given theme.


790 Practicum in Instructional Technology (1-6:1-6:0). Prerequisites: Completion of IT track requirements, except for practicum, and permission of advisor. Provides supervised practice in applying the knowledge and skills of the student's chosen track through placement in an appropriate work setting.

791 Project Development Practicum (9:9:0). Corequisites: EDIT 704 and 732. Designed for full-time students in the Instructional Technology Track 1 Design and Development Immersion Program, this course option allows students to join a design team focusing on the instructional design process and development of a technology-based instructional or training product. Students are expected to reflect on their involvement and process of instructional design through the submission of a portfolio at the culmination of the experience.

792 Advanced Project Development Practicum (9:9:0). Prerequisite: EDIT 791. Designed for full-time students in the Instructional Technology Track 1 Design and Development Immersion Program, this course option allows students to participate in a second design project team, refining their skills in the process of instructional design. Students are expected to substantially reflect on their first design experience and bring to the advanced project development team an enhanced understanding of instructional design.

797 Advanced Topics in Education (3:3:0). See EDUC 797.

895 Emerging Issues in Instructional Technology (3:3:0). Prerequisite: Admission to the Ph.D. program or permission of instructor. Covers selected emerging issues in instructional technology. This seminar examines ways instructional technology provides an infrastructure for creating, managing, and evaluating innovative types of teaching/learning environments.

Interdisciplinary Studies (MAIS)
College of Arts and Sciences

798 Individualized Studies Project (3-6:0:0). Prerequisites: Degree candidacy in M.A. I.S. Individualized Studies or Liberal Studies tracks, completion of 27 credits of graduate course work, and approval of project proposal by the faculty advisor, two committee members, and M.A.I.S. program director. Individualized Section form required. Research project related to the student's concentration taken under supervision of the faculty advisor and project evaluation committee.

799 Individualized Studies Thesis (6:0:0). Prerequisites: Degree candidacy in the M.A.I.S. Individualized Studies or Liberal Studies tracks, completion of 27 credits of graduate course work, and approval of a thesis proposal by the faculty advisor, two committee members, and M.A.I.S. program director. Individualized Section form required. Research project related to the student's concentration taken under supervision of the faculty advisor and project evaluation committee.

500 Approaches to International Commerce and Policy (4:3:0). First foundation course in the ICP program. Introduces the fields of national economic policy and international trade, investment, and finance. Using a case-study method, students learn basic economic concepts such as national income accounting, balance of payments, and factors affecting foreign exchange rates. Students are also given practice in comparing national strategies for growth and development and in using political and economic analysis to assess the reasons for the choice of a national economic strategy and its relative effectiveness.

502 Comparative Political Institutions (4:3:0). Introduces the political institutions of the United States and its major trading partners in Europe, Asia, and Latin America. The course underlines American exceptionalism, how the latter is manifested in the country’s institutions and policies, and what consequences it has for America's international position.

503 Investment and Macroeconomics for International Commerce (4:3:0). Provides students with an overview of basic concepts in macroeconomic theory, as well as mathematical skills, with an emphasis on their application to problems of the contemporary global economy. The course covers subjects such as monetary systems, balance of payments, the foreign exchange market, foreign investment and international institutions, and issues in world monetary arrangements.

http://catalog.gmu.edu
504 Trade and Microeconomics for International Commerce (4:3:0). Provides a foundation in international economics and presents the fundamentals of international trade, finance, and transactions. The course focuses on alternative approaches to understanding the international economic system. Topics include classical and neoclassical theories of trade, alternative theories of trade and their extensions, tariffs, customs unions, institutions, and economic development. Students learn to employ appropriate analytical approaches, including graphical analyses, and to communicate the results concisely. Throughout, the emphasis is on relating theory to practical applications.

601 Research and Analysis Methods for International Commerce (3:3:0). Provides the skills necessary to conduct qualitative and quantitative research and analysis of international trade and transactions. Students obtain practical information on sources of data and their origins, strengths, and weaknesses. The course helps students develop tools for statistical analysis of data, and includes use of computers for analyzing and displaying information. It covers major data sources as well as literature and indices related to international transactions. A final oral and written presentation that demonstrates skill in communicating complex data concisely is required.

602 International Financial Institutions and Globalization (3:3:0). Examines the nature and dynamics of financial interactions between public and private sectors throughout the world. The aims and actions of the international financial institutions in fostering trade and development are covered, with emphasis on emerging economies. Policy issues include devolving political and economic structures, differing resource and cultural endowments, privatization, financial crises, sector imbalances and equity. International and domestic financial markets and instruments are reviewed.

603 International Trade Relations (3:3:0). Examines the role of the United States in the world economy and the evolving global trading system. The course analyzes the regulatory framework for trade and the political dynamics of international trade relations. Particular attention is given to domestic trading institutions and global and regional institutions such as the GATT/WTO, NAFTA, EU, and APEC. The debate between free and fair trade advocates as well as prospects for U.S. trade policy are examined.

604 International Trade and Technology (3:3:0). Examines science and technology policies and international trade, with an emphasis on their relationships and interactions. Assesses the roles of science and technology as economic drivers and explores the strategies employed by companies and governments to link research and development to economic growth and competitiveness. Examines the research and development systems and technology-related trade policies of the United States, Japan, Europe, major developing countries, and selected newly industrialized economies, with an emphasis on policies affecting trade and technology. Explores specific cases involving interactions between science, technology, and international trade.

605 International Commerce and Culture (4:3:0). Examines and applies the major dimensions of cultural analysis to international commerce and policy. The course assesses cultural perspectives that influence the flow of peoples, messages, goods, capital, and technology across national and cultural boundaries. It focuses on problems that U.S. officials and the business community face when conducting activities in the context of differing cultures and value systems. Examples from particular world culture zones are considered, including East Asia, Africa, the Muslim world, Europe, and the former Soviet Union.

612 International Business Operations and the Multinational Corporation (3:3:0). Examines the international business environment and the challenges facing companies in conducting operations in an increasingly interconnected global marketplace. The course focuses on issues of management and organization, as well as on the resolution of conflicts that may arise between business organizations and their home and host governments. An additional focus is on the role of multinational corporations in the international environment and their impact on global trade, economic development, and the political system. Trade and international investment theories and the world financial environment are also studied. Broad issues such as sovereignty of decision making and the global impact of business activities are also explored.

701 Special Topics in International Commerce and Policy (1-3:1-3:0). Offers specialized courses on various aspects of international commerce and policy.

702 Special Topics in International Commerce and Policy: Study Abroad (3:3:0). Provides an opportunity for study abroad under the supervision of a George Mason faculty member. Course topics, content, and locations vary.

710 International Business Transactions: Finance and Investment (3:3:0). Focuses on techniques for financing trade and on payment methods, including letters of credit, countertrade, and other approaches. Issues of direct concern in the financing of international business operations, such as preparing financing proposals, risk insurance, international taxation, pricing policies, and currency conversion and foreign exchange risk management, are covered. The course introduces concepts of foreign direct investment, alliances and acquisitions, joint ventures, and other methods for investing overseas.

711 United States Law and Global Trade (3:3:0). Prerequisite: ITRN 603 or permission of instructor. Surveys the types of regulations imposed by the United States, foreign governments, and international institutions on transnational business activities. The course reviews the principal regulatory bodies in the United States and overseas, and their powers and authorities. Covers tariffs and customs regulations; product safety and environmental restrictions; intellectual property, copyright, trademark, and patent regulations; and licensing rules. The course also covers special restrictions that may be imposed because of political considerations such as embargoes, munitions controls, and antibiery and antiboycott regulations.

712 World Trade Organization and Global Trade (3:3:0). Focuses on the legal aspects of international trade regulation by studying the international legal and political regime established under the WTO and assessing the impact of domestic economic legislation on U.S. trade regulations.

716 European Union in the International System (3:3:0). Examines current developments in European market integration from a global perspective. Emphasizes the impact of the single market and the proposed economic and monetary union of the United States and other major trading partners. Examines European economic relations with Eastern Europe, the former Soviet Union, and the Lome Pact countries.
720 Regional and Supranational Organizations (3:3:0).
Assesses the role of international organizations in the
international system today and focuses on a wide range of
international and regional economic and political institu-
tions. Emphasizes the changing nature of these organiza-
tions in relation to nation states and the relationship of
international organizations to U.S. national security and
economic interests.

730 Information Technology Fundamentals for Inter-
national Business and Trade (3:3:0). Deals with technol-
ogy and issues relating to the emergence of computing,
information, and telecommunications technologies in the
mainstream of society. The aim is to provide a general un-
derstanding and facility with technologies of contempo-
rary interest.

731 Business-to-Business Marketing in International
Commerce (3:3:0). Provides students with an understand-
ing of the concepts of the international marketing process
and the international environment within which compa-
nies operate.

734 Pricing in International Commerce (3:3:0). Deals
with learning the theory and techniques of pricing that
enable an organization to effectively pursue its marketing
and business strategies.

736 Sources of Growth in East Asia (3:3:0). Examines
the extraordinary economic success of the East Asian NIEs
and some of their present problems. The focus is on under-
standing the proximate sources of growth, the role of tech-
nological development, and salient political issues.

737 World Trade in Semiconductors and Information
Technologies (3:3:0). Examines bilateral and multilateral
approaches to world trade in technology products. The U.S.-
Japan Agreement on Semiconductors and its successor
agreements are compared with those of the WTO. The
course also looks at the effects of the agreements on U.S.
industry, their relevance to trade development, and com-
mmercial transactions.

738 Fundamentals of International Marketing (3:3:0).
Allows students to acquire a working knowledge of prin-
ciples and practices that enable managers to effectively
market organizations, products, services, and brands. The
course emphasizes the international dimensions of mar-
keting where appropriate.

740 ABCs of Exporting and Importing (3:3:0). Acquaints
students with legal, regulatory, and practical issues that arise
in the importation and exportation of merchandise. Topics
include the theoretical framework for government oversight
of international movement of goods, legal issues between
parties and governments; and practical guidance concern-
ing the structuring of import and export transactions to avoid
legal and tariff liability.

742 Technology Policy and International Strategies
(3:3:0). Introduces students to the opportunities and prob-
lems created for organizations and society by the emerg-
ing Internet and policies affecting the trajectory of Internet
developments. Also covers technological factors in the plan-
ning horizon; domestic policy and international treaty fac-
tors affecting the Internet trajectory; and new horizons for
Internet applications.

744 The Politics of International Competitiveness (3:3:0).
Provides an inquiry into the governance problems of pub-
lic managers and political leaders as they cope with global
competitiveness in the post-industrial era. The course fo-
cuses on the integration of the public and private sectors
worldwide, with special emphasis on the United States' role
and how it influences such areas as technology trans-
fer, national security, electronic commerce, trade policies,
money flows, and human resources.

750 Trade and Politics in Eastern Europe and the Former
Soviet Union (3:3:0). Examines the background of and
recent developments in the political, business, and cultural
environment confronting American firms seeking to do
business in Eastern Europe and the former Soviet Union.
The course emphasizes international trade patterns and
relations between these states and the United States. It ex-
amines modes of doing business in these countries and
the unique problems American firms confront. The focus is on
privatization, joint ventures, and countertrade.

751 Trade, Investment, and Politics in the Western Hemi-
sphere (3:3:0). Examines the cultural, political, economic,
and legal aspects of conducting business and trade with
countries of the Western Hemisphere. The focus is on the
evolving pattern of inter- and intra-hemisphere trade, as
well as on the region's global trade integration. Special
attention is given to NAFTA and other bilateral and regional
agreements, and to the potential for and implications of a
free trade area in the hemisphere. The course emphasizes
manipulation and analysis of regional trade data to describe
and project trade patterns.

752 International Business Lobbying in the United
States, Europe, and Japan (3:3:0). Presents a compara-
tive overview of the lobbying process and of lobbying prac-
tices, and explores the representation of foreign firms in
the United States, the European Community and its mem-
ber states, and Japan. Contemporary problems relating to
lobbying by multinational corporations in a foreign politi-
cal and cultural setting are examined.

Examines the impact of globalization and changes in the
international economic and political systems on concepts
of national security. Emphasizes the nexus of economic
and security concerns in the post-cold war era, with par-
ticular attention to emerging issues, including trade and
economic security, proliferation of advanced military tech-
nology and control of weapons of mass destruction, inter-
national drug trafficking, and defense conversion. The focus
is on the implications of changing security requirements
on U.S. defense and economic policy and activities.

757 Global Corporate Business Planning and the Com-
petitive Edge (3:3:0). Provides students with an introduc-
tion to planning international business activities, including
licensing agreements, joint ventures, acquisitions, and di-
vestitures. Using a step-by-step planning methodology, stu-
dents learn to integrate marketing, financial, regulatory,
legal, and cultural factors into a management strategy and
business plan.

758 Global Market Planning Practicum (3:3:0). Provides
students with an opportunity to develop an international
market plan for a specific industry or service sector. Stu-
dents consult with industry experts and use key trade data-
bases to develop a strategic plan that recommends market
entry strategies. The completed market plan is submitted
to industry experts for their use and dissemination.
759 Trade Licensing, Controls, and Documentation (3:3:0). Examines legislation and practices concerning regulation of trade. Reviews current customs and import-export control regulations and documentation requirements for international transactions. The course is designed for students who need a practical and detailed understanding of rules and documentation for international business transactions.

760 International Environmental Politics (3:3:0). Examines the growing concerns related to global environmental issues and the problems they pose to political institutions—domestic, foreign, and international. The course covers the major environmental issues such as global warming, ozone depletion, cross-border flow of pollution, and threats to biodiversity. It assesses the strengths and weaknesses of traditional political institutions in dealing with these issues and providing for sustainable economic development while limiting environmental damage.

761 European Political and Economic Union (3:3:0). Examines the movement for European integration since World War II, focusing on the political and institutional development of the European Community/Union. Topics include theories of European integration, the Treaties of Rome, the Single European Act, the Maastricht Treaty, European Union (EU) policies and programs, and the EU’s external relations. Analyzes especially the changing nature of U.S.-EU relations and prospects for EU enlargement into Central and Eastern Europe.

764 Trade, Investment, and Politics in East Asia (3:3:0). Examines issues related to international transactions involving Korea, China, Taiwan, and Hong Kong, with some attention to Japan. The focus is on trade and financial relations between these East Asian nations and the United States. The course assesses the impact of culture and domestic political and economic institutions within these states as well as their roles in regional institutions and in the international system.

765 Trade, Investment, and Politics in Sub-Saharan Africa (3:3:0). Examines the role and potential of sub-Saharan Africa in the international trading system. Political, historical, cultural, and development factors are emphasized. The course focuses on the perspectives of U.S. firms as well as on international institutions trading or investing in this region.

766 Trade, Investment, and Politics in the Middle East and North Africa (3:3:0). Examines the major economic, political, and cultural issues that influence trade and investment relations with the Middle East and North Africa. The course focuses on the roles of international and regional institutions in economic development, and develops an understanding of the challenges facing the region and of their implications for the formulation of trade and investment strategies by U.S. firms.

767 Political Economy and Integration in Latin America (3:3:0). Examines the contemporary political, economic, and cultural dynamics of the Latin American and Caribbean regions. Emphasizes issues and trends that affect U.S.-Latin American political, business, and trade relations, particularly recent political and economic reforms. The course examines the roles of domestic interest groups and decision-making systems in individual countries, as well as the evolution of regional integration arrangements and integration with the international system.

769 International Entrepreneurship (3:3:0). Introduces students to a practical planning approach for small and medium-size entrepreneurial firms seeking to enter the international marketplace. The course focuses on the key business and financial documents related to doing business overseas, and assesses the role of language, technology, and information systems in formulating a successful business strategy. Role playing and simulated negotiations provide opportunities for students to sharpen their business skills.

770 International Contract Negotiation (3:3:0). Reviews the growing role of arbitration in international transactions. Examines the roles of international, national, and government arbitration bodies, with a particular emphasis on how differing cultural characteristics affect negotiating behavior and the effectiveness of arbitration.

771 Trade, Investment, and Politics in South and Southeast Asia (3:3:0). Focuses on trade and finance issues in the most dynamic countries of South and Southeast Asia. The course assesses cultural and political factors, regional trade patterns, and institutions, with a focus on the implications for regional development and for business opportunities for U.S. firms.

772 International Telecommunications (3:3:0). Focuses on developments in the field of international telecommunications and satellite regulation. The regulatory environment and the business and financial aspects of the global telecommunications industry are examined.


780 Internship (1/3:3:0). Open to authorized graduate majors only. Departmental and advisor approval are necessary before enrolling. Provides the student with a practical work experience in state, federal, or international agencies or the private sector. A written project that integrates the work experience and the student’s academic program is required.

790 Independent Study (1/3:3:0). Open to authorized graduate majors only. Departmental and advisor approval are necessary before enrolling. Provides students an opportunity to pursue intensive research in an area of particular interest not covered by other courses. Note: Not all courses earn three hours of graduate credit. Some courses may vary in length and thus in credits earned. Some course requirements are subject to change.

795 Final Project (1-3:0:0). Includes the writing of a 40-page capstone paper that draws together the key themes of the program. Completion of the project is required for graduation.

Italian (ITAL)

Modern and Classical Languages

101 Elementary Italian I (3:3:1). Designed for students with no prior knowledge of Italian. Introduction to Italian,
including elements of grammar, vocabulary, oral skills, listening comprehension, and reading. Lab work required.

102 Elementary Italian II (3:3:1). Prerequisite: ITAL 101 or permission of instructor. Continuation of ITAL 101. Lab work required.

201 Intermediate Italian I (3:3:1). Prerequisite: ITAL 102 or permission of department. Further development of skills in listening, speaking, and writing. ITAL 201 and 202 must be taken in sequence. Lab work required.

202 Intermediate Italian II (3:3:1). Prerequisite ITAL 201 or permission of department. Application of language skills to reading, composition, and discussion.

Japanese (JAPA)
Modern and Classical Languages

101, 102 Introduction to the Japanese language (3:3:1), (3:3:1). Must be taken in sequence. Introduction to Japanese, including basic grammar, oral expression, listening comprehension, and reading and writing. Lab work required.

109 Intensive Japanese I (6:6:2). Equivalent to JAPA 101, 102 taught in a single semester. Recommended for students who desire an intensive introduction to Japanese. May not be taken for credit in combination with JAPA 101 or JAPA 102. Lab work required.

201 Intermediate Japanese I (3:3:1). Prerequisite: JAPA 102 or equivalent. Further development of skills acquired in JAPA 101 and 102, including grammar, oral expression, listening comprehension, and reading and writing. The use of the written language (katakana, hiragana, and kanji) emphasized. Lab work required. JAPA 201 and 202 must be taken in sequence.

202 Intermediate Japanese II (3:3:1). Prerequisite: JAPA 201 or equivalent. Continuation of JAPA 201. Lab work required.

209 Intensive Japanese II (6:6:2). Prerequisite: JAPA 201 or 109 or equivalent. Equivalent to JAPA 201, 202 taught in a single semester. May not be taken for credit in combination with JAPA 201 or 202. Lab work required.

Latin (LATN)
Modern and Classical Languages

Placement: See Academic Testing section of Admission chapter.

101, 102 Elementary Latin (3:3:0). Must be taken in sequence. Introduction to Latin, including basic grammar, vocabulary, and development of reading skills, and introduction to Roman civilization.

109 Intensive Elementary Latin (6:6:0). Equivalent to LATN 101 and 102 and taught in a single semester. Recommended for students in the minors of classical studies or Latin and for students who want an intensive introduction to Latin. May not be taken for credit in combination with LATN 101 or 102.

201 Intermediate Latin I (3:3:0). Prerequisite: LATN 102 or equivalent. Intensive review of elementary grammar. Introduction to more advanced grammatical constructions and patterns of usage, continued development of reading proficiency and vocabulary and readings in Latin literature.

202 Intermediate Latin II (3:3:0). Prerequisite: LATN 201 or equivalent. Study of advanced grammatical constructions, vocabulary, and patterns of usage. Reading of selections from Roman authors of the late Republic and early Empire, and study of their cultural and political background.


321 Latin Tutorial (1-3:0:0). Prerequisites: LATN 202 or equivalent and permission of program chair. Readings in Latin drawn from classical or postclassical literature. Selection of authors or genres by instructor in consultation with student. Meetings on a tutorial basis. May be repeated once.

351 Roman Prose Literature (3:3:0). Prerequisite: LATN 202 or equivalent. Introduction to a major work of prose and its themes and literary qualities. Emphasis on interpretation and stylistic analysis. Course concentrates on one complete work. Topics and authors vary. May be repeated for credit.

352 Roman Poetry (3:3:0). Prerequisite: LATN 202 or equivalent. Introduction to a major work of poetry and to its themes, meters, and poetic techniques. Emphasis on interpretation, metrical and stylistic analysis, and the poet's role in society. Topics and authors vary. May be repeated for credit.

451, 452 Studies in Roman Literature (3:3:0, 3:3:0). Prerequisites: LATN 351/352 or equivalent, or permission of instructor. Focus on a single Latin author or literary genre. Approaches subject from a variety of interpretive perspectives and uses secondary literature as well as primary texts. Topics and authors vary. Sequence may be repeated for credit.

Law (LAW)
School of Law

181 Telecommunications Law and Regulation (3:3:0). Federal regulation of the telecommunications industry including broadcasting, cable, common carrier, commercial and private mobile radio, satellite, and broadband wireless. The course includes a study of the major legal and technical issues involved in organizing, financing, maintaining, and regulating the U.S. telecommunications industries. The balance between public need and private enterprise is addressed, and the course includes questions about first amendment and copyright issues related to the airwaves and cyberspace.

Learning, Social and Organizational (LRNG)
School of Public Policy

492, 592 Special Topics in Social and Organizational Learning (1-3:1-3:0). Covers topics in social or organizational change seen from economic, historical, philosophical, literary, organizational, and/or information technology perspectives. Courses first appear under this heading. Consult program office and class schedules for descriptions. May be repeated for credit.
572 Taming the Electronic Frontier (3:3:0). Using the Internet as a primary medium for interactive learning, this innovative course is offered in a classroom as well as over cable TV. It establishes a dialog between producers and consumers of information-age goods by exploiting distance-learning technologies such as television in combination with e-mail/FTP/gopher/WAIS and other groupware tools. These provide the basis for electronically mediated organizational learning exercises that challenge traditional power relationships between producers and consumers in all institutional contexts.

583 Groupware for Organizational Learning (3:3:0). Provides exposure to groupware systems such as Lotus Notes, the World Wide Web, and Folio Views, and the ways they can be incorporated to help organizations use knowledge more effectively. Trains students in application development for enhancing organizational learning, and introduces them to the range of diverse software products designed to facilitate coordination and collaborative work.

592 Internet Literacy (1:1:0). This five-week, one-credit minicourse taught via the Internet and video provides Internet competency for distance-learning initiatives across the George Mason University curriculum. Topics include concepts, skills, and software for reading, searching, and writing hypertext for the web and for participating in e-mail and newsgroups, for any course in the George Mason curriculum. Uses the new campus infrastructure, cable TV, and videotape, as well as the Internet as the medium of collaborative and experiential learning and as a demonstration of best practices in distance learning.

596 Independent Study (1-12:0:0). Covers research, analysis, and/or implementation within the realm of social and organizational learning. Students work with a member of the program faculty. May be repeated for credit.

601 Organizational Learning (3:3:0). Provides a re-examination of organizations and the role of management from an interpretive standpoint. Develops a process view of organizations that identifies differences in interests, perspectives, and cultures among groups and explains the role of management in facilitating understanding to achieve effective cooperation in a dynamic work environment. Themes include organizational culture, decision making, collaborative communities, and teamwork, and the "reading" of organizational change. Case studies and experiential exercises reinforce the learning process. The course complements LRNG 672.

602 Group Dynamics and Team Learning (3:3:0). Using unstructured learning environments, participants learn how to facilitate team learning for organizational effectiveness by engaging in meaningful group interaction. Explores various aspects of group dynamics such as power, perception, motivation, leadership, and decision making.

672 Organizational Learning Laboratory (3:3:0). Focuses on the creation of a learning and experimental environment to explore questions and concerns typically faced by managers in their effort to build learning organizations. Questions are analyzed using experiential learning and action research. Classroom group interactions and group projects simulate real-world organizations. The object is to acquire competence to diagnose and analyze organizations and to develop skills to become better facilitators of organizational learning. The course complements LRNG 601.

676 Comparative Socio-Economic Systems (3:3:0). Covers the study of fundamental alternatives in public policy. Explores the systemic, evolutionary patterns in overall socioeconomic institutional arrangements, and examines the manner in which knowledge is discovered, changed, and communicated in social systems. Drawing on the field of complex evolving systems, this course pays particular attention to two traditions—Marxism and the Austrian School. Textual material is in Folio Views software, which facilitates a close reading and enables collaboration in earlier analysis and interpretation of texts.

692, 792 Special Topics in LRNG (1-3:1-3:0). Covers topics in social or organizational change seen from economic, historical, philosophical, literary, organizational, and/or information technology perspectives. New courses that first appear under this heading include Teaching Practicum: Instructional Technologies, Building Learning Organizations for Global Business, Computational Modeling of Social Learning, and Strategic Knowledge Management. May be repeated for credit.

714 Ethnography of Corporate Culture (3:3:0). Contrary to popular usage, "corporate culture" is not a simple byproduct of organizational charts and advertising images, but rather the "web of meaning" that endows organizational action with its deepest significance. Like all other instances of local culture, corporate cultures must be studied by ethnographic methods of "thick description." After exploring conceptions of corporate culture, this course examines exemplary ethnographies of various organizations, including those of different societies, as preparation for students' own ethnographic field work and writing.

761 Computational Modeling of Social Learning (3:3:0). Explores the processes of social interaction and the emergent (higher-order or macro-) phenomena by modeling social interaction on computers. Models are simulations of "virtual worlds" populated by a variety of "virtual agents," and they allow processes to be observed in action through visual representations of economic activity. The modeling language used is Smalltalk V/Windows 2.0, from Digital Corp. The aim of the course is to bring together the insights of social scientists and computational scientists, using the former's understanding of social systems and the latter's modeling principles and techniques to produce models in which the entities modeled have both the capacity of volition and varying interpretations of and strategies for dealing with their environments.

762 Strategic Knowledge Management (3:3:0). This course deals with theory and practices of leveraging and sharing knowledge to develop more effective organizations. Its focus is on knowledge and communities of practice, and it includes the use of collaborative technology in managing interactions.

763 Technology and Learning in Organizations (3:3:0). This course examines the enormous potential of information technology to enhance the way organizations work and learn. The focus includes user interface design and the organizational processes that support effective use of this technology.

764 Learning Across Cultures (3:3:0). This course focuses on the ideas and practices involved in fostering learning, innovation, and new knowledge creation in the highly
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multicultural environments of knowledge intensive, global economies and political systems.

770 Pricing Strategy and Tactics (3:3:0). Covers techniques of strategic analysis necessary to price more profitably by evaluating the price sensitivity of buyers, determining the relevant costs for a pricing decision, anticipating and influencing competitors' pricing, and formulating pricing strategies appropriate for the market. Participants learn tactics required to implement strategies that enable them to price differently to different market segments, enhance the perception of their product's value, and coordinate pricing with the other elements of marketing. Involves the analysis of case and real-world problems as well as the discussion of current events that show how to apply the techniques developed in the class.

781 Interpretive Social Theory (3:3:0). This course is an advanced, philosophical study of the interpretive school of economics sometimes known as the “Austrians.” It weaves together Austrian ideas, epistemology, and hermeneutics. The organizing theme is the re-interpretation of the Austrian school as a radically interpretive approach to social theory. Course material is in the form of Folio Views hypertext, which lends itself to the close analysis of text and provides a practical way of demonstrating and appreciating the value of interpretive social theory.

796 Independent Study (1-12:1-12:0). Requires research, analysis, and/or implementation within the realm of social and organizational learning. Students work with a member of the program faculty. May be repeated for credit.

868 Business, Government, and the International Economy (3:3:0). Provides a broad overview of international development and trade since World War II. Covers the growth strategies of developed countries (e.g., the United States, Germany, Japan) as well as developing countries (e.g., Brazil, India, China). The course is designed to give students a broad understanding of the modern world's system of political economy shaped by national policies, international agreements, and business activity. Almost all instruction is by case method.

Liberal Studies (LS)

Philosophy and Religious Studies

500 Religious Worlds in Transition (3:3:0). Examines a selection of non-Western and pre-Western cultures and religions, both ancient and modern, and examines their responses to an evolving world. Each culture is viewed from two standpoints: first, from its own construction of values, its conceptions of the relationship of the sacred to the world, the human condition, and “success” in human life; second, from its responses to the inevitable crises of history and the forces of change.

502 Religions in Conflict and Dialogue (3:3:0). Examines the nature and patterns of religious conflict and explores ways of engaging in dialogue. Exploration of religious pluralism for dialogue is the main theme of the course.

511 Contemporary Values (3:3:0). Students identify personal, social, political, and religious values operative in contemporary society; examine their foundations and interrelationships; and examine in depth at least one area of human life in which values are both important and contested.

513 Existence, Faith, and Doubt (3:3:0). Examines the idea of religion, of the essential features and variations belonging to religious existence, of the challenges to religious self-understanding posed by contemporary interpretation of religious consciousness, and of the responses to those challenges through a hermeneutics of the religious symbol.

515 Time and the Human Condition (3:3:0). Explores Western culture's changing interpretations of the meaning and value of time and an examination of the ways these changing interpretations reflect diverse understandings of the meaning of the human condition.

520 Science, Reason, and Reality (3:3:0). Advanced exploration of the interrelations between science, reason, and reality. Explores philosophical perspectives such as the logical empiricist approach, the Popperian falsifiability orientation, Kuhn's historicism, Newton-Smith's rationalism, a modeling approach by Van Fraassen, and Hacking's experimental realism.

Linguistics (LING)

English Department


507 Field Work in Applied Linguistics (3:0:0). Prerequisite: LING 326, 520, 521, or 582. Contact the English Department one semester prior to enrollment. Field work provides experience working in a language-teaching program or an educational research organization.

520 Descriptive Linguistics (3:3:0). Introduction to the terminology and methodology of modern linguistic science and a detailed structural analysis of English phonology, morphology, and syntax.

521 Applied Linguistics: Teaching English as a Second Language (3:3:0). Prerequisite: LING 520, 690, or 786. Theories and basic principles of the teaching of a second language, especially as they relate to the English language, introducing students to methods of teaching English to speakers of other languages.

522 Modern English Grammar (3:3:0). Prerequisite: One course in linguistics or permission of instructor. Overview of the structure of modern English beginning with word classes and ending with analyses of complex sentences. Most topics are introduced as problems of language description; in solving them, principles of syntactic argumentation are demonstrated as well. Students learn to tap their own intuitions about English to analyze grammatical structure.

523 Descriptive Aspects of English Phonetics and Phonology (3:3:0). An in-depth description and analysis of the sound system processes of modern English. Segmental phonetics, syllable structure, connected speech, and prosodic phenomena are among the topics. Implications for language instruction are also addressed.

581 Psycholinguistics (3:3:0). Prerequisite: LING 520, 690, or 786, or permission of instructor. Study of mental and psychological aspects of human language, including aphasia, association, autism, language acquisition, verbal concept formation, and perception.
412 Linguistics (LING) • Management (MGMT)

582 Second Language Acquisition (3:3:0). Prerequisite: LING 520, 690, or 786, or permission of instructor. Second language (L2) acquisition examined from a linguistic perspective. First and second language acquisition are compared, and factors contributing to L2 variation are explored, including linguistic universals, transfer, age, input, and affective considerations.

686 Special Topics in Linguistics (3:3:0). Prerequisite: Varies with topic. Detailed advanced study of selected area of linguistics. Content varies. May be repeated once for credit with permission of department.

690 Generative Phonology (3:3:0). Sound systems of English and other languages from the perspective of phonological theory. Topics include articulatory phonetics, distinctive features, the nature of phonological representations and processes, rule ordering, abstractness, the role of external evidence, and nonlinear phonology.

691 Theories of Language (3:3:0). Prerequisite: LING 520, 690, or 786, or permission of instructor. A seminar course in linguistic metatheory. A wide range of theories about language and about linguistic theory are examined, including those of Saussure, Bloomfield, Chomsky, and others. Readings from original sources.

692 Phonology II (3:3:0). Prerequisite: LING 690. Recent trends in phonological theory. Topics include stress assignment, tone spreading, and vowel harmony, from within a nonlinear framework. Segmental structure and underspecification are discussed.

785 Semantics and Pragmatics (3:3:0). Prerequisite: LING 520, 690, or 786, or permission of instructor. Developments in theoretical linguistics that explore how language form is related to meaning and context. Topics include reference, lexical semantics, logic, quantification, truth conditions and sentential meaning, presuppositions, and speech acts.

Management (MGMT)

School of Management

If a student takes noncore, upper-level business courses before acceptance to the School of Management, those courses will not count on an undergraduate degree application for any major in the school (except as general elective credit). A grade of C or better must be presented on the graduation application for each upper-level course in the major. Prerequisites are strictly enforced. Degree status is defined as formal admission to the School of Management.

301 People and Organizations (3:3:0). Prerequisites: Completion of at least 48 hours including COMM 100, 101, 104, 220, or 260. This course examines the drivers of individual and group performance within organizations in the post-industrial business context. Issues related to individual and organizational performance are introduced.

312 Principles of Management (3:3:0). Prerequisites: MGMT 301; degree status. This course builds on the fundamental theories and concepts learned in MGMT 301 by examining the nature of managerial work under a range of business models and under rapidly changing business conditions. Managerial functions and activities such as planning, organizing, controlling, staffing, and decision-making are examined in depth and in the context of current organizational examples and scenarios.

321 Introduction to Human Resource Management (3:3:0). Prerequisites: MGMT 301; degree status. Human capital is now the most important asset many firms use. This course builds on MGMT 301 by introducing key concepts and techniques that managers need to know in order to best attract, retain and develop skilled personnel, based on current practice and theory in Human Resources Management. Legal and ethical considerations in human resource management are also emphasized.

323 Teams and Leadership (3:3:0). Prerequisites: MGMT 301 and degree status. This course focuses on intensive development of a higher-level skill set for collaboration and leadership in contemporary environments. Builds on content introduced in core management coursework (MGMT 301, 312 and 321). Attention is given to developing personal leadership capabilities, collaborating in traditional and virtual environments, improving group processes, managing conflict, tolerating ambiguity, improving communication, creative problem solving, and coaching and motivating employees.

331 Labor Relations (3:3:0). Prerequisites: MGMT 301; degree status. This course is an in-depth analysis of the labor-relations component introduced in MGMT 321 and is designed for management majors interested in pursuing a human resources career. Course content includes examination of the foundations of union, labor contracts, bargaining, and the legal context of union-management relations.

391 Special Topics in Management (3:3:0). Prerequisites: MGMT 301 or 302 taken prior to fall 2001; degree status. Objective is to offer coherent and organized coverage of important contemporary topics. Specific topics are announced when course is scheduled.

411 Organization Theory and Development (3:3:0). Prerequisites: MGMT 301; degree status. This course looks at advanced topics in the design and development organizations. Students will move beyond the fundamentals learned in the management core and develop detailed understandings, tools, and skills about the relationships between organizational structure, design, and culture to improve organizational performance.

412 Diversity in Organizations (3:3:0). Prerequisites: MGMT 301; degree status. This course builds on MGMT 301 by emphasizing the understanding of, appreciation for, and skills in addressing organizational issues of diversity in ethnicity, gender, age, ability, and thought. Diversity as both a legal issue and a lever for improved individual and organizational performance will be covered.

421 Advanced Human Resource Management (3:3:0). Prerequisites: MGMT 301; degree status. This course builds on MGMT 321 by examining cutting-edge strategic technological, and international issues in HRM, including Human Resource Information Systems. This course is for management majors interested in an HRM career and prepares for certification as Professional in Human Resources (PHR) by the Society for Human Resource Management.

431 Employee Relations (3:3:0). Prerequisites: MGMT 301; degree status. This course is an in-depth analysis for management majors interested in pursuing a career in HRM. Course content focuses on issues in employee relations from a historical and current perspective.
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451 New Venture Creation (3:3:0). Prerequisites: MGMT 301; degree status. This course is designed to expose students to the process of conceptualizing and creating a new venture. Using the central concept of innovation, students will evaluate opportunities and consider the impact of the technological environment on opportunity and the new venture creation process. Additionally, students will develop business plans in which they address the issues critical to a start up firm. These issues include management composition and structure, effective marketing strategy, operational logistics, legal issues, financial projections and financing options.

471 Competitive Strategy (3:3:0). Prerequisites: MGMT 301; degree status. This course explores the sources of sustained competitive success—why some firms outperform others. It focuses on two issues: how a firm uses human, financial, technological, and information resources at the business level to compete in a particular industry, and how a firm at the corporate level chooses the industries in which it will compete. It gives students the tools and concepts needed to analyze dynamic industry environments and firms and then formulate appropriate strategies.

493 Management of Technology (3:3:0). Prerequisites: MGMT 301; degree status. This course uses a general manager's perspective to explore the relationships between technology, patterns of competition, and the development of competitive advantage. Readings and discussions help explain how firms can exploit technology, whether they should invest in new technologies, and how they should respond to technological threats. The application part of the course is a project on advanced technologies issues of particular relevance to George Mason's business community.

491 Seminar in Management (3:3:0). Prerequisites: MGMT 312; degree status. Advanced study of management concepts and selected topics. Intensive analysis of management problems that represent long-term strategic significance or current urgency for organizational planning and operations. Significant contemporary research findings are included.

499 Independent Study (1-3:0:0). Prerequisite: Management majors with at least nine upper-level management credits. Research and analysis of selected problems or topics in management must be arranged with an instructor and approved in writing by the associate dean for undergraduate programs. Written report required.

Management Information Systems (MIS)

School of Management

If a student takes noncore, upper-level business courses prior to acceptance to the School of Management, those courses will not count on an undergraduate degree application for any major in the School of Management (except general elective credit). A grade of C or higher must be presented on the graduation application for each upper-level course in the major. Course prerequisites are strictly enforced. Degree status is defined as formal admission to the School of Management.

102 Spreadsheet Applications for Business (1:0:1). Hands-on course using a popular spreadsheet package. Business examples are used to teach the fundamentals of spreadsheets and their use in business applications.

301 Introduction to Business Information Systems (3:3:0). Prerequisite: Completion of 32 hours. Introduction to fundamentals of hardware, software, networking, the Internet and its technology components. Role of technology in contemporary business. Basic relational concepts. Hands on experience in building business database applications and web sites. Projects required.

310 Introduction to Database Management Systems (3:3:0). Prerequisites: MIS 301; degree status. Introduction to the principles of designing, maintaining, and manipulating databases. Emphasis on relational databases. Applications are business oriented, such as accounts receivables, order entry, customer history, etc. Hands-on implementation using a software package is required.

320 Business Data Communications (3:3:0). Prerequisites: MIS 301; degree status. Broad introduction to technology components used in modern networks. Emphasis on the use of networks to facilitate business processes. Includes lab work and exercises.

330 Computer Systems Analysis and Design (3:3:0). Prerequisites: MIS 301, 310; degree status: a programming course is recommended. An introduction to the life cycle of a computer information system with emphasis on information requirements analysis, feasibility studies, economics, systems design, equipment selection, and the implementation process. Team project and computer lab are required.

411 Management and Control of Information Systems (3:3:0). Prerequisites: MIS 301, or MIS 201 taken prior to fall 2001 and ECON 103; degree status. Discussion of the uses of an economics perspective to study issues arising in the management and control of information systems. Topics include cost/performance trends in information technology, software development cost estimation, systems project management, pricing computer services, and the strategic use of information technology.

412 E-Business Systems Development (3:3:0). Prerequisites: MIS 301, degree status. An introduction to the life cycle of the development of Web based information systems for E-business. Emphasis on technologies, methods and application development tools. Team project and computer lab are required.

430 Data Warehousing and Data Mining (3:3:0). Prerequisites: MIS 301, 310, degree status. Technologies and methods to develop decision support systems. Data warehousing and data mining techniques. Includes lab session and exercises. Term project required.

435 Knowledge Management (3:3:0). Prerequisites: MIS 301, 310, degree status. The course focuses on the new trends on how Knowledge Management works for organizations, what is the best strategy for such transition and what are the knowledge management elements.


450 Internet Architecture and Industry (3:3:0). Prerequisites: MIS 301, 310, 320, degree status. Overview of elements of Internet architecture. Analysis of economic and regulatory issues. Internet technology and industry trends. Includes lab sessions and exercises.

http://catalog.gmu.edu
491 Seminar in Management Information Systems (3:3:0). Prerequisites: MIS 301, all required courses in DMIS major; degree status. Analysis of selected topics that highlight the latest developments in the information resource management field, including contemporary research findings and case studies of information systems in business and other organizations.

499 Independent Study in Management Information Systems (1-3:3:0). Prerequisite: MIS 301, all required courses in DMIS major; degree status. Research and analysis of selected problems or topics in information resource management. Must be arranged with an instructor and approved in writing by the associate dean for undergraduate programs before registration.

Marketing (MKTG)
School of Management

If a student takes noncore, upper-level business courses prior to acceptance to the School of Management, those courses will not count on an undergraduate degree application for any major in the school (except as general elective credit). A grade of C or higher must be presented on the graduation application for each upper-level course in the major. Prerequisites are strictly enforced. Degree status is defined as formal admission to the School of Management.

301 Principles of Marketing (3:3:0). Prerequisite: Completion of at least 48 credits including ACCT 203, and ECON 103. Examination of marketing principles, concepts, strategies, tactics, and analytical tools used by profit and nonprofit organizations to market ideas, products, and/or services to selected target groups. Emphasis on how to promote, distribute, and price the firm's offering in a dynamic economic, social, political, and international environment.


313 Advertising Management (3:3:0). Prerequisites: MKTG 301; degree status. In-depth study and application of advertising and its role in marketing planning. Study includes identification of relevant data to analyze the marketing situation, development of product position, marketing and advertising objectives, creative strategy, media planning, and evaluation.

315 Internet Marketing (3:3:0). Prerequisites: MKTG 301, MIS 301; degree status. This course explores the impact of Internet technology on marketing strategy and practice. Topics include the opportunities and challenges created by the Internet in areas such as advertising and promotion, customer service, pricing, retailing (including electronic commerce), distribution channels, and customer relationship management.

332 Retailing Management (3:3:0). Prerequisites: MKTG 301; degree status. Comprehensive view of retailing as it relates to the total marketing process. Emphasis is on retail decision alternatives used when formulating retail store/non-store strategies.

333 Business to Business Marketing (3:3:0). Prerequisite: MKTG 301; degree status. Examines the unique challenges and opportunities of marketing systems between suppliers, manufacturers, resellers and government.

351 Marketing Research Techniques and Applications (3:3:0). Prerequisites: DESC 210 and MKTG 301; degree status. Study of concepts, theories, and principles underlying the marketing research process. Focus is on development and evaluation of research designs for gathering marketing information.

407 International Business (3:3:0). Prerequisites: MKTG 301, MGMT 302, and FNAN 301; degree status. Multidisciplinary approach to international trade from the viewpoint of business management. Introduces unique aspects of international transactions including patterns and theories of international business, impact of foreign trade and international environment, and international business planning.

471 Marketing Management (3:3:0). Prerequisites: 90 credits including MKTG 312, 313, and 351; degree status. Emphasizes the managerial aspects of marketing, including development of marketing strategies and plans and integrating specific elements of the marketing process. Case analysis is emphasized.

481 Marketing in the Nonprofit Sector (3:3:0). Prerequisites: MKTG 301; degree status. Discussion of the unique problems of marketing in nonprofit organizations, including government, and their solution through application of traditional and innovative techniques. Explanation of how to market commercial ventures owned by nonprofits.

491 Special Topics in Marketing (3:3:0). Prerequisites: Nine credits of marketing; degree status. In-depth treatment within a seminar format of contemporary topics in marketing. Culminates in the preparation of a substantial paper and oral presentation.

499 Independent Study (1-3:0:0). Prerequisite: 90 credits with a minimum of 24 credits of business courses including principles of marketing, finance, and management. Primary research proposal in a marketing area is required with prior approval from the instructor and the associate dean for undergraduate programs.

Master of Business Administration (MBA)
School of Management

603 Managerial Economics and Decisions of the Firm (3:3:0). Prerequisite: Admission to M.B.A. program. Provides a fundamental understanding of how microeconomics concepts are usefully applied to managerial decision making. Principles of microeconomic theory are explored fully, including market supply and demand, production and cost functions, industry structure, and product and resource pricing.

612 Managing Costs and Evaluating Performance (1.5:1.5:0). Prerequisites: Admission to M.B.A. program and MBA 613. Examines the impact of cost and cost allocation on performance and evaluation.

613 Financial Reporting and Decision Making (3:3:0). Prerequisite: Admission to M.B.A. program. Foundation course focusing on the economics and analysis of business transactions and related financial reporting issues. Topics include an introduction to the accounting framework used in financial reporting, analysis of economic events and their impact on financial reports, analysis of the impact of ac-
623 Marketing Management (3:3:0). Prerequisite: Admission to M.B.A. program. Develops abilities to make marketing decisions in a wide variety of institutional and competitive situations. Emphasis on the use of technology to aid in analysis, decision making, and communication of decisions to relevant publics. Emphasis on case studies, team work, and projects.

633 Statistics for Business Decision Making (3:3:0). Prerequisite: Admission to M.B.A. program. Use of statistical methods as analytical tools for understanding and solving business problems, and for supporting business decision making. Extensive use of both applied business scenarios to illustrate concepts, and computer software for data analysis.

638 Managing Operations and Technology for the Digital Enterprise (3:3:0). Prerequisite: Admission to M.B.A. program. Focus on the design, planning, and control activities needed to produce and deliver goods and services in modern organizations. The course introduces a wide range of operations management decisions such as operations strategy, process analysis and design, capacity planning, supply chain management, total quality management, and project management. Quantitative modeling, case studies, and computer software are used to analyze and solve operations management problems.


653 Organizational Behavior and Human Resource Management (3:3:0). Prerequisite: Admission to M.B.A. program. Emphasizes development of conceptual tools for understanding and analyzing individual and group behavior in organizations and organizational processes. Considerable focus on development of relevant skills for working in groups and teams. Course consists of lectures, discussions, case analyses, and in-class exercises.

673 Legal Environment for Management (1.5:1.5:0). Prerequisite: Admission to M.B.A. program. Introduces contemporary legal and ethical doctrines and examines how they can be applied to guide and enhance the decision-making processes of managers in the global economy. Lectures, class discussions, cases, and projects.

678 Strategy and Organizational Leadership (3:3:0). Prerequisite: Admission to M.B.A. program. Capstone course in the M.B.A. program focused on strategy development at the business unit and corporate level. Uses cases, readings, and a project format to familiarize students with the strategic management function, and to develop analytical, organizational, and formatting skills necessary to analyze complex business situations. Provides opportunities for students to integrate knowledge gained in prior course work.

701 Business Analysis and Valuation (3:3:0). Prerequisite: Completion of M.B.A. core requirements or permission of instructor. Develops a framework for business analysis and valuation using financial statement data. Management decisions such as equity valuation, creditworthiness, merger valuation, corporate financial structure, and management communication strategy are analyzed.

702 Corporate Financial Policy (3:3:0). Prerequisite: Completion of M.B.A. core requirements or permission of instructor. Applies the theories and methods of corporate financial management to a series of complex case problems/situations. Topics include capital projects as real options, cost of capital/capital structure, firm valuation, project finance, and merger/acquisition analysis.

703 Financial Markets (3:3:0). Prerequisite: Completion of M.B.A. core requirements or permission of instructor. Brings into perspective the relationship between financial markets ranging from global equity markets, to the market for U.S. Treasury securities, to markets for numerous exchange-traded and over-the-counter financial derivative instruments such as futures, options, swaps, or asset-backed securities.

704 Risk Management and Financial Innovation (3:3:0). Prerequisite: Completion of M.B.A. core requirements or permission of instructor. Considers how to identify, measure, and manage financial risk using innovative financial instruments and diversification strategies. The course focuses on derivatives as tools in the risk management plan of a firm or institution.

705 Venture Capital and Private Finance (3:3:0). Prerequisite: Completion of M.B.A. core requirements or permission of instructor. Considers the market microstructure of venture capital and private finance: the costs and benefits from employing private financing, interaction between the financiers and entrepreneurs, financial analysis of potential ventures, and investor exit strategies.

706 Investment Analysis (3:3:0). Prerequisite: Completion of M.B.A. core requirements or permission of instructor. Focuses on the analysis of equity securities and debt instruments given the implications of the efficient market hypothesis and modern capital market theory.

707 Accounting Systems (3:3:0). Prerequisite: Completion of M.B.A. core requirements or permission of instructor. Focuses on the analysis, design, and implementation of information systems as they relate to the accounting function and the financial management of the firm.

708 Global Tax Strategies (3:3:0). Prerequisite: Completion of M.B.A. core requirements or permission of instructor. Provides a framework for making managerial decisions in a global tax environment. Business decisions such as location of facilities, employee compensation, mergers and acquisitions, capital and asset structure, and business form are examined.

711 Entrepreneurship (3:3:0). Prerequisite: Completion of M.B.A. core requirements or permission of instructor. Considers the fundamental aspects of entrepreneurship and the process of new venture creation. Draws on a broad range of business disciplines including management, marketing, finance, and accounting to develop evaluation and execution skills.

712 Project and Cost Management (3:3:0). Prerequisite: Completion of M.B.A. core requirements or permission of instructor. Focuses on project scheduling, time-cost trade-offs, budgeting, cost control, and project monitoring. Special emphasis on cost-management aspects of projects in
technology in intensive industries. Use of software and case studies.

713 Human Resource Management (3:3:0). Prerequisite: Completion of M.B.A. Core or Instructor’s Permission. This survey of human resource management will provide students with a thorough understanding of the role of and the techniques available to management for effectively utilizing the organization’s human resources.

717 International Finance (3:3:0). Prerequisite: Completion of M.B.A. Core or Instructor’s Permission. Advanced analysis of management of the firm’s international financial operations. Topics include currency risk, political risk, returns and funding of international projects, international markets and accounting, and the cost of capital. Lecture, discussion, readings, and cases.

721 Marketing Decision Systems (3:3:0). Prerequisite: Completion of M.B.A. core requirements or permission of instructor. Develops the skills necessary to plan and implement an effective market research study. Topics include research design, statistical analysis, data mining and modeling, and the use of database systems. The course offers a perspective on how managers can use market data to develop successful product or service strategies.

722 Consumer Behavior (3:3:0). Prerequisite: Completion of M.B.A. core requirements or permission of instructor. Examines behavioral science concepts useful in understanding and predicting marketplace behavior. The course emphasizes applications of product and service strategies, with a focus on how the information age affects the way consumption occurs.

723 Supply Chain Management (3:3:0). Prerequisite: Completion of M.B.A. core requirements or permission of instructor. Examines the logistics of supply chain systems, including inventory management, distribution channels, and information systems. Strategic alliances and international issues are emphasized.

724 Marketing Communications (3:3:0). Prerequisite: Completion of M.B.A. core requirements or permission of instructor. Examines all forms of communication and all sources of brand or company contacts as potential message channels in building a relationship with the customer. The course focuses on an integrated planning process for all communication elements, including consumer and trade advertising, public relations, direct and database marketing, promotions, and sales presentations to achieve synergy in communicating with various constituencies.

725 Leadership (3:3:0). Prerequisite: Completion of M.B.A. core requirements or permission of instructor. Provides an overview of the major conceptualizations of leadership and motivation in organizations. The course integrates theory, research, and applications. Students apply the principles of leadership and motivation to their own work situations and to the evaluation of cases.

731 Business Systems Development (3:3:0). Prerequisite: Completion of M.B.A. core requirements or permission of instructor. Studies methods and tools for analyzing and designing business information systems with an emphasis on business processes. Topics include data modeling, process modeling, interaction analysis, and user interface.

732 Knowledge Management (3:3:0). Prerequisite: Completion of M.B.A. core requirements or permission of instructor. Examines the firms that use knowledge management principles and approaches: intellectual capital, human capital, customer capital, tacit and explicit knowledge, the new role of the Chief Knowledge Officer, leveraging of knowledge management.

733 Business Data Communications (3:3:0). Prerequisite: Completion of M.B.A. core requirements or permission of instructor. Introduces data communications and telecommunications technologies and their application in business, including LANs, WANs, PBXs, voice services, network operating systems, corporate internetworking, the Internet. Analysis of the datacommunications industry. Business applications of datacommunications in manufacturing and service sectors, along with regulatory issues and impact of globalization.

743 Electronic Commerce (3:3:0). Prerequisite: Completion of M.B.A. core requirements or permission of instructor. Applies skills and knowledge in designing and building a business-to-business or business-to-consumer web commerce site. Emphasis is on products, strategies, and web site design.

735 Systems Thinking and Business Simulation (3:3:0). Prerequisite: Completion of M.B.A. core requirements or permission of instructor. Systems approach to design, analysis, and improvement of cross-functional business processes. Use of business simulation software for modeling and analysis. Application areas include E-commerce, online services, and technology management.

736 Managing Digital Business (3:3:0). Prerequisite: Completion of M.B.A. core requirements or permission of instructor. Develops a strategic understanding of the new electronic marketplace. Emphasis is on technical, legislative, and social issues influencing digital business. Changes in business processes and organizations enabled by electronic commerce technologies and applications are studied.

737 Corporate Information Systems Policy (3:3:0) Prerequisite: Completion of M.B.A. Core or Instructor’s Permission. The role of the CIO in the private and the public sector is studied. Procurement and outsourcing strategies for IT investments. Enterprise information systems development, management and security.

798 Global Business Perspectives (3:3:0). Prerequisite: Completion of M.B.A. core requirements or permission of instructor. Applies the M.B.A. core courses to global business enterprise, typically through site visits to facilities located outside the United States.

799 Special Topics in Business (3:3:0). Prerequisite: Completion of M.B.A. core requirements or permission of instructor. Sections established as necessary to focus on various topical issues that emerge in the practice of business administration.

Master of New Professional Studies (MNPS)

University Programs

700 The New Professionalism: Theory and Practice (3:3:0). An experiential exploration of contemporary and relevant ethical theories and their diverse applications to the professional studies field. This course examines issues such as the ethical relationship between the professionals and clients, ethical accountability and responsibility, the ethics
of institutions, and the professional's role in sustaining ethical standards. Philosophical and pedagogical assumptions made by the individual in understanding professional management issues and the social and individual purposes of being a professional are examined reflectively against a broad range of philosophical, social, political, and economic imperatives affecting many organizations. MNPS 700 will be customized for each track to reflect the specialized nature of the respective tracks. To learn about the detailed course content, please contact appropriate program directors.

702 The New Professional as Reflective Practitioner (3:3:0). The changes in organization identity and understanding are epistemological, as well as structural and ethical. This course identifies the central problems in epistemology, and examines how an epistemology appropriate to professional practice may be constructed, what is meant by the notion of "ways of knowing" and the "reflective practitioner," and the implications for professional learning. The core issues of generalizability, objective knowledge and understanding, and the nature of evidence, truth, and meaning and how they affect the nature of organizational reality and the professional's practice are studied. Special attention is given to developing the skills for "double-loop learning" and reflection in professional lives (e.g., through journals, narrative autobiography, and imaginative literature). MNPS 702 will be customized for each track to reflect the specialized nature of the respective tracks. To learn about the detailed course content, please contact appropriate program directors.

703 Technology and Learning in the New Professions (3:3:0). Although various technological modes are used throughout the program (e.g., teacher-student, student-student contact via electronic mail), specific teaching in this core course provides for the development of software tools aimed at facilitating collaborative work, such as Lotus Notes, Folio Views, and the Virtual Notebook system. Specifically, the course examines in detail the enormous potential for enhancing the way organizations, not merely professionals, can learn, notably through the development of Internet literacy, and skills in using differing Internet navigation tools. The course is rooted in applying technology to real-world problems in different professional worksites, offering in-depth training in the use and development of groupware applications. In all other courses, there will be requirements for the use of technology in learning. MNPS 703 will be customized for each track to reflect the specialized nature of the respective tracks. To learn about the detailed course content, please contact appropriate program directors.

704 Research Methodologies in the New Professionalism (3:3:0). Corequisite: EDUC 597. In the social sciences and specifically in the field of professional studies, a positivist epistemology with its implications for the application of methodologies drawn from the physical and natural sciences has proved inadequate. From anthropology, sociology, and other disciplines, a "thick" understanding of what is needed to create a better praxis can be created. Kurt Lewin, for example, dubbed his methodological invention "action research," arguing that "there is nothing so practical as a good theory." Lewin called for a form of research that starts with the participants describing reality as they see it, reflecting on it, and deriving theories and learning that are immediately applicable to concrete situations. This course concentrates on understanding and using research methodologies from such varied sources as Freire, McKeon, and Janowitz, with a practical team activity in which students study an organization or aspects of it, using ethnography, field study, or any appropriately defensible research methodology. MNPS 704 will be customized for each track to reflect the specialized nature of the respective tracks. To learn about the detailed course content, please contact appropriate program directors.

720 Learning Community (3:3:0). Prerequisites: Candidates for the MNPS (Organizational Learning) degree only. A series of workshops, seminars, and readings groups involving at least 60 hours of contact time and culminating in a two-day retreat during which candidates for the M.S. in New Professional Studies (Organizational Learning) do presentations to the class and to the faculty on their research practice. The theme of this module is communication, collaboration, and interaction in organizations. After an initial one-and-a-half day workshop, MNPS candidates meet with all faculty once a month as a readings group, to give talks and presentations on the application of organizational learning ideas in their organizations, to discuss current issues in organizational learning, and to provide feedback about the use of collaborative computing technology in the learning process.

Mathematical Sciences (MATH)

Mathematical Sciences

Knowledge of high school algebra is a prerequisite for all mathematics courses. In exceptional cases, the prerequisite for a course above the calculus sequence may be waived at the discretion of the instructor.

105 Precalculus Mathematics (3:3:0). Prerequisites: High school Algebra I, Algebra II, and Geometry, and specified score on the Math Placement Test, or successful completion of self-paced Algebra Tutorial Program offered by the Math Literacy Center. Call the Mathematical Sciences Department at (703) 993-1460 for details. Review of mathematics skills essential to the study of calculus. Topics covered are equations, inequalities, absolute values, graphs, functions, exponential and logarithmic functions, and trigonometry. May not be used as credit toward the B.A. or B.S. in Mathematical Sciences or toward satisfying Area B of the university core requirements or the analytical reasoning requirement for the B.A. degree in the College of Arts and Sciences. May not be taken for credit after receiving a grade of C or better in any MATH course numbered 113 or higher.

106 Quantitative Reasoning (3:3:0). Prerequisite: Specified score on the Math Placement Test or successful completion of self-paced Basic Math Program offered by the Math Literacy Center. Quantitative skills for the real world. Topics include critical thinking, modeling by functions, graphs, growth, scaling, probability, and statistics.

108 Introductory Calculus with Business Applications (3:3:0). Prerequisite: Specified score on the Math Placement Test or successful completion of self-paced Algebra Program offered by the Math Literacy Center. Call the Mathematical Sciences Department at (703) 993-1460 for details. Functions, limits, the derivative, and the integral. Applications of differentiation and integration. Students who have received credit for MATH 113 or 114 may not receive credit for this course.

110 Introductory Probability and Statistics (3:3:0). Prerequisite: Specified score on the Math Placement Test or
successful completion of self-paced Basic Math Program offered by the Math Literacy Center. Elementary set theory, probability, and statistics.

111 Linear Mathematical Modeling (3:3:0). Prerequisite: Specified score on the Math Placement Test or successful completion of self-paced Basic Math Program offered by the Math Literacy Center. Matrix algebra, systems of linear equations, Markov chains, difference equations, and data fitting.

113 Analytic Geometry and Calculus I (4:4:1). Prerequisites: Thorough understanding of high school algebra and trigonometry and specified score on the Math Placement Test or a grade of C or better in MATH 105. Functions, limits, the derivative, maximum and minimum problems, the integral, and transcendental functions.

114 Analytic Geometry and Calculus II (4:4:1). Prerequisite: Grade of C or better in MATH 113. Methods of integration, conic sections, parametric equations, infinite series, and power series.

115 Analytic Geometry and Calculus I (Honors) (4:4:1). Prerequisite: Placement or permission of department. More challenging version of MATH 113. Functions, limits, the derivative, maximum and minimum problems, the integral, and transcendental functions.

116 Analytic Geometry and Calculus II (Honors) (4:4:1). Prerequisite: Successful completion of MATH 115 or A in MATH 113 and recommendation of MATH 113 instructor. More challenging version of MATH 114. Methods of integration, conic sections, parametric equations, infinite series, and power series.

125 Discrete Mathematics I (3:3:0). Prerequisite: Specified score on the Math Placement Test or successful completion of the self-paced Algebra Program offered by the Math Literacy Center. Introduction to the ideas of discrete mathematics and combinatorial proof techniques including mathematical induction, sets, graphs, trees, recursion, and enumeration.

203 Matrix Algebra (3:3:0). Prerequisite: MATH 114 or permission of instructor. Systems of linear equations, linear independence, linear transformations, inverse of a matrix, determinants, vector spaces, eigenvalues, eigenvectors, and orthogonalization.

213 Analytic Geometry and Calculus III (3:3:0). Prerequisite: Grade of C or better in MATH 114. Partial differentiation, multiple integrals, line and surface integrals, and three-dimensional analytic geometry.

214 Elementary Differential Equations (3:3:0). Prerequisite: MATH 213 or 215. First-order ODEs, higher-order ODEs, Laplace transforms, linear systems, nonlinear systems, numerical approximations, and modeling.

215 Vector Calculus (3:3:0). Prerequisites: Permission of instructor and MATH 113, 114. Vectors and vector-valued functions, partial differentiation, multiple integrals, line integrals, surface integrals, and transformation of coordinates.


271 Mathematics for the Elementary School I (3:3:0). Concepts and theories underlying elementary school mathematics, including problem solving, whole numbers and numeration, whole numbers operations and properties, number theory, fractions, decimals, ratio and proportion, and integers.

272 Mathematics for the Elementary School II (3:3:0). Continuation of MATH 271; MATH 272 is recommended before enrolling in MATH 272. Topics include rational and real numbers, introduction to algebra, geometry, statistics, and probability. Intended for school educators; does not count toward a major in mathematics.

290 Foundations of Mathematics (3:3:0). Prerequisite: MATH 114. Set theory; graphs; functions; equivalence relations and partitions; partially ordered sets; induction, construction of the natural, rational, real and complex number systems; well-ordering principle; and cardinality. Primarily intended for mathematics majors.

301 Number Theory (3:3:0). Prerequisite: Six credits of math. Prime numbers, factorization, congruences, and Diophantine equations.

302 Geometry (3:3:0). Prerequisite: Six credits of math. Fundamental concepts of incidence. Axioms of Euclidean geometry and the resulting theory, and axioms and development of non-Euclidean and projective geometry.


315 Advanced Calculus I (3:3:0). Prerequisites: MATH 213 and 290. Number system, functions, sequences, limits, continuity, differentiation, integration, transcendental functions, and infinite series.

316 Advanced Calculus II (3:3:0). Prerequisite: MATH 315. Sequences of functions, Taylor series, vectors, functions of several variables, implicit functions, multiple integrals, and surface integrals.


322 Linear Algebra (3:3:0). Prerequisites: MATH 290 and 203. Abstract vector spaces, linear independence, bases, linear transformations, matrix algebra, inner product, and special topics.

325 Discrete Mathematics II (3:3:0). Prerequisite: MATH 125. Advanced counting, binomial identities, generating functions, advanced recurrence, inclusion-exclusion, and network flows.

351 Probability (3:3:0). Prerequisite: MATH 213 or 215. Random variables, probability functions, special distributions, and limit theorems.

352 Statistics (3:3:0). Prerequisite: MATH 351. Estimation, decision theory, testing hypothesis, correlation, linear models, and design.

382 Introduction to Stochastic Processes (3:3:0). Prerequisite: MATH 351. General notion of stochastic processes,
finite and infinite Markov chains, discrete and continuous Markov processes, stationary processes, random walk problems, birth and death processes, waiting line and serving problems, and Brownian motion.

411 Functions of a Complex Variable (3:3:0). Prerequisite: MATH 214 or 216. Analytic functions, contour integration, residues, and applications to such topics as integral transforms, generalized functions, and boundary value problems.

413 Modern Applied Mathematics I (3:3:0). Prerequisites: MATH 203 and 216 (or 214). Synthesis of pure mathematics and computational mathematics. Interplay between discrete and continuous mathematics is emphasized throughout. Mathematical structure is revealed from equilibrium models in discrete and continuous systems.

414 Modern Applied Mathematics II (3:3:0). Prerequisite: MATH 413. Continuation of MATH 413, which involves a synthesis of pure mathematics and computational mathematics. Fourier analysis and its role in applied mathematics is developed (e.g., differential equations and approximations). Discrete aspects are emphasized in computational models.


441 Operations Research I (3:3:0). Prerequisite: MATH 203 or 216, or permission of instructor. Survey of deterministic methods for solving real-world decision problems. Programming model and simplex method of solution, duality and sensitivity analysis, transportation and assignment problems, shortest path and maximal flow problems, project networks including PERT and CPM, introduction to integer and nonlinear programming, dynamic programming and game theory. Emphasis on modeling and problem solving.


447 Numerical Analysis II (3:3:0). Prerequisites: MATH 216 (or 214) and 446. Numerical differentiation and integration, initial-value and boundary-value problems for ordinary differential equations, methods of solution of partial differential equations, iterative methods of solution of nonlinear systems, approximation theory.

491, 492 Reading and Problems (1-3:0:0), (1-3:0:0). For mathematical sciences majors only. Independent study in math. Must be arranged with instructor before registering.

493 Topics in Applicable Mathematics (3:3:0). Prerequisite: Six credits of math at or above the 310 level. Topics that have been successfully used in applications of mathematics. Subject determined by instructor.

494 Topics in Pure Mathematics (3:3:0). Prerequisite: Six credits of math at or above the 310 level. Topics of pure math not covered in other courses. Topics might include Galois theory, cardinal and ordinal arithmetic, measure theory, mathematical logic, and differential geometry. Subject determined by instructor.

Prior knowledge of linear algebra and calculus (single and multivariable) is assumed in all math graduate courses. A double number separated by a comma (MATH 555, 556) indicates that both graduate courses normally constitute a sequence and that the first semester is prerequisite to the second. The prerequisite may be waived by permission of the department chair. See also STAT and OR courses.


554 Mathematics of Compound Interest (3:3:0). (Formerly MATH 360.) Prerequisite: MATH 113; corequisite: MATH 114. Simple and compound interest, annuities, present and future value, yield rates, capital budgeting, amortization schedules, mortgages, and bonds. Material covered corresponds to the Society of Actuaries Exam: Mathematics of Compound Interest. Not appropriate for graduate science and engineering majors not considering an actuarial or financial career.

555, 556 Actuarial Mathematics I, II (3:3:0). (Formerly MATH 460, 461.) Prerequisites: MATH 554 and either MATH 351 or STAT 344. Two-semester sequence covering the material for Society of Actuaries Exam: Actuarial Mathematics. Topics include survival distribution and life tables, life insurance, life annuities, net premiums, net premium reserves, multiple life models, pensions, insurance models including expense, and nonforfeiture benefits and cash values.

600 Special Topics in Mathematics (1-6:1-6:0). Mathematical workshops, special courses, or other projects.

601, 602 Analysis I, II for Teachers (3:2:1). Prerequisites: Open to in-service teachers of mathematics at the middle or secondary level. Others may enroll with permission of instructor. A background in mathematics is desirable but not necessary. While some needed topics from college algebra will be reviewed in class, a thorough understanding of high school algebra and trigonometry is expected. Develops the continuous ideas of calculus with particular emphasis on concepts as opposed to computational aspects of calculus. Specific topics include decimal representation of real numbers, sequences, series, and limits; differentiation to find speed, slopes of curves, and tangents; integration to find volumes and distances and area under curves. Optimization problems including maximization of area and volume and the modeling of these concepts. Graphing techniques will be supported by both the theory of calculus and graphing utilities such as the TI-83 calculator or if possible computer software such as Maple.

604 Geometry for Teachers (3:2:1). Prerequisites: Open to in-service teachers of mathematics at the middle or secondary level. Others may enroll with permission of instructor. Background in mathematics is desirable but not necessary. Covers standard topics from Euclidean geometry and includes a discussion of non-Euclidean geometries. Emphasizes an informal and explorative approach to geometry and makes use of the geometry sketchpad. Other topics include geometric constructions and the role of proof in geometry.
420 Mathematical Sciences (MATH)

605 Discrete/Finite Mathematics for Teachers (3:2:1). Prerequisites: Open to in-service teachers of mathematics at the middle or secondary level. Others may enroll with permission of instructor. Background in mathematics is desirable but not necessary. A thorough understanding of high school algebra is assumed. Discusses finite mathematics in juxtaposition to the continuous ideas of calculus. Specific topics may be chosen from a variety but might consist of elementary counting and combinatorics including recursion and difference equations and their analogy to calculus. A different emphasis beginning with counting might lead to a more thorough discussion of probability and central measures of statistics. Other topics may include graph theory and its connection to geometry. Audience for whom the course is intended will to some extent guide the choice of topics.

607 Algebraic Structure for Teachers (3:2:1). Prerequisites: Open to in-service teachers of mathematics at the middle school level. Others may enroll with permission of instructor. Background in mathematics is desirable but not necessary. A thorough understanding of high school algebra is assumed. Expands on the customary operations on the integers and rationals to discuss systems that mimic these operations, thereby enhancing one's understanding of the former. Emphasis is placed on the concepts of multiplicative and additive inverses and their corresponding identities as they occur in other systems. Topics might include the integers modulo n and their connections to elementary number theory, permutation groups, rigid transformations, groups of symmetry of the plane and their connection to geometry, and matrices treated as linear transformations and their connections to solutions of systems of equations.

608 Problem Solving in Mathematics (3:2:1). Prerequisites: Open to in-service teachers of mathematics at the middle school level. Others may enroll with permission of instructor. Background in mathematics or science is desirable but not necessary. It is assumed that a student will have been exposed to most of the topics covered in MATH 601, 604, 605, and 607. Introduces a variety of challenging mathematical problems appropriate for the middle school student for the purpose of analyzing and solving problems—perhaps in a variety of ways—using the mathematics learned in the previous courses. In addition, students are asked to search for such problems and orally present their solutions. The specific topics to be covered in such problems might be any of the courses listed as prerequisites.

619 Topics in Mathematical Logic (3:3:0). Special topics in the foundations of mathematics not included in the regular mathematics curriculum. May be repeated for credit.

621 Algebra I (3:3:0). Groups, linear algebra, and matrix groups.

625/CSI 740 Numerical Linear Algebra (3:3:0). Prerequisite: Computer literacy, including some programming experience. Theory and development of numerical algorithms for the solution of a variety of matrix problems: linear systems, least squares problems, eigenvalue problems, and the singular value decomposition. Direct and iterative method, analysis of sensitivity to rounding errors, and applications.

629 Topics in Algebra (3:3:0). Special topics in pure or applied algebra not covered in the regular algebra sequence. May be repeated for credit.


639 Topics in Topology and Geometry (3:3:0). Special topics in topology and geometry not covered in the regular topology and geometry sequence. May be repeated for credit.

641 Combinatorics and Graph Theory (3:3:0). Study of fundamental concepts in combinatorics and graph theory. Various methods of enumerative combinatorics, including the principle of inclusion-exclusion, the multinomial theorem, generating functions, recurrence relations, graphs and subgraphs, trees, connectivity, planar graphs, coloring, and matching.


652 Mathematical Statistics (3:3:0). Prerequisite: MATH 651. Sampling distributions, point and interval estimation (Cramer-Rao theorem), testing of hypotheses (Neyman-Pearson tests, uniformly most powerful tests, sequential tests), linear models, and distribution free methods.

653 Risk Theory (3:3:0). Prerequisite: MATH 351 or STAT 644 required. MATH 555 recommended but not required. Economics of insurance, individual risk models for short term, collective risk models for single period, collective risk models over an extended period, and applications of risk theory. Material included in this course corresponds to the Society of Actuaries Exam: Risk Theory.


655 Pension Valuation (3:3:0). Prerequisite: MATH 556, SOA exam P-360U or EA-1A, or permission of instructor. Basic mathematics used in pension actuarial work without regard to pension law. This is the material covered in the Society of Actuaries Exam P-360U (EA-1B).


671 Fourier Analysis (3:3:0). Study of fundamental ideas in Fourier analysis. Topics include orthonormal systems, Fourier series, continuous and discrete Fourier transform theory, generalized functions, and an introduction to spectral analysis. Applications to the physical sciences, linear systems theory, and signal processing are used to motivate and integrate these topics.

672 Wavelet Theory (3:3:0). Prerequisites: Some knowledge of advanced calculus and computer literacy. Study of the theory and computational aspects of wavelets and the wavelet transform. Emphasizes computational aspects of wavelets, defining the Fast Wavelet Transform in one and two dimensions. Developing the appropriate numerical algorithms. Includes developing the theory of wavelet bases on the real line, discussing multi-resolution analysis, splines, time-frequency localization, and wavelet packets.

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673 Dynamical Systems (3:3:0). Prerequisites: Elementary courses in linear algebra and differential equations. Contemporary topics in the field of nonlinear dynamical systems are illustrated in mathematical models from physics, ecology, and population dynamics. Traditional qualitative analysis of difference and differential equations provides the background for understanding chaotic behavior when it occurs in these models. Topics include stability theory, fractals, lyapunov exponents, and chaotic attractors.


675 Linear Analysis I (3:3:0). Prerequisite: MATH 315 (Advanced Calculus) or its equivalent. Metric spaces, normed linear spaces, completeness, compactness, continuous (bounded) linear transformations, Banach spaces, Hilbert spaces, and orthogonal series.

676 Linear Analysis II (3:3:0). Prerequisite: MATH 675 or permission of instructor. Analysis of bounded and unbounded operators, spectral theorems, differential operators, and applications. Brief account of Lebesgue integration theory may be included.


678 Partial Differential Equations (3:3:0). Prerequisite: An elementary differential equations course. Physical examples, characteristics, boundary-value problems, integral transforms, and other topics, such as variational, perturbation, and asymptotic methods.

679 Topics in Analysis (3:3:0). Special topics in analysis not covered in the regular analysis sequence. May be repeated for credit.

680 Industrial Mathematics (3:3:0). Students take examples from industry and go through the complete solution process: formulation of a mathematical model of the problem; solution of the mathematical model (possibly by numerical approximation), interpretation and presentation of the results. The course emphasizes working in groups, relating mathematics to concrete situations, and communication and presentation skills.

682/OR 641 Linear Programming (3:3:0). Prerequisite: OR 341 or permission of instructor. An in-depth look at the simplex method. Computational enhancements—the revised simplex method, sparse-matrix techniques, bounded variables and generalized upper bounds; and large-scale decomposition methods—are also covered. Other topics include computational complexity of the simplex algorithm, and the Khachian and Karmarkar algorithms.

683 Modern Optimization Theory (3:3:0). Introduction to the basic mathematical ideas and methods for solving linear and nonlinear programming problems, with emphasis on the mathematical aspects of optimization theory. Along with reviewing the classical topics of linear programming, the course covers the recent developments in linear programming, including the interior point method, and considers basic results in nonlinear programming, including very recent developments in this field.

685 Numerical Analysis (3:3:0). Prerequisite: Computer literacy, including some programming experience. Computational techniques for the solution of problems arising in science and engineering. Includes theoretical development as well as implementation, efficiency, and accuracy issues in using algorithms and interpreting the results. Specific topics include linear and nonlinear systems of equations, polynomial interpolation, numerical integration, and an introduction to numerical solution of differential equations.

686 Numerical Solutions of Differential Equations (3:3:0). Prerequisites: MATH 446 or 685 and an elementary differential equations course. Finite difference methods for initial value problems, two-point boundary value problems, Poisson equation, heat equation, and first-order partial differential equations.

687 Variational Methods (3:3:0). Prerequisites: MATH 446 or 685 and an elementary differential equations course. Weak formulation of partial differential equations, energy principles, Galerkin approximations, and finite element methods. Review and development of the necessary analysis is included.

688 Topics in Actuarial Mathematics (3:3:0). Prerequisite: Permission of instructor. Special topics in actuarial science not covered in the regular actuarial mathematics sequence. May be repeated for credit.

689 Topics in Applied Mathematics (3:3:0). Special topics in applied math not covered in the regular applied math sequence. May be repeated for credit.

697 Independent Reading and Research (1-3:0:0). In areas of importance, but with insufficient demand to justify a regular course, an individual student may undertake a course of study under the supervision of a consenting faculty member. Written statement of the content of the course and a tentative reading list is normally submitted by the student as part of the request for approval to take the course. Literature review, project report, or other written product is normally required. May be repeated for a maximum of nine credits.

795 Seminar (1-3:1-3:0). May be repeated for credit.

799 Thesis (1-6:0:0). Original or compulsory work to be evaluated by a committee of three faculty members. Graded S/NC.

800 Studies for the Doctor of Philosophy in Education (variable credit). Prerequisite: Admission to the Ph.D. in Education program to study in mathematical sciences. Program of studies designed by student's discipline director and approved by student's doctoral committee, which brings the student to participate in the current research of the discipline director and results in a paper reporting the original contributions of the student. Enrollment may be repeated.
Medical Technology (MTCH)

200 Introduction to Medical Technology (1:1:0). Introduction to the profession of medical technology.

401 Orientation to the Problems and Practices of the Clinical Laboratory (1-2:0:0). Prerequisites: Completion of requirements for B.S. with a major in medical technology except for the 30 credits of professional study, and admission to a school of medical technology approved by the National Accrediting Agency for Clinical Laboratories. Orientation to clinical lab; specimen collection and record keeping; management principles and problems; educational theories as they apply to the teaching of clinical laboratory procedures; and quality control principles. Not offered on campus.

402 Clinical Hematology and Coagulation (1-8:0:0). Prerequisites: Completion of requirements for B.S. with a major in medical technology except for the 30 credits of professional study, and admission to a school of medical technology approved by the National Accrediting Agency for Clinical Laboratories. Morphology of blood cells in health and disease; theories of hematopoiesis and coagulation; techniques for measurement of hematologic parameters; and hematologic pathologies and their lab evaluation. Not offered on campus.

403 Clinical Microscopy (1-3:0:0). Prerequisites: Completion of requirements for B.S. with a major in medical technology except for the 30 credits of professional study, and admission to a school of medical technology approved by the National Accrediting Agency for Clinical Laboratories. Methods for the routine examination of urine, feces, and certain other body fluids, especially the microscopic identification of normal and pathologic components. Includes a study of the kidney and theories of microscopy. Not offered on campus.

404 Serology and Immunohematology (1-7:0:0). Prerequisites: Completion of requirements for B.S. with a major in medical technology except for the 30 credits of professional study, and admission to a school of medical technology approved by the National Accrediting Agency for Clinical Laboratories. Includes both diagnostic and blood bank techniques. Not offered on campus.

405 Clinical Microbiology (1-8:0:0). Prerequisites: Completion of requirements for B.S. with a major in medical technology except for the 30 credits of professional study, and admission to a school of medical technology approved by the National Accrediting Agency for Clinical Laboratories. Biology and pathology of bacteria, rickettsia, fungi, parasites, and viruses of clinical importance and their culture and identification. Not offered on campus.

406 Clinical Chemistry (1-10:0:0). Prerequisites: Completion of requirements for B.S. with a major in medical technology except for the 30 credits of professional study, and admission to a school of medical technology approved by the National Accrediting Agency for Clinical Laboratories. Chemical reactions and procedures used in clinical determinations on blood, urine, and cerebral spinal fluid. Includes manual and automated methods of chemical analyses. Not offered on campus.

Military Science (MLSC)

ROTC

100 Introduction to Army/ROTC (0:2:2). Introduces the student to the organizations, missions, customs, and traditions of the US Army and national defense establishment. Includes a laboratory in applied leadership, common military tasks, and physical fitness.

101 Self/Team Development (0:2:2). Introduces the student to leadership principles, dimensions, styles, and assessment, among other varied topics. Includes a laboratory in applied leadership, common military tasks, and physical fitness.

200 Leadership Skills I (1:2:2). Covers writing, briefing techniques, leadership, tactical communications, and officer/NCO roles, among other topics. Includes a laboratory in applied leadership, common military tasks, and physical fitness.

201 Leadership Skills IV (0:2:2). Familiarizes students in troop-leading procedures, operations orders, briefings, and basic first aid, among other topics. Includes a laboratory in applied leadership, common military tasks, and physical fitness.

300 Applied Leadership I (1:2:2). Prerequisite: MLSC 100, 101, 200, 202, or veteran status. Focuses on tactics of the infantry squad and platoon, and includes map reading, navigation, marksmanship, and other subjects. Some field training on weekend days is required. Includes a laboratory in applied leadership, common military tasks, and physical fitness.

301 Applied Leadership II (0:2:2). Prerequisite: MLSC 300. Prepares cadets to successfully complete a five-week Army ROTC Advanced Camp the following summer. Topics include tactics, squad and platoon drills, marksmanship, land navigation, and health and physical fitness. Some field training on weekend days is required. Includes a laboratory in applied leadership, common military tasks, and physical fitness.

400 Military Management (3:3:2). Prerequisites: MLSC 300 and 301. Considered the “transition to lieutenant” phase in which managerial theories are applied to personnel, training, and logistics management situations. Students have command and staff responsibilities for the George Mason cadet corps and receive hands-on experience operating as a management team. There are several briefing and writing requirements as well. Includes a laboratory in applied science, common military tasks, and physical fitness.

401 Military Law and Ethics (3:3:2). Prerequisite: MLSC 400 or MLSC 300/301. Continuing the “transition to lieutenant” phase of ROTC, examines the ethics of the military environment to include customs, ethical codes and decision making, constraints, and appeals to moral principles. American judicial system is also examined, with emphasis on the Uniform Code of Military Justice. Command and staff responsibilities are assigned to students for hands-on experience operating as a management team for the George Mason cadet corps. Includes a laboratory in applied leadership, common military tasks, and physical fitness.

LAB 201 Leadership Laboratory (Lead Lab) (0:2:2). Students enrolling in any ROTC class must enroll in this lab section. LAB 201 meets as a combined unit on Tues-
days, 3-4:20 p.m. LAB 201 trains students in a variety of practical military tasks, from drill and ceremonies to small-unit tactics. Upper-class cadets lead training as part of their staff leadership experience. LAB 201 also includes one field training exercise per semester, and physical training sessions are conducted every Monday, Wednesday, and Friday, 7-8 a.m., at the Field House. The Professor of Military Science can authorize waivers to LAB 201 enrollment in certain circumstances (scheduling conflicts, etc.)

Minor in Management (MSOM)
School of Management

Prerequisite for all MSOM courses is completion of 38 hours.

300 Managing Financial Resources (3:3:0). Course may not be taken for credit by School of Management majors. Focus on using basic concepts of accounting and financial management to make investment, credit, and operating decisions for an organization. Emphasis is on using financial reports to aid the planning and control of organizational activities.

300 Managing Financial Resources (3:3:0). Prerequisite: 38 credit hours. Course may not be taken for credit by School of Management majors. Focus on using basic concepts of accounting and financial management to make investment, credit, and operating decisions for an organization. Emphasis is on using financial reports to aid the planning and control of organizational activities.

301 Managing People and Organizations (3:3:0). Course may not be taken for credit by School of Management majors. Introduces students to key issues in management, organizational behavior, and human resource management. Special attention is given to best practices used by effective managers.

302 Managing Information (3:3:0). Course may not be taken for credit by School of Management majors. Provides an overview of the strategic role of information, the need for information systems, organizing information, integration of information systems in management processes and decision making, and related discussions in electronic business and electronic commerce.

303 Marketing in a Global Economy (3:3:0). Course may not be taken for credit by School of Management majors. Presents marketing principles, concepts, strategies, and analytical tools used by profit and nonprofit organizations to market ideas, products, and/or services to selected target groups. Emphasis on how to develop, promote, distribute, and price the firm's offerings in a dynamic economic, social, political, and global environment.

304 Starting and Managing the Enterprise (3:3:0). Course may not be taken for credit by School of Management majors. Exposes students to the behaviors required to successfully launch a new business, tools to identify and evaluate opportunities, and the issues critical to a start up firm. These issues include organizational structure, effective marketing strategy, operational logistics, legal issues, financial projections, and financing options.

305 Managing International Business (3:3:0). Course may not be taken for credit by School of Management majors. Provides a multidisciplinary approach to the global economy from the viewpoint of managing international business. The course introduces unique aspects of managing in the global economy including the theory and political economy of international trade and foreign direct investment, the global monetary system, and the strategy of international business.

Molecular Biosciences and Informatics (MBI)
School of Computational Sciences

530 Bioinformatics Methods I (3:3:0). Prerequisite: Graduate standing or permission of instructor. Involves study of methods and tools for molecular bioinformatics, including Internet interfaces to biological databases, molecular modeling tools, pairwise sequence comparison methods, database similarity searches, multiple sequence alignment, and tools for phylogenetic analysis.

531 Bioinformatics Methods II (3:3:0). Prerequisite: MBI 530 or permission of instructor. A continuation of MBI 530. Involves study of methods and tools for molecular bioinformatics, including molecular modeling, nucleic acid structure prediction, protein structure and function, and gene discovery.

532 Bioinformatics Methods III (3:3:0). Prerequisite: MBI 530 or permission of instructor. Involves study of practical issues in data management for DNA sequencing and other bioinformatics projects, including preprocessing data generated by automatic sequencers, creating sequencing project databases, automatically assembling DNA sequences, and ensuring data quality control.

533 Biotechnology I (3:3:0). Prerequisite: Graduate standing or permission of instructor. A laboratory intensive course introducing the theory and practice of modern biotechnology. Includes study of recombinant DNA, gene expression, and genetic analysis and associated methods. Laboratory exercises change to reflect the more recent advances in the field.

534 Biotechnology II (3:3:0). Prerequisite: MBI 533 or permission of instructor. A laboratory intensive course presenting the science and technology of DNA sequence determination and analysis. Lecture topics include DNA sequencing chemistry, biochemistry, and bioinformatics used in forensic, biomedical, and biotechnology applications.

535 Biotechnology III (3:3:0). Prerequisite: MBI 534 or permission of instructor. A laboratory intensive course covering applications of the Polymeras Chain Reaction (PCR) to problems in the theoretical and applied biosciences. Course focus is on current applications, procedures, and problems associated with the use of this versatile technology.

536 Biotechnology IV (3:3:0). Prerequisite: MBI 535 or permission of instructor. A laboratory intensive course that introduces the theory and practice of genome analysis, including the genetics, biochemistry, and tools for analysis of global gene expression, as well as the detection and quantification of genes and gene products.

537 Forensic DNA Science I (3:3:0). Prerequisite: MBI 533 or permission of instructor. A laboratory intensive course that introduces the theory and practice of modern forensic DNA science, including the biochemistry, chemistry, genetics, statistics, instrumentation, software, and wetware required for applications of DNA science to forensics.
538 Forensic DNA Science II (3:3:0). Prerequisite: MBI 537 or permission of instructor. An advanced laboratory intensive course that covers the science and technology of DNA polymorphism analysis, including nuclear and mitochondrial DNA. Students receive extensive laboratory training in DNA polymorphism analysis on the PEBiosystem's 310 and 377 genetic analyzers.

539 Forensic DNA Science III (3:3:0). Prerequisite: MBI 538 or permission of instructor. Provides advanced data analysis and interpretation. Covers in depth the theory, practice, and analysis of nuclear and mitochondrial DNA polymorphisms for complex forensic and biomedical applications, with emphasis on examples from casework.

Music (MUSI)
College of Visual and Performing Arts

Private Music Instruction
All private music instruction is by arrangement. Students must consult the director of applied music studies in the Department of Music for teacher assignment and registration numbers. Private music instruction fee applies.

For a music major, music minor, or jazz studies minor: half-hour lesson per week (1 credit), $164.50; hour lesson per week (2 or 3 credits), $329.

Private music instruction is offered in the following areas: accompanying, bassoon, cello, clarinet, composition, conducting, euphonium, flute, classical guitar, jazz guitar, harp, harpsichord, horn, koto, oboe, organ, percussion, piano, saxophone, string bass, trombone, trumpet, tuba, viola, viola da gamba, violin, and voice.

221 and 421 Undergraduate Private Music Instruction (1-3:0-.5-1). Prerequisite: For the 1- and 2-credit level, an audition is required (or portfolio of compositions for private composition); for the 3-credit level, students must have 8 credits on the major instrument and approval by the appropriate concentration audition committee. To earn 1 credit per semester, a student takes 14 half-hour private music lessons; to earn 2 or 3 credits per semester, a student takes 14 one-hour private lessons. The following amount of practice (or composing) is expected each day: 1 credit/50 minutes; 2 credits/one hour and 40 minutes; and 3 credits/two and one-half hours.

621 Graduate Private Music Instruction (2-3:0:1). Prerequisite: Audition or portfolio of compositions for private composition. To earn 2 or 3 credits per semester, a student takes 14 one-hour private music lessons. The 3-credit sequence is designed for students working toward the M.A. degree with a concentration in performance, composition, or conducting.

324, 424, and 724 Junior, Senior, and Graduate Recitals (1:0:0). Corequisite: Concurrent enrollment in the appropriate 3-credit private music instruction course. A public recital given by the student during the junior or senior year or during graduate study. The junior recital must be at least 25 minutes long; the senior recital must be at least 50 minutes long. Gradauate recitals must be of the following lengths: Composition: 30 minutes; Conducting: 30 minutes; Performance (single or multiple instruments): 50 minutes. All recitals are by arrangement. Students must consult with the director of applied music studies to register and schedule dates.

323 Music Education Recital (0:0:0). Prerequisite: A minimum of 8 credits in private music instruction in the major instrument; corequisite: Concurrent enrollment in the appropriate 2-credit private music instruction course. Recital on the major instrument given by the student during the junior or senior year. Recital must be at least 25 minutes long. All recitals are by arrangement. Students must consult with the director of applied music studies to register and schedule dates. Graded S/NC.

100 Fundamentals of Music (3:3:0). Cannot be applied toward a degree in music. Study of musical notation, interval and triad construction, the reading of treble and bass clefs, scale construction, rhythm, elementary sight singing and ear training, and application at the keyboard.

101 Introduction to Classical Music (3:3:0). Can be taken by music majors as a free elective only. An introduction to the art-music tradition of the West. Techniques for expanding listening skills are developed through the study of musical elements, styles, and selected masterworks of musical literature.

102 Popular Music in America (3:3:0). Can be taken by music majors as a free elective only. An investigation of popular music styles and its development in the United States with particular emphasis on the last fifty years. The course uses lectures, recordings, and video to enhance critical listening skills and to examine the stylistic and social contexts of popular music.

103 Musics of the World (3:3:0). For non-music majors only. Study and comparison of musical structure and expression in several world cultures with special attention to social context and function. Selected Asian, Middle Eastern, African, and American (Latin, Native, African) cultures will be studied.

104 Introduction to 20th-Century Music (3:3:0). Can be taken by music majors as a free elective only. Survey of various styles found in 20th-century music. Tonal, atonal, serial, and experimental music.

105 Music in the United States (3:3:0). Can be taken by music majors as a free elective only. Study of music in the United States from colonial times to present. Through interaction with musical examples, the student traces significant African and European influences on emerging style and artistic activity in the United States.

107 The Development of Jazz (3:3:0). Can be taken by music majors as a free elective only. Historical, analytical, and aural survey of jazz from inception to present day. Looks at trends resulting from synthesis of jazz with other musical idioms.

113 Sight Singing and Ear Training I (2:3:0). Prerequisites: MUSI 115 and 171, or permission of instructor. Students are taught to sing a line of music without the accompaniment of an instrument. Matching tones, major and minor scales, key signatures, intervals, rhythm, treble and bass clefs, rhythmic and melodic dictation.

114 Sight Singing and Ear Training II (2:3:0). Prerequisite: MUSI 113 or permission of instructor. Continuation of MUSI 113. Alto and tenor clefs, modulation, various modes, melodic and harmonic dictation.
115 Theory I (3:3:0). Prerequisite: Student must be able to read music pass a fundamentals of music test (administered during first week of classes), and have some proficiency on a musical instrument or in voice. Music notation, scales, key signatures, intervals, chords, cadences, figured bass.

116 Theory II (3:3:0). Prerequisite: MUSI 115 or permission of instructor. First- and second-inversion chords, modulation, nonharmonic tones, figured bass, seventh chords. Analysis of Bach chorales; composition of four-part chorales in 18th-century style.

171 Keyboard Skills I (1:0:3). Prerequisite: Nonmusic majors must have permission of instructor. Study of piano keyboard as it is related to various clefs in music. Emphasis on solution of basic stylistic and technical problems.

172 Keyboard Skills II (1:0:3). Prerequisite: MUSI 171. Nonmusic majors must have permission of instructor. Study of piano keyboard as it is related to intermediate song and combined in various music forms.

215 Theory III (3:3:0). Prerequisite: MUSI 116 or permission of instructor. Study of four-part chromatic harmony and analysis of 19th-century compositions.

216 Form and Analysis (3:3:0). Prerequisite: MUSI 215 or permission of instructor. Analytical study of the evolution of musical formal structures based primarily upon harmonic and textural principles.

221 Undergraduate Private Music Instruction. See beginning of Music course section.

251 The Art of Teaching Music (3:3:0). Prerequisite: Admission to a music major, music minor, or jazz studies minor program. Introduction to and exploration of the various music teaching professions. Philosophical, pedagogical, and practical issues are examined in the context of diverse teaching situations and venues that range from the private studio and public school to community music schools and commercial establishments. Observation of professionals in the field is required.

273 Keyboard Skills III (1:0:3). Prerequisite: MUSI 172. Nonmusic majors must have permission of instructor. Continuation of MUSI 172. Study of techniques of harmonization at the piano keyboard.

300 Recital Attendance (0:0:9). Students attend 10 student recitals to be selected from departmental recitals, music education recitals, and junior, senior, and graduate recitals. Graded S/NC (Satisfactory/No Credit).

301 Music in Motion Pictures (3:3:0). Prerequisite: 30 credits. Intensive study and analysis of the use of music tracks in motion pictures to introduce the picture, set a scene, create moods, or for musical numbers. From the silent film scores of the 1920s to the present (including electronic music).

302 American Musical Theater (3:3:0). Prerequisite: 30 credits. Intensive study of the musical elements in the American musical theater from its European and later African roots to its evolution between the wars into a native form, and its continual assimilation of external influences such as new forms of jazz and rock to the eclectic form of the present day.

311 Jazz Studies (3:3:0). Prerequisite: MUSI 379. A jazz musicianship course integrating improvisation, theory, composition, and arranging. Focuses on the concepts unique to our time in style, form, and harmony.

319 Class Composition and Arranging (3:3:0). Prerequisite: MUSI 114, 216, or permission of instructor. Students write original compositions for specified instruments, voices, or combinations. They then apply compositional principles to the creative arrangement of existing music of various styles.

323 Music Education Recital. See beginning of Music course section.

324 Junior Recital. See beginning of Music course section.

325, 326 Performance Seminar for Singers and Accompanists I, II (2:3:0). Prerequisite: Audition. Seminar for vocal performance and piano majors, designed to develop and improve artistic and performance skills through a master class format. Courses emphasize diction, style, song preparation and execution, interpretation, phrasing, and overall stage presence. Each course may be taken three times for credit.

331 Music History in Society I (3:3:0). Prerequisite: Co-requisite: MUSI 215, or permission of instructor. Historical survey of Western music from Greek times through the late Baroque era, with emphasis on specific musical genres and the composers who developed them. Musical developments are related to other aspects of society. Instruction is conducted by means of lectures, recordings, and video. The learning process is enhanced by reading, listening, writing, and analytical assignments.

332 Music History in Society II (3:3:0). Prerequisite: MUSI 216 and MUSI 331, or permission of instructor. Historical survey of Western music from the early Classical era through the mid-nineteenth century, with emphasis on specific musical genres and the composers who developed them. Musical developments are related to other aspects of society. Instruction is conducted by means of lectures, recordings, and video. The learning process is enhanced by reading, listening, writing, and analytical assignments.

351 Keyboard Pedagogy (3:3:0). Prerequisites: MUSI 114, 216, 273, and 8 credits in piano, organ, or harpsichord or permission of instructor. Investigation of various methods, theories, techniques, and materials used in teaching of keyboard to children and adults, both in individual and group situations.

352 Vocal Pedagogy and Diction (2:2:0). Prerequisite: Junior standing in applied voice or permission of instructor. Instruction in the teaching of voice for all levels through the study of vocal physiology and pedagogical methods.

353 Instrumental Pedagogy and Literature (3:3:0). Prerequisite: Junior standing in instrumental private music instruction or permission of instructor. Instruction in the teaching of instrumental music techniques for all levels through the study of pedagogical methods, standard literature, and musical instruments produced by present-day manufacturers.

361 Class Strings: Violin and Viola (1:0:4). Prerequisite: Admission to the music major program or permission of instructor. Study of techniques of playing and teaching the violin and viola. Survey of instructional materials and bow and instrument selection. Three clock hours per week are spent studying violin and viola. One clock hour per week is spent in Laboratory Ensemble.
362 Class Strings: Cello and String Bass (1:0:4). Prerequisite: Admission to the music major program or permission of instructor. Study of techniques of playing and teaching the cello and string bass. Survey of instructional materials and bow and instrument selection. Three clock hours per week are spent studying cello and string bass. One clock hour per week is spent in Laboratory Ensemble.

363 Class Woodwinds: Flute and Clarinet (1:0:4). Prerequisite: Admission to the music major program or permission of instructor. Study of techniques of playing and teaching the flute and clarinet. Survey of instructional materials and mouthpiece and instrument selection. Three clock hours per week are spent studying flute and clarinet. One clock hour per week is spent in Laboratory Ensemble.

364 Class Woodwinds: Oboe and Bassoon (1:0:4). Prerequisite: Admission to the music major program or permission of instructor. Study of techniques of playing and teaching the oboe and bassoon. Survey of instructional materials and mouthpiece and instrument selection. Three clock hours per week are spent studying oboe and bassoon. One clock hour per week is spent in Laboratory Ensemble.

365 Class Brass (1:0:4). Prerequisite: Admission to the music major program or permission of instructor. Study of techniques of playing and teaching the brass instruments. Survey of instructional materials and mouthpiece and instrument selection. Three clock hours per week are spent studying brass instruments. One clock hour per week is spent in Laboratory Ensemble.

366 Class Percussion (1:0:4). Prerequisite: Admission to the music major program or permission of instructor. Study of techniques of playing and teaching the percussion instruments. Survey of instructional materials and instrument selection. Three clock hours per week are spent studying percussion instruments. One clock hour per week is spent in Laboratory Ensemble.

367 Class Guitar (1:0:4). Prerequisite: Admission to the music major program or permission of instructor. Study of techniques of playing and teaching the guitar. Survey of instructional materials and instrument selection. Three clock hours per week are spent studying guitar. One clock hour per week is spent in Laboratory Ensemble.

368 Class Voice (1:0:4). Prerequisite: Admission to the music major program or permission of instructor. Study of the human voice in artistic singing. Practical application of basic principles is emphasized. Three clock hours per week are spent studying voice. One clock hour per week is spent in Laboratory Ensemble.

371, 372 Techniques of Accompanying I, II (1:0:3). Prerequisite: Successful audition on a keyboard instrument for admission to a music degree program. 4 credits in undergraduate private music instruction on a keyboard instrument, or permission of instructor. Development of accompanying skills through collaboration with solo singers, instrumentalists, and small ensembles. Students perform for each other, observe lecture/demonstrations and performances by professionals, and participate in master classes. Each course may be taken two times for credit. ay

379 Jazz Improvisation (1:1:2). Prerequisite: MUSI 116 or permission of instructor. Corequisite for Jazz Studies minors: MUSI 485 Jazz Chamber Ensembles. A study of improvisation techniques and styles, with emphasis on the common practice period of jazz. Application on the student's major instrument or voice to develop creativity and personal expression.

380 Wind Ensemble (1:0:3). Prerequisite: Audition. Highly selective group of instrumentalists performing works from the wind ensemble repertoire. Public concerts will be given.

381 University Chorale (1:0:3). Prerequisite: Audition. Performance of works from the choral repertoire. Public concerts are given.

382 Piano Ensemble (1:0:3). Prerequisite: Audition and 4 credits in Private Music Instruction: Piano. Study and performance of original four-hand works for one and two pianos. Public performances.

383 Symphonic Band (1:0:3). Prerequisite: Audition. Performance of works from the band repertoire. Public concerts are given.

384 Symphonic Chorus (1:0:3). Prerequisite: Audition. Performance of major works from the choral repertoire. Public concerts are given.

385 Chamber Singers (1:0:3). Prerequisite: Audition. Discovery, interpretation, and performance of choral music for vocal chamber music ensemble from all historical periods. Emphasis on achieving a high level of artistic performance and on bringing to the university and its surrounding community musical compositions that are not readily accessible in the regular concert repertoire.

387 Symphony Orchestra (1:0:3). Prerequisite: Audition. Performance of works from the symphony orchestra repertoire. Public concerts are given.

388 Musical Theater Techniques (1:3:1:2-6). Prerequisite: Audition. Preparation and presentation of works or parts of works from the musical theater repertoire (opera, operetta, musical comedy). Students investigate applicable techniques in lab sessions and rehearsals. Public performance is given. May be taken for credit four times.

389 Jazz Ensemble (1:0:3). Prerequisite: Audition. Provides practical experience in various aspects of jazz performance: section work within a large aggregation, combo work, and improvisation. Public concerts are given.

391 Conducting I (2:0:3). Prerequisites: MUSI 114, 216, and 273, or permission of instructor. Study of basic techniques of conducting a musical ensemble.

393 Music Administration and Management (2:2:0). Prerequisite: MUSI 116 or permission of instructor. Prepares the student to address aspects of administration and management of music programs in public and private schools. Various principles and concepts of management styles and planning are investigated. Such topics as curriculum, budget, student recruitment and retention, external relations of the music unit, and legal issues for music educators are covered.

395 Teaching Internship (1:4:0:0). Prerequisite: MUSI 251. Internship with a professional individual or organization in the field of teaching. Provides an introduction to teaching or augments the student's teaching skills. Students develop individual contracts defining the learning and competencies to be gained from the experience. Maximum

http://catalog.gmu.edu
of 9 internship credits (MUSI 395, 495, 496) can be applied toward a degree. 

396 Conducting II (2:0:3). Prerequisite: MUSI 391 or permission of instructor. Advanced conducting course emphasizing techniques for instrumental and choral conducting. Refining gestures, full score analysis and interpretation, rehearsal techniques, and changing meters are included. 

401 Impact of the Arts on Civilization (3:3:0). Prerequisite: 30 credit hours, or permission of instructor. By analyzing how the various genres of art impact us in various ways—intellectual, emotional and subliminal—this course broadens aesthetic and historical perspective, exposes students to major strands of contemporary thought, and develops discursive abilities through role-playing in roundtable discussions.

415 Music in Computer Technology (3:3:0). Prerequisite: MUSI 319 or permission of instructor. Overview of ways the computer is used in music. Topics include principles of musical instrument digital interface (MIDI), the various kinds of synthesis; acoustics and sound processing; and musical composition using the computer. Explores the music resources of the Internet as well as survey current multimedia applications in music history, theory, ear training, improvisation, and notation. 

419 Orchestration (3:3:0). Prerequisites: MUSI 114, 216, and 319, or permission of instructor. Principles of combining and balancing instruments in orchestral and chamber contexts. Attention to orchestral terminology and general notation as well as timbre, range, clefs, transposition, special effects, and scoring procedures. 

421 Undergraduate Private Music Instruction. See beginning of Music course section. 

424 Senior Recital. See beginning of Music course section. 

425 Performance Synthesis. Course under development. 

431 Music History in Society III (3:3:0). Prerequisite: MUSI 216, MUSI 331, and MUSI 332, or permission of instructor. Study of contributions to the world of music in selected cultures such as India, Indonesia, China, Japan, Africa, the Middle East, the Americas, etc. Emphasis will be placed on comparative musical characteristics as well as sociological function. Instruction is conducted by means of lectures, recordings, and video. The learning process is enhanced by reading, listening, writing, and analytical assignments. 

432 Music History in Society IV (3:3:0). Prerequisite: MUSI 216, MUSI 331, MUSI 332, and MUSI 431, or permission of instructor. Historical survey of Western music from the late nineteenth century to the present, with emphasis on specific musical genres and the composers who developed them. Musical developments are related to other aspects of society and the interaction between world musics is considered. Instruction is conducted by means of lectures, recordings, and video. The learning process is enhanced by reading, listening, writing, and analytical assignments. 

461 The Teaching of General Music in the Elementary and Middle School (3:3:1). Prerequisites: MUSI 114, 216, 273, and acceptance into the music education concentration. Corequisite: MUSI 391. For music majors only. Study of theory, methods, practice, and materials involved in the teaching of general music in the elementary and middle school. Students spend three hours per week in class and one hour per week observing/teaching in Laboratory Ensemble. Students also participate in field observation of music classes in the public schools. 

463 The Teaching of Vocal Music in the Secondary School (3:3:1). Prerequisites: MUSI 114, 216, 273, 391, and acceptance into the music education concentration. Corequisite: MUSI 396. For music majors only. Survey of repertoire and methods for teaching high school choral groups, small ensembles, and voice classes. Students spend three hours per week in class and one hour per week observing/teaching in Laboratory Ensemble. Students also participate in field observation of music classes in the public schools. 

464 Instrumental Music Methods I (3:3:1). Prerequisites: MUSI 114, 216, 273, and acceptance into the music education concentration. Corequisite: MUSI 391. For music majors only. Prepares students to successfully plan, organize, and administer marching band and jazz ensemble programs in their secondary public school curriculum. Students spend three hours per week in class and one hour per week observing/teaching in Laboratory Ensemble. Students also participate in field observation of music classes in the public schools. 

465 Selected Topics in Music Education (1-3:1-3:0). Prerequisite: 90 credits in a music degree program or permission of instructor. Topics of practical interest to prospective and practicing music educators covering pedagogy, performance, and logistics relating to teaching music in schools, private studios, and communities. May be repeated for credit. 

466 Instrumental Music Methods II (3:3:1). Prerequisites: MUSI 114, 216, 273, 391, and acceptance into the music education concentration. Corequisite: MUSI 396. For music majors only. Prepares students to teach instrumental music in elementary, junior high/middle, and secondary schools. Students spend three hours per week in class and one hour per week observing/teaching in Laboratory Ensemble. Students also participate in field observation of music classes in the public schools. 

485 Chamber Ensembles (1:0:3). Prerequisite: Audition. Performance of works from the chamber music repertoire. Public performances are given. 

492/492H Selected Topics in Music (1-3:1-3:0). Prerequisite: 45 credits or permission of instructor. Topics of practical interest to students in such areas as composition, music history and literature, world music, and performance practices. May be repeated for credit. 492H denotes a music history course. 

495 Internship in Music Education (Student Teaching) (6:0:0). Prerequisite: Completion of all courses required for the B.M. degree with a music education concentration. Full semester of an intensive supervised clinical experience in approved Virginia schools. Experiences in elementary and secondary school settings. Maximum of 9 internship credits (MUSI 395, 495, 496) can be applied toward a degree. 

496 Internship (3-6:0:0). Prerequisite: Open to music majors with 90 credits. Contact the department one semester before enrollment. Internships are approved work-study programs with specific employers or agencies. Credit is determined by the department. Maximum of 9 internship credits (MUSI 395, 495, 496) can be applied toward a degree.
497, 498 Independent Study (1-3:0:0). Prerequisites: Music majors with 90 credits and permission of instructor and department chair. Individual research and study of a selected subject in close consultation with an instructor. Student may choose from the musicological, ethnomusicological, theoretical, compositional, or educational areas of music and produce at least one major written work based on the research.

511 Analytical Techniques (3:3:0). Prerequisite: Baccalaureate in music or permission of instructor. Detailed formal and stylistic examination of music selected from the major style periods. Development of the analytical skills necessary for theoretical study at the graduate level.

512 Advanced Orchestration (3:3:0). Prerequisite: Baccalaureate in music with a minimum of three credits in orchestration or permission of instructor. Intensive study through analysis and arrangement of advanced instrumentation methods. Scoring for large forces. Twentieth-century vocal and instrumental techniques such as multiphonics. Unusual instruments. New methods of notation. Late 20th-century performance practices.

515 Music in Computer Technology (3:3:0). Prerequisite: Baccalaureate degree in music or permission of instructor. Overview of ways the computer is used in music. Topics include principles of musical instrument digital interface (MIDI); the various kinds of synthesis; acoustics and sound processing; and musical composition using the computer. Explores the music resources of the Internet and surveys current multimedia applications in music history, theory, ear training, improvisation, and notation.

525, 526 Performance Seminar for Singers and Accompanists I, II (2:3:0). Prerequisite: Audition. Seminar for vocal performance and accompanying/piano majors designed to develop and improve artistic and performance skills through a master class format. Emphasizes diction, style, song preparation and execution, interpretation, phrasing, and overall stage presence. Each course may be repeated once for credit.

531 Advanced Topics in Music History and Literature (3:3:0). Prerequisite: Baccalaureate in music or permission of instructor. Thorough examination of a specific musical style, genre, composer, compositional school, or historical development. Primary and secondary source materials studied in historical and/or analytical contexts. May be repeated for credit as topics change. f, sum

552 Vocal Pedagogy and Diction (2:2:0). Prerequisite: Graduate status in applied voice or permission of instructor. Instruction in the teaching of voice for all levels through the study of vocal physiology and pedagogical methods.

553 Instrumental Pedagogy and Literature (3:3:0). Prerequisite: Baccalaureate degree in music or permission of instructor. Instruction in the teaching of instrumental music techniques for all levels through the study of pedagogical methods, standard literature, and musical instruments produced by present-day manufacturers.

561 Advanced Topics in Music Education (1-6:1-6:0). Prerequisite: Baccalaureate degree in music or permission of instructor. Intensive examination of specific areas of concern to music educators engaged in teaching vocal, instrumental, and general music at all levels or functioning as private studio teachers. Individual research, group discussions, and participation in related activities. May be repeated for credit.

562 The Psychology of Music Teaching and Learning (3:3:0). Prerequisite: Baccalaureate degree in music or permission of instructor. Study of the learner’s musical behaviors (affective, cognitive, and psychomotor) in an effort to devise an empirically based teaching method founded on learning principles.

571, 572 Techniques of Accompanying I, II (1:0:3). Prerequisite: Admission to graduate-level private music instruction in a keyboard instrument or permission of instructor. Development of accompanying skills through collaboration with solo singers, instrumentalists, and small ensembles. Students perform for each other, observe lecture/demonstrations and performances by professionals, and participate in master classes. Each course may be taken two times for credit.

580 Wind Ensemble (1:0:3). Prerequisite: Audition. Highly selective group of instrumentalists performing works from the wind ensemble repertoire. Public concerts are given. May be taken four times for credit.

581 Graduate Choral Ensembles (1:0:3). Prerequisite: Audition. Performance of works from the choral repertoire. Public concerts are given. May be taken four times for credit.

583 Symphonic Band (1:0:3). Prerequisite: Audition. Performance of works from the band repertoire. Public concerts are given. May be taken four times for credit.

585 Chamber Ensembles (1:0:3). Prerequisite: Audition. Performance of works from the chamber music repertoire. Public performances are given. May be taken four times for credit.

587 Symphony Orchestra (1:0:3). Prerequisite: Audition. Performance of works from the symphony orchestra repertoire. Public concerts are given. May be taken four times for credit.

589 Jazz Ensemble (1:0:3). Prerequisite: Audition. Provides practical experience in various aspects of jazz performance. Participation in section rehearsals and small and large jazz groups. Jazz improvisation is expected. Public concerts are given. May be taken four times for credit.

592 Advanced Topics in Music (1-6:1-6:0). Prerequisite: Baccalaureate degree in music or permission of instructor. Intensive study of specific areas of concern to musicians engaged in performance, composition, and conducting. Individual research, group discussions, and participation in related activities. May be repeated for credit.

597 Advanced Topics in Conducting (3:3:0). Prerequisite: Baccalaureate degree in music with a minimum of two semesters of study in conducting or permission of instructor. Intensive study of an advanced topic in conducting chosen according to interest of students and instructor from topics such as choral music performance techniques and score preparation, wind ensemble performance techniques and score preparation, orchestral performance techniques and score preparation, performance practices in choral music before 1750, and rhythmic analysis as a guide to score interpretation in music of all periods. Maximum of six credits may be earned.

621 Graduate Private Music Instruction. See beginning of Music course section.
662 Introduction to Research in Music (3-3:0). Prerequisite: Baccalaureate degree in music or permission of instructor. Development of skills, attitudes, and understanding necessary in doing and reporting research in music, including philosophical bases, scope and organization, stylistic practices in writing research reports, the study of materials and resources in music and music education, and the proper use of library and other research services.

663 Aesthetics of Music Education (3-3:0). Prerequisite: Baccalaureate degree in music or permission of instructor. Study of the philosophical foundations of contemporary music education, as well as a critical examination of music programs and activities in aesthetic education and efforts by the music education establishment to enhance them.

684 Graduate Lecture-Recital (1-3:0:0). Prerequisite: Baccalaureate degree in music and permission of the department chair. Corequisite: Graduate private music instruction at the 3-credit level. Combination of musical performance and scholarly presentation on a well-defined topic. Public presentation is required. Preparation of the program is directed by a member of the full-time music faculty in consultation with the student's private music instructor. May be taken for a maximum of 6 credits.

688 Advanced Musical Theater Techniques (1-3:1:2-6). Prerequisite: Audition. Preparation and presentation of works or parts of works from the musical theater repertoire (opera, operetta, musical comedy). One hour of lecture per week (for each credit pursued) and two hours of practicum per week. Students investigate applicable techniques through topic-oriented lectures and assignments and in goal-oriented practicum sessions and rehearsals. Public performances are given.

699 Independent Study (1-3:0:0). Prerequisite: Baccalaureate degree in music and permission of the department chair. Individual research and study in one of the concentrations available in the Master of Music. May be taken for a maximum of 6 credits.

724 Graduate Recital (1:0:0). Prerequisite: At least three credits in graduate private music instruction in the area of concentration at the three-credit level. Corequisite: Enrollment in graduate private music instruction in the concentration at the 3-credit level. Public performance in the area of concentration.

799 Thesis (1-6:0:0). Prerequisites: At least 12 graduate credits (including MUSI 511) and approval of the thesis topic. Students in the music education concentration must also have taken MUSI 562 and have successfully passed the comprehensive exit examination. Supervised research on an approved thesis topic. Graded S/NC.

800 Studies for the Doctor of Philosophy in Education (variable credit). Prerequisite: Admission to the Ph.D. in Education program to study in music. Program of studies designed by the student's discipline director and approved by the student's doctoral committee that brings the student to participate in the research, performance, or creative activity of the discipline director and results in a paper reporting the original contributions of the student. Enrollment may be repeated.

New Century College (NCLC) New Century College

Division I Courses

110 Community of Learners (8:8:0). Designed for students pursuing a B.A. or B.S. in Integrative Studies within New Century College. Develops essential college skills, particularly communication (reading, writing, speaking) for critical thinking and problem solving, information literacy, statistics, and probability. Issues such as transition to college life, cultural diversity, and personal freedom and responsibility are explored. Credit distribution: composition (3), communication (2), math/analytical reasoning (1), and information technology (2).

111 Composition, Communication and Community (7:7:0). Students study key skills for our information economy. They research original ideas and analyze critically the ideas of others. They also learn to communicate their conclusions through writing, speech, and the creative use of electronic media. Topics covered include writing to learn, information literacy, individual and small-group communication, and collaborative problem solving. NCLC 111 fulfills credit for ENGL 101 (3 credits), COMM 100 (3 credits), and UNIV 100 (1 credit).

120 The Natural World (8:6:2). Designed for students pursuing a B.A. or B.S. in Integrative Studies within New Century College. Introduces the worlds of science and mathematics. Students explore contemporary issues of public health and the environment, with a historical perspective and understanding of how scientists communicate ideas. Students will engage in debate, poster presentation, and group problem solving. Credit distribution: math/analytical reasoning (2), natural science (4), and communication (2).

121 Science, Mathematics, and Technology in Society (7:7:0). Building on skills developed in NCLC 110/111, this course is designed for students pursuing a B.A. or B.S. in Integrative Studies within New Century College. This course introduces the natural sciences and their relation to mathematics. After building a knowledge base, students explore the natural world through contemporary issues. The class discusses man and nature from biological, historical and contemporary viewpoints, while developing an understanding of how science develops and communicates ideas. Students learn to work in groups to solve problems and work through issues, then publicly present ideas through debates, posters and various written formats. Credit distribution: math/analytical reasoning (3), natural science (4).

130 The Social World (8:8:0). Designed for students pursuing a B.A. or B.S. in Integrative Studies within New Century College. Focuses on the social world and its cultural origins. Students investigate how that world is both model and mirror of social behavior. Students are encouraged to model objective and subjective thinking, analysis and synthesis, explanation, and understanding. Credit distribution: arts (2), humanities (2), and social sciences (4).

140 Self as Citizen (8:8:0). Designed for students pursuing a B.A. or B.S. in Integrative Studies within New Century College. Explores the definitions of self and society in historical non-Western and Western contexts. Issues relating to the concepts of moral identity and cultural differences are covered using text, film, plays, social science...
research methods, and writing. Credit distribution: art (1), literature (3), and social sciences (4).

165 Independent Study. See Division III Courses.

190 Internship. See Division III Courses.

195 Experiential Learning. See Division III Courses.

**Division II Courses**

**Learning Communities: Special Topics (3-15:3-15:0).** Division II is composed of a variety of learning communities; each combines subjects usually taught in separate courses into a single course of study. Offering the equivalent of between 3 and 15 credits of undergraduate work, learning communities replace the often fragmented classroom experience and integrate material from several perspectives. In learning communities, faculty and students study topics in an integrated context and explore various ways of understanding. Credit is assigned for each learning community at the time it is offered.

200 Visual Thinking and the Creative Impulse (3-15:3-15:0). Studies the creative process in the arts and sciences through demonstration and the analysis of the psychology and the arts. Visual perception, memory, classical and modern art, and performance are explored as examples. Students are presented with the opportunity to assess themselves as creative thinkers.

201 The World since 1945 (3-15:3-15:0). Examines the history of the past 50+ years to illuminate the contemporary world as well as build connections between the global and local. Using historical works, fiction, autobiographies, films, and daily newspapers, students explore such major events as the Cold War, the struggle against apartheid in South Africa, the Vietnam War, the Chinese Cultural Revolution, and the continuing conflict in the Middle East. As a learning community, the course requires active student participation in group projects and discussions.

202 Developing Public Speaking and Critical Thinking Skills (4:3:1). Combines the process of learning to speak in front of audiences with the analysis of arguments and persuasive appeals. By looking at public speech, advertising, and television, the student learns to critique persuasive messages.

204 Creative Leadership Development (4:3:1). Examines the leadership phenomenon that is within each person and the strategies for learning, interpreting, creating, and developing leadership that is reflective and active.

220 Energy and Environment (3-15:3-15:0). Investigates current sources of energy, various modes of their utilization, and environmental effects. Offers an overview of the mechanical, physical, and chemical methodologies of energy use and delves into the biological, environmental, and ecological aspects of pollution-generating mechanisms.

225 Dean's Honor Book Review (1:1:0). Open to New Century College students who were admitted with a GPA of 3.3 or better. Considers the ways in which specific works such as books, dramas, works of art, or ideas have influenced the intellectual climate of their times and beyond.

226 Dean's Honors Seminar (1:1:0). Prerequisite: Students must have entered New Century College with a GPA of 3.3 or greater or with six or more AP credits. Considers the dynamic relationship an author or artist has with the cultural and intellectual climate of the times and beyond. The broader question is how one helps create culture and is influenced by it.

230 Math and Culture (3-15:3-15:0). Focuses on mathematical problems and their emergence in different cultures and historical moments. Emphasis is on the interdisciplinary nature of the motivations for the development of mathematics and on the process of mathematical discovery. The course entails a high degree of faculty/student interaction, which enables students to demonstrate, through the use of presentations and projects, their understanding and mastery of fundamental mathematical ideas and techniques and the role of mathematics in the development of human culture.

245 Visual Culture and Society (4:3:1). Explores the role of visual culture in contemporary society including an examination of photography, the visual and performing arts, film and video, and electronic media. Readings focus on the historical foundations of visual culture as well as theories of visual culture and aesthetics. Students investigate the ways that forms of visual culture function in society and how these are linked to race, class, and gender as well as politics and economics. Students will gain hands-on experience working with contemporary visual media tools such as computer graphics and digital video editing.

249 The Internet: Literacy, HTML Tools, and Virtual Community (3-15:3-15:0). This course is an introduction to cyberspace, the Internet, and the World Wide Web. Students learn basic HTML to create individual and collaborative web pages. In addition to using e-mail, students explore use of listservs, online discussion forums, and virtual communities. Assignments include collaborative and individual web pages, analytical and creative papers, and online research. One hour of experiential credit is required in this class.

265 Independent Study. See Division III Courses.

270 Page and Stage: Theory and Practice (3-15:3-15:0). In reading, writing, and performing plays and other literary texts, we discover our own ability to inhabit others' minds, live in others' bodies and see through others' eyes. Students investigate the metamorphosis of reader into actor and text into three-dimensional theater. Some questions to consider are, How do writers use images, voices and structure to shape their material and reach out to an audience? How does the actor as detective follow a writer's clues to achieve a unique performance? Throughout the semester, students practice communicating those answers on page and stage.

275 Special Topics (3-15:3-15:0). Studies topics of special interest to undergraduates. May be repeated for credit if subtitle is different.

290 Internship. See Division III Courses.

295 Experiential Learning. See Division III Courses.

300 Utopia (3-15:3-15:0). Examines utopian and dystopian literature, theory, and practice including Plato, Piercy, LeGuin, Robinson, and others. Examines how utopian dreams (and dystopian nightmares) have changed over time and how texts are designed to jostle readers' ideas about society and themselves. Students study several utopian experiments and visit a few local utopian communities.

301 Traditions and Modernity (3-15:3-15:0). Examines five decades from 1880 to 1930 by studying a whole series
of movements (Populists, Ku Klux Klan, New Woman, New Negro, Southern Agrarians, Fundamentalism, etc.) as Americans struggle to balance the often contradictory tug of tradition and modernity in their lives. Course examines the social movements that emerged by teaching students to read the representative textbooks, films, music, correspondence, and trial records of these movements. Students are encouraged to think about the ways in which individuals during this period learned to think of themselves as participants in overlapping and sometimes competing groups, as turn of the century Americans tried to create new identities, even when the participants believed they were reviving old ones.

302 Epic Creations (3-15:3-15:0). Integrates western European, Native American, and colonial American experiences by examining the past through the lenses of literature, art, and history. Traces the paths of ancient and contemporary guides by reading, writing, discussing, surfing the web, watching videos, and taking field trips as we create our own modern epics. Three of the credits are experiential learning on campus.

303 Modernization and Its Discontents: Conflict/Community in Modern Russia and America (3-15:3-15:0). Compares regional studies, which consider the problem of modernization and its effects on the individual from the political, social, and cultural perspectives, using the prism of literature to achieve this aim. Examines the works of fiction, both from the realm of officially recognized literature and the popular culture.

304 Social Movements and Community Activism (4:3:1). Explores community activism by looking at social movement case studies and engaging in direct social action. Students learn about grassroots movements, the rhetorical strategies used to attract group members, and how movements evolve into viable organizations and institutions. Includes 1 credit of experiential learning.

305 Conflict Resolution and Transformation (6:6:0). Examines the nature and dynamics of conflict and ways to resolve and transform conflict. Experiential learning is used as the vehicle through which students explore their assumptions about communication and develop their skills for resolving interpersonal conflicts.

306 Our Common Futures (3-15:3-15:0). Students and faculty work together to model patterns of life that fit within the planet's ecological means. Involves the study of "environomics," introductions to urban systems and planning, and studio work to actually create models of alternative growth.

307 Narratives of Nature (6:3:3) Course begins with the individual's connection to the infinite, the cosmos, and ends in a microscopic examination of the behavior of the human animal. Looks at the fundamental questions relating to scientific thinking and writing.

310 Violence and Gender (3-15:3-15:0). Using nonfiction, research documentaries, oral histories, case studies, literature, feature films, music, dance, and the visual arts, this course examines the dynamics of violence through different cultural lenses. Students have the opportunity to work in university and community settings to integrate their academic experiences with practice.

311 The Mysteries of Migration: Consequences for Conservation (3-15:3-15:0). Investigates the biology of migration and its implications for science policy. Students consider the phenomenon of migration in the context of natural history, conservation, and cultural issues. The course includes several weekend trips for field study.

312 Images and Experiences of Childhood: Social Construct, Literature and Film (3-15:3-15:0). Immerses students in the images of childhood through the media of literature, video, and poetry, with a strong emphasis on historical perspectives of childhood. The class is interactive, requires some work in groups, and requires classroom participation.

313 Strangers in a Strange Land: Immigration in 20th Century America (3-15:3-15:0). Examines the immigration experience as a historical reality and as a cultural image within the context of 20th-century America. Using Russian immigration as a microcosm, the course studies the impact of various waves of Russian refugees on American political, economic, and cultural life. Three separate emigrations are considered: the Jewish emigration of the early 20th century, the white Russian emigration of the 1920s–1950s, and the post-Jackson exodus of the 1970s–1980s.

315 Spirituality and Conflict Transformation (6:6:0). Examines dimensions of spirituality as they relate to a range of activities, including peace-making efforts in large-scale conflicts, conflicts within faith communities, and interpersonal disputes. Experiential learning explores spiritually informed resolution.

319 An Endangered Earth (3-15:3-15:0). Introduces students to the special set of issues and problems raised by science in the public policy process, especially the inherent tension between the tenets of a democratic society and the tenets of a scientific community. Using environmental policy problems as the specific vehicle, the course is structured to prepare students to ask intelligent and useful questions about the science and politics of particular public policy issues, understand where they might go to find information for developing options, and develop criteria by which they can evaluate these ideas.

320 Construction of Differences: Race, Class, and Gender (3-15:3-15:0). Investigates the concept of race, sex, sexual orientation, and social class in contemporary American society. Examines the commonalities in the construction of these categories and experiences of those who occupy them.

321 Vision Quest: Modeling the Natural World Using Art, Computer Programs, and Science (3-15:3-15:0). Imparts the concepts of science in a visual, auditory, and kinetic fashion. Uses simulation programs, modeling the natural world to help students understand the principles and mysteries of science.

325 Dean's Honor Book Review (1:1:0). Open to New Century College students who have had a previous semester GPA of 3.300 or better and have at least 30 college credits. Focuses on classical philosophers and artists and the impact of their works for contemporary times. May be repeated for credit if the topic is different.

326 Dean's Honors Seminar (1:1:0). Prerequisite: Students must have maintained an overall GPA of 3.300 or greater while in New Century College. Focuses on a variety of topics of interest ranging from book and film reviews to development of special events and symposiums. May be repeated for credit if the topic is different.
330 Enterprise Development (3-15:3-15:0). Prepares students for enterprise development in diverse environments by examining the spectrum of sociocultural, organizational, behavioral, strategic, and management factors that impact enterprise creation. Instructional method is interactive, using case studies, scenarios, role playing, guest speakers, and student-driven semester projects to link theory to practice.

331 The Nonprofit Sector (4:3:1). Through a combination of lecture and electronic classroom experience, students develop skills to conduct research essential to the nonprofit-profession manager of the future. Students explore types and numbers of nonprofit organizations, their finances, services, as well as the importance of this information in strategic planning, marketing, fund raising, and general management decisions. This course is also taught on-line.

335 Ethics, Communication, and Freedom (3-15:3-15:0). Prerequisites: Sophomore standing and three credits each of communication and philosophy, or permission of instructor. Students examine ethical principles, discuss some underlying bases for these principles, and work to understand how such principles are experienced and can be applied in a free society. Focus is on examining potential conflicts between ethics and the freedoms believed essential to a healthy democratic society. Cases are drawn from the areas of sports, medicine, media, politics, and business.

336 Wealth, Power, and Values (3-15:3-15:0). Investigates the political, economic, social, industrial, and diplomatic sources of wealth, values, and power at the end of the 18th, 19th, and 20th centuries. Includes lecture, discussion, debate, and experiential learning, with emphasis on individual research projects.

337 Politics, the Arts, and History (9:9:0). Students taking this learning community receive opportunities to see how major musicians, composers, studio artists, dramatists, writers, architects, and dancers confront political issues and historical events. Students are required to attend several museum exhibitions and/or performances.

340 Progress: Can America Figure Out What It Means? (3-15:3-15:0). Explores our land—the built and the left natural—as valued and sacred. Challenges students as developers and environmentalists, as citizens and business persons, to strive for a win-win scenario.

341 Progress: Washington—the New Edge City? (3-15:3-15:0). NCLC 340 investigates how the city, both the good parts and the bad parts, came to be. This course investigates what we might do about the situation. Requires active engagement of the students in research and discussion. Collective field work and class field trips both semesters. Students may take either Part I or Part II of this course but are encouraged to take both if possible.

345 Introduction to Multimedia (3-15:3-15:0). Technological, aesthetic, and educational issues of using interactive multimedia. Topics include theoretical underpinnings of some technological issues involved in multimedia computing as well as techniques for authoring interactive multimedia projects using a variety of digital media tools.

348 Information in the Digital Age (6:3:3). Prerequisites: NCLC 249. Examines how purpose and function relate to form and how digital material can attract or hinder audience responsiveness. The unique concerns of copyright, security, and privacy in a digital environment are consider-
ered. By looking at significant social, cultural, ethical, business, and economic consequences of the digital age, students gain hands-on experience in working with and assessing digital information.

350 Counterculture, Cyberculture (3-15:3-15:0). Explores cyberspace guided by these questions, What is cyberspace? How do we interact with it? How does it affect us, especially in relationships between individuals, between readers and texts, between artists, performances, and audiences? What occurs in our concepts of self, machine, and community as we become further involved in cyberconnections? What will come next?

360 The Built Environment (3-15:3-15:0). Examines, records, and interprets objects, structures, and landscapes that compose our built environment. Draws on the fields of historical archaeology, architectural history, and urban geography, and employs photography, cartography, and evocative writing to represent the material world we inhabit. Builds on the study of one neighborhood in Arlington, Virginia, and expands to the whole metropolitan area.

361 Neighborhood, Community, and Identity (3-15:3-15:0). Examines the processes of neighborhood formation and transformation in the context of urbanism, suburbanism, immigration, and transmigration. Students explore the history and meaning of neighborhoods in the Northern Virginia and the Washington, D.C., metropolitan area.

365 Independent Study. See Division III Courses

370 The Romantic Road: Literature and the Arts in 19th-Century Germany (3-15:3-15:0). Examines romantic themes and genres, including fairy tales and myths, and nature, love, and exoticism in their historical context through the study of original musical compositions, art works, and literature. Required museum visits, concerts, and other cultural events supplement class sessions.

375 Special Topics (3-15:3-15:0). Studies topics of special interest to undergraduates. May be repeated for credit if subtitle is different.

379 Cancer and Its Social Impact (4:3:1). Prerequisites: 60 credits or permission of instructor. Introduces students to the epidemiology and biological basis for treatment and prevention of cancer. Students consider the social impact of cancer by looking at how patients and families cope with the disease. A portion of the learning community focuses on working with and learning from people living with cancer. Designed for biology and premedical students as well as nonscience majors interested in connecting the physiology of health and disease to the human spirit.

380 Alternative Therapies in Health and Illness: New Age Meets Hippocrates (6:6:0). Students explore philosophical underpinnings and bio/psycho/social/spiritual rationale for use of alternative therapies in health and illness. The reflection of health care practices in literature is integrated into the course. A variety of alternative health therapies are explored, with opportunities for experiential learning with an alternative health care practitioner.

381 When Cultural Worlds Collide (3-15:3-15:0). Explores what happens when "civilization" encounters "the jungle" by reading, writing, discussing, and viewing written and filmed works dealing with contacts between cultures with colliding world views. Literature (from Conrad's The Heart of Darkness to Shakespeare's The Tempest to
Burrough's Tarzan), news articles, radio broadcasts, web home pages, art exhibits, and many film and video presentations provide the basis for in- and out-of-class activities.

390 Internship. See Division III Courses.

395 Experiential Learning. See Division III Courses.

401 Conservation Biology (3-15:3-15:0) Prerequisite: Junior standing or permission of instructor. Provides students with a working knowledge of conservation biology. Integrates the study of social, economic, and political factors with biodiversity, population modeling, habitat degradation, and management issues. Students confront the leading edge of this exciting field by developing real species conservation plans. The experiential learning component of the course will include trips to the Smithsonian Institution's Conservation and Research Center in Front Royal, Virginia, to study with nationally known experts.

406 Our Common Future (3-15:3-15:0). Students and faculty work together to model patterns of life that fit within the planet's ecological means for current and future generations. Includes the study of "environomics," urban systems and planning, and studio work to create models of alternative growth. This course builds on work previously established in NCLC 306.

410 Contemporary Health Issues (3-15:3-15:0). Looks at a variety of health and health care issues. Examines several of the major health concerns of women and, to a lesser degree, men. Also explores the biology and medical implications of these diseases and how our society deals with potential life-altering information. Examines who is making the decisions on the allocation of research funds and prevention of diseases.

420 Skills for the Workplace (3-15:3-15:0). Develops a variety of work-readiness skills needed to become successful in both local and global marketplaces. Topics and skills covered include communication, problem solving in the business setting, workplace ethics, listening skills, how to influence others, building team project rapport, and meeting effectiveness skills.

422 An Experiential Approach to American Foreign Policy (3-15:3-15:0). Takes an experiential approach to the study of American foreign policy. Through case studies, discussions, group projects, and directed research, students learn how foreign policy is made and executed and how they as citizens, activists, or officials can influence national decisions.

423 Management in the Global Marketplace (6:6:0). Takes an experiential approach to the study of global management and organizational behavior. Through exercises, case studies, discussions, group projects, and individual research and essays, students learn the principles of effective management as they apply to modern global organizations, whether public, private, or nonprofit.

424 Force and Justice in the International System (3-15:3-15:0). Examines the ethical dimensions of war and peace, human rights, and international justice. During the first seven weeks of the semester, students explore these issues in a classroom setting, followed by a seven-week, off-campus internship, and an integrating project, monitored by the instructor. The class meets again as a group in the last week of the semester to share and consolidate the learning experience.

426 Dean's Honors Research/Thesis (3:3:0). Research related to an aspect of your specialization or B.I.S. Project. Course will require analysis, quantitative interpretation, and a minimum 15-page thesis to be presented in written and oral form.

431 Principles of Fundraising (4:3:1). Prerequisite or corequisite: NCLC 33J. This course combines theory, practice and experience across several disciplines within its teachings. The study of philanthropy includes the review of history, public policy, economics, human behavior, communication, and financial management. Students develop skills needed to generate philanthropy and leverage such with other sources of income. Through a combination of reading, lecture, discussion, and experience, students learn how to generate resources for public good.

440 Death, Dying, and Decision Making (3:3:0). Prerequisites: 60 credits or permission of instructor. Provides an interdisciplinary examination of the clinical care of dying persons along with psychosocial issues related to the processes of death and dying. Special emphasis on the application of ethical principles in resolving complex problems for individuals with life-threatening illnesses and their families as care givers and/or decision makers. Students consider the changing norms and mores surrounding end-of-life decisions and explore the care available to terminally ill patients.

441 AIDS: Impact on Society (variable 3-15:3-15:0). Designed to give the student an in-depth understanding of the medical, legal, and psychosocial factors surrounding HIV disease. Provides the students with a conceptual framework of current issues so they will be better prepared to deal with the emerging challenges posed by AIDS. Students have the option to take this course for five credits and work with the Center for Service-Learning to develop an internship or experiential learning project, which involves the impact of AIDS in our society.

445 Multimedia Design (5:4:1). Prerequisite: NCLC 345 or permission of instructor. Technological, aesthetic, and educational issues of using interactive multimedia. Topics include theory and practice, integration of digital media, interface and navigation studies, and technical constraints on design.

465 Independent Study. See Division III Courses.

475 Special Topics (3-15:3-15:0). Studies topics of special interest to undergraduates. May be repeated for credit if subtitle is different.

490 Internship. See Division III Courses.

491 The Senior Capstone Experience (2:2:0). This course should be taken the semester prior to graduation; 85 credit hours required. This course is a graduation requirement for integrative studies students. Designed for students to complete the final NCC portfolio and senior exhibition. Information on issues related to professional development (i.e., interviewing skills, resume development, career strategies and alumni opportunities) are provided.

495 Experiential Learning. See Division III Courses.

595 Experiential Learning. See Division III Courses.

Division III Courses Concentration. Designed by student and faculty mentor. Students have the flexibility to major in interdisciplinary...
studies or to follow one of the concentrations that have been developed. In some cases, students can design their own specialization (B.A. or B.S.). Extensive use of courses in other departments, independent study, internships, co-ops, service learning, study abroad, and mentored research are all components of this degree. Faculty advisers help each student choose the best path to fulfill career objectives.

165, 265, 365, 465 Independent Study (1-12:1-12:1-12). Prerequisite: Permission of instructor and dean. Individualized section form required. Study of a topic not otherwise available to the student. May involve any combination of reading assignments, tutorials, lectures, papers, presentations, or field/laboratory study (determined in consultation with the instructor). Students are encouraged to work as a team on a particular topic. A maximum of 12 credits can be used to fulfill graduation requirements.

190, 290, 390, 490 Internship (1-6:0:1-6). Prerequisite: Sophomore standing and permission of instructor. Internship credit may be applied toward 12 credits required in experiential learning. Students may take no more than six credits in any one semester, unless approved by the director of integrative studies or the associate dean. Structured and supervised professional experience, within an approved agency, for which the student earns academic credit. The primary purpose of an internship is to connect the student’s academic course work to experiences and challenges outside the university classroom. The faculty also expects that students will enhance their competencies and skills and explore career options.

195, 295, 395, 495, 595 Experiential Learning (1-18:1-18:0). Prerequisite: A minimum of 12 credits of experiential learning (including internships) are required for the B.A./B.S. in Integrative Studies with a maximum of 24 credits used toward fulfilling graduation requirements. All students enrolled in the B.A. or B.S. program are required to participate in the equivalent of at least 12 hours of course work devoted to experiential learning. Experiential learning sites may change each semester to include study abroad programs, internships, and community service learning opportunities. Students should complete learning contracts for each experiential learning activity undertaken.

Nursing (NURS)

College of Nursing and Health Science

254 Introduction to Professional Nursing (3:3:0). Enrollment restricted to second degree students only. Prerequisite: NURS 262; corequisites: NURS 318, 319, and 320. Introduces nursing as an emerging discipline, profession, and occupation. Emphasis is placed on nursing process, critical thinking, principles of teaching/learning, and life span growth and development. Health maintenance practices and the foundation of basic and age-related nutrition are also discussed.

262 Technologies in Nursing (4:2:6). Enrollment restricted to second degree students only. Presents basic fundamentals of nursing care and includes foundational technologies. Consists of three hours of lecture. The clinical meets two mornings per week in acute care settings and the campus lab meets once a week. sum

318 Concepts of Health, Groups and Family (3:3:0). Enrollment restricted to second degree students only. Pre-requisite: NURS 262; corequisites: NURS 254, 318, and 320. Focuses on small groups and families as participants in health care. Cultural and religious differences and family crises are discussed. Legal and ethical dimensions of nursing practice are also introduced.

319 Pathophysiological Basis of Nursing Care for Individuals and Small Groups I (4:4:0). Enrollment restricted to second degree students only. Prerequisite: NURS 262; corequisites: NURS 254, 318, and 320. Focuses on pathophysiological, psychological, sociocultural, and risk-reduction factors related to nursing care for clients with acute medical-surgical and psychopathological conditions.

320 Application of Nursing Care for Individuals and Small Groups I (6:0:18). Enrollment restricted to second degree students only. Prerequisite: NURS 262; corequisites: NURS 254, 318, and 319. Includes seven weeks of acute care nursing for medical/surgical clients and seven weeks of psychiatric nursing with a focus on small groups. Students may also have the opportunity to follow selected clients into the clinic and/or home care situations. The clinical consists of two full days at agencies. Before the onset of clinical experience, selected technologies are presented in the campus laboratory.

325 Application of Nursing Care for Individuals and Small Groups II (5:0:15). Enrollment restricted to second degree students only. Prerequisites: NURS 254, 262, 318, 319, 320, and 450; corequisites: 419, 426, 430, and 455. Includes seven weeks of clinical with a focus on obstetric/family nursing and seven weeks of pediatric nursing. Students may also have the opportunity to follow selected clients in clinics and/or home situations. The clinical consists of two full days at acute care clinical agencies.

330 Nursing as a Process for Health (4:4:0). Prerequisite: Junior standing; corequisite: NURS 331. Introduces the student to the nursing process and to communication skills as the foundation for beginning health assessment and fundamental nursing care for culturally diverse individuals throughout the life span.

331 Nursing as a Process for Health Practicum (4:0:12). Prerequisite: Junior standing; corequisite: NURS 330. Gives the student the opportunity to practice health assessment and fundamental nursing technologies while using communication skills with culturally diverse and vulnerable populations in a variety of settings.

332/HSCL 332 Concepts of Health Promotion and Disease Prevention Throughout the Life Span (3:3:0). Introduces the student to the concepts of epidemiology, health promotion, disease prevention, and their impact upon the health status of culturally diverse and vulnerable individuals, families, small groups, and communities. Focus is on health problems and potential interventions throughout the life span and incorporates the principles of teaching/learning and the process of critical thinking as they apply to the health professional.

333 Nursing as a Health Profession (3:3:0). Prerequisite: Junior standing. Introduces the student to nursing as a dynamic and caring health profession. Includes historical perspectives on current ethical, legal, political, social, and cultural issues including health care policy, and introduces the student to nursing as a collaborative process.
334 Nursing as a Health Profession and Discipline (3:3:0). Prerequisite: Open only to RNs and LPNs. Introduces the student to nursing as a dynamic and caring health profession, the impact of epidemiology, health promotion, and disease prevention on the health status of culturally diverse and vulnerable individuals, families, small groups, and communities throughout the life span. Incorporates the nursing process and the critical thinking process as they apply to the art and science of nursing. Historical perspectives on current ethical, legal, political, and social issues are included. 

340 Nursing as a Health Science I (4:4:0). Prerequisite: Successful completion of NURS 330, 331, 332, or 333, or permission of associate dean. Introduces students to the changing health needs of culturally diverse and vulnerable populations throughout the life span. Focus is on nursing care, pathophysiological, psychological, sociocultural, and risk-reduction implications of frequently experienced health problems.

341 Nursing as a Health Service I (4:0:12). Prerequisites: Successful completion of NURS 330, 331, 332, and 333; corequisites: NURS 342, NURS 344. Gives the student an opportunity to provide collaborative nursing care to culturally diverse and vulnerable populations experiencing frequently occurring physiological, psychological, and social health problems in a variety of settings throughout the life span.

342 Nursing as a Health Service I Seminar (1:1:0). Prerequisites: Successful completion of NURS 330, 331, 332, and 333; corequisite: NURS 341. Meets every other week for two hours. Provides an opportunity for students to integrate nursing care with the health care needs of culturally diverse and vulnerable populations throughout the life span.

343/HSCT 343 Pharmacology (3:3:0). This course provides the student the opportunity to study the principles of pharmacokinetics, the pharmacodynamics of selected drug classifications, and nursing responsibilities related to drug administration to individuals throughout the life span.

344 Intermediate Technologies in Nursing (1:0:2). Prerequisites: Successful completion of NURS 330, 331, 332, and 333; corequisite: NURS 341. Laboratory course designed to assist students in acquiring therapeutic nursing interventions. Technologies presented are aseptic and wound care, administration of medications including dosage calculations, and management of intravenous therapy.

345 Nursing as a Health Service II (5:0:15). Prerequisite: Successful completion of fall and spring junior nursing courses; corequisite: NURS 346. Concentrated clinical course in an acute care setting giving the student the opportunity to provide culturally diverse adults experiencing acute or chronic health problems with collaborative nursing care.

346 Nursing as a Health Service II Seminar (1:1:0). Corequisite: NURS 345. Meets every week for two hours. Explores in-depth nursing care related to culturally diverse adults experiencing acute and chronic health problems. Case presentations dealing with adult family members with health problems are used.

380/NCLC 410 Contemporary Health (6:6:0). Course must be taken as NURS 380 (3 credits) and BIOL 226 (3 credits) or WMST 300 (3 credits). Looks at a variety of health and health care issues. Explores the biology and medical implications of diseases and examines who is making the decisions on the allocation of research funds and prevention of diseases.

400 Clinical Nursing Elective (3:0:9). Prerequisite: NURS 301, 302, 314, 315, 324, 325, or equivalent. Allows students to synthesize previously learned knowledge and skills, acquire additional clinical experience, and observe and participate in nursing practice.

410 Nursing as a Health Science II (3:3:0). Prerequisite: Junior year; corequisite: completion of computer NCLEX review is required to fulfill course requirements. Encompasses complex health problems of culturally diverse and vulnerable populations throughout the life span. Focuses on nursing care needs and pathophysiological, psychological, and sociocultural implications of complicated health problems.

411 Research Dimensions in Nursing (3:3:0). Enrollment restricted to second degree students only. Prerequisites: NURS 254, 262, 318, 319, 320, 426, 419, 430, 450, and 455; corequisite: NURS 471. Presents basic concepts and methods of nursing research. The research process is examined as a foundation for scholarship.

419 Pathophysiological Basis for Nursing Care of Individuals and Small Groups II (3:3:0). Enrollment restricted to second degree students only. Prerequisites: NURS 254, 262, 318, 319, 320, and 450; corequisites: NURS 325, 426, 430, and 455. Focuses on pathophysiological, psychological, sociocultural, and risk-reduction factors related to nursing care of childbearing women, infants, children, and adolescents experiencing acute health care problems.

420 Implementing Complex Nursing Care for Individuals (intensive medical-surgical nursing experience) (6:0:18). Enrollment restricted to second degree students only. Prerequisites: NURS 254, 262, 318, 319, 320, 426, 419, 430, and 455; corequisite: NURS 475. Applies in an acute care setting the management of health care delivery systems for clients experiencing complex health care problems. Opportunities for students to follow selected clients into clinics and home care situations may be arranged. Clinical course provides for continual daily experience in an acute care medical-surgical setting for six weeks, and includes a review of complex clinical nursing.

425 Comprehensive Health Assessment (3:2:2). Prerequisite: Open only to RNs and LPNs. Introduces the student to systematic health assessment across the life span and expands that knowledge base to include knowledge and skills necessary to perform comprehensive health assessments with culturally diverse and vulnerable populations.

426 Nursing Leadership and Management (3:3:0). Enrollment restricted to Saudi-U.S. University Project students only. Prerequisites: NURS 254, 262, 318, 319, 320, and 450; corequisites: NURS 325, 419, 430, and 455. Introduces the managerial principles and processes of health care delivery systems, including concepts of interdisciplinary team management, collaboration, and team management. Leadership concepts are also addressed.

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secondary, and tertiary prevention are discussed. Strategies for working with individuals, families, and small and large groups in community settings also are presented. s

436/HSCI 436 Leadership and Management of Health Care (3:3:0). Introductory course in the leadership and management of health-related organizations. Reviews administrative issues in health-related services with particular emphasis on developing organizational strategies for effective interfacing of medical, nursing, allied health, and administrative staff. s,summer

440/HSCI 440 Community Health and Epidemiology (3:3:0). Prerequisite: Completion of the junior year. Addresses population-focused health care. Emphasis is on primary, secondary, and tertiary prevention of health problems. Concepts of community, public health, and health policy affecting culturally diverse and vulnerable populations are examined. s

441 Nursing as a Health Service III (5:0:15). Prerequisites or corequisites: NURS 410, 436, and 440; corequisite: NURS 442. Provides clinical experience with a focus on collaborative nursing care with individuals, families, and large groups in the community. Emphasis is on health promotion and disease prevention for well populations and community-based care for individuals and families with acute and chronic illnesses. s

442 Nursing as a Health Service III Seminar (1:1:0). The seminar examines nursing care related to populations with emphasis on health promotion and disease prevention. Ethical, policy, and legal implications are examined.

450 Health Assessment (3:2:2). Enrollment restricted to second degree students only. Prerequisites: NURS 254, 262, 318, 319, and 320. Introduces the student to systematic health assessment across the lifespan and expands that knowledge base to include skills necessary to perform comprehensive health assessments.

451 Nursing as a Health Service IV (5:0:15). Prerequisites or corequisites: NURS 410 and 436; corequisite: NURS 452, 455. Gives the student an opportunity to provide complex, collaborative nursing care to culturally diverse and vulnerable populations. Concentrated clinicals are available in selected institutional settings. s

453/HSCI 453 Research in Nursing and Health Science (3:3:0). Prerequisite: Statistics. Introductory research course designed to present basic concepts and methods of research. The research process is examined as a foundation for scholarship. Emphasis is placed on critique and use of current research in health care and health science research in clinical practice.

455 Advanced Technologies in Nursing (2:0:4). Corequisites: NURS 451, 452. Provides an opportunity for students to acquire advanced skills in nursing practice. Refinement of assessment skills associated with selected advanced technologies are integrated into this laboratory course.

465/HSCI 465 Professional Transition and Role Integration (3:3:0). Course to be taken in final semester of enrollment for traditional and LPN nursing students. For all other students, senior standing is required. Completion of the NCLEX review course for LPN and traditional students. Completion of individual study plan if scores on the NLN CAT Practice Exam warrant it. Assists students in synthesizing the varied dimensions of their role as a health professional. Special emphasis is placed on collegiality, professional role transition, and responsible membership within the health professions and society. (Writing-intensive course)

471 Professional Issues in Nursing Practice (3:3:0). Enrollment restricted to second degree students only. Prerequisites: NURS 254, 262, 318, 319, 320, 419, 426, 430, 450, and 455; corequisite: NURS 411. Explores in group discussion the influence of professional issues on the nurse's role in clinical practice. sum

475 Grand Rounds Complex Case Presentations (3:3:0). Enrollment restricted to second degree students only. Prerequisites: NURS 254, 262, 318, 319, 320, 419, 426, 430, 450, and 455. Examines nursing implications of selected major health problems that significantly affect individuals throughout the life span. Focus is on complex health problems. Class meets once a week in the format of group presentations in the clinical setting. sum

480/HSCI 480 Health Aspects of Aging (3:3:0). Studies physiological and psychological factors that influence health and have implications for preventive measures in disease and health disorders in the aging. Nutrition, the nature of health problems, and methods of assessing physical and psychological needs are examined.

481/NCLC 380/BIOL 226 Alternative Therapies in Health and Illness: New Age Meets Hippocrates (6:5:1). Explores philosophical underpinnings and bio/psycho/social/spiritual rationale for the use of alternative therapies in health and illness in various cultures. A variety of alternative health therapies are explored, with opportunities for experiential/service learning with an alternative health care practitioner.

487 Principles, Concepts and Techniques of Operating Room Nursing (3:3:0). Prerequisites: RN licensure, one year clinical experience, and letter of acceptance into a six month operating room clinical preceptorship. Prepares the registered nurse in the basic principles and skills of operating room nursing. A learning environment is provided for the registered nurse with no previous operating room experience to apply fundamental skills and knowledge of operating room nursing in clinical practice. Based on the Association of Operating Room Nurses Standards and Recommended Practices and Guidelines.

495 Directed Reading in Nursing (1-2:0:0). Prerequisites: 90 credits and permission of college. Examines literature on specialized topic in nursing practice, education, or scholarship. Readings are conducted in consultation with faculty.

496/HSCI 496 Violence in Society (3:3:0). The interdisciplinary seminar course examines the magnitude of the problem of violence globally and more specifically within the United States. Discussion and reflective activities engage students in the learning process.

499 Independent Study in Nursing (1-3:0:0). Prerequisite: Permission of college. Provides individual study of a particular problem area in nursing research, theory development, or education under the direction of faculty. Clinical practice may be arranged.

505/HSCI 402/HSCI 505 Case Management (3:3:0). Prerequisite: Bachelor's degree or permission of instructor. Open to seniors. Survey course on the state of case management programs and practice for health and human service professionals. Special emphasis is placed on com-

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paring the nature, process, and outcomes for baccalaureate and graduate students guided by the objectives.

508/HSCI 508 Psychopharmacology (3:3:0). Surveys therapeutic effects and side effect profiles of psychopharmacological drugs including psychotropic and recreational drugs. Emphasis on understanding mechanisms of actions, drug interactions, and subject variables that influence drug effects.

509 Introduction to Emergency Nursing (3:3:0). Introduces emergency care nursing, focusing on relevant pathophysiological disease processes, diagnostics, medical therapeutics and relevant technology as applied to emergency nursing. Focus will be on the care of multicultural clients across the life span, as well as the patient-family unit of care. The concepts of collaboration and triage, as well as legal, ethical, and psychosocial issues will be addressed. This course is based on the core curriculum of the Emergency Nursing Association (ENA).

520/HSCI 520 Rehabilitation Theory and Practice (3:3:0). Explores rehabilitation theory and research and their application to the practice of today’s healthcare professional and to the care of specific client populations. Rehabilitation theory will be evaluated as a new paradigm for healthcare delivery.

530 Nurses as Writers (3:3:0). Focuses on the theories and practices related to writing in nursing. Researching, composing, revising, and editing are practiced in a variety of writing styles.

534/HSCI 530 A Global Perspective (3:0:0). Directed at students from a variety of disciplines, this course examines what malnutrition is and how it occurs by looking at several situations from around the world. It looks at the impact of how nutrition can affect a society and community and examines the benefits of a well-nourished population.

542/HSCI 542 Health Policy (3:2:1). Explores issues surrounding the development of public health policy and the influence of policy of health care delivery, nursing, and other health professions. Classroom and field experience.

543/HSCI 543 Global Health: Trends and Policy (3:3:0). Surveys health challenges in the world today; their social, economic, and epidemiological causes; and the role and likely success of high-tech medicine, primary preventive health care, social manipulation, and aid in alleviating the problems.

544/HSCI 544 The Washington Internship in Health Policy (1:0:2). Prerequisite: Annual Health Policy Institute. Undergraduate requires permission of instructor. This course provides a one-week (40 hours) exposure to an organization with a public policy agenda in health. Placements may be in a Capitol Hill office, a federal health agency, a national association, or other policy organization. Interns will engage in a variety of field experiences related to the legislative process, including network development of policy-interested contacts and skill development to expand a student’s ability to impact the health policymaking process.

546/HSCI 546 Leadership Strategies in Health Policy (3:3:0). This course examines the leadership process from a policy, personal, and organizational perspective to expand the student’s ability to impact the health policy-making process.

550 Pathophysiologic Bases for Major Health Deviations of Individuals (3:3:0). Examines health deviations occurring in people in the United States that require long-term and/or terminal health care interventions. Deviations are presented within a developmental framework as they influence physiologic integrity at the cellular level. Focus is on man as a whole, open system. Complex health programs from the perspective of maintaining homeodynamics are examined.

552/HCS 205 Advanced Physiology and Pathophysiology (5:4:1). System-focused advanced physiology and pathophysiology analyzing health deviations across life span. Knowledge is applied to interpret changes in normal function that results in symptoms indicative of illness. This systematic assessment is foundational to clinical decision-making and management of health deviations. Lecture, clinical laboratory, and practicum are presented.

554/HCS 207 Practicum in Advanced Health Assessment (1:0:3). Applies advanced health assessment skills and clinical decision making with adults of all ages in primary care settings. Skills and techniques needed to collect data for comprehensive health assessment are emphasized in this supervised practicum by nurse practitioner faculty preceptors.

570 Cultural Dimension of Aging (3:3:0). Examines the impact of cultural definitions of aging, research methodologies, and findings of cross-cultural studies. Implications for health care and nursing are explored.

571/HSCI 571 HIV/AIDS: Concepts, Principles, and Interventions (3:3:0). Provides an overview of all aspects of HIV disease to include retrospective and current concepts and analyses of the epidemic, global, and societal impact, and cutting-edge research. Examines the development of therapeutic tools and skills to educate, reduce risks, control infection, and affect the care and healing of client, family, and community, as well as issues of increasing dilemma for health care professionals.

577/HSCI 577 Comparative Health Care Systems in the World (3:3:0). A comprehensive review of selected national health care systems within the World Health Organization’s designated regions. Health care systems are analyzed, compared, and contrasted. Issues are discussed in relationship to national governments and global health.

578/HSCI 578 Cultural Competence and Diversity in Health Care (3:3:0). Cultural competence and diversity in health care are examined. A number of models are explored, including but not limited to organizational culture competence, cultural competence training models, and anthropological and sociological models. Students develop skills in cultural competence. This course is open to health care providers and all related fields. Lecture, seminar, guest lecture.

580 Operating Room RN First Assistant (3:3:0). Prepares the experienced operating room nurse to become a Registered Nurse First Assistant. Modeled after the official AORN RNFA Core Curriculum. Student receives hands-on practice in knot tying and suturing, as well as experience with microscope and endoscopy labs.

581 Operating Room—RN First Assistant Clinical Practicum (3:1:2). Prerequisite: NURS 580 and operating room nursing experience. Practicum course that prepares the Registered Nurse First Assistant (RNFA) to practice in an expanded clinical nursing role in the operating room. Based on the Core Curriculum of the American Association of Operating Room nurses (AORN) for the
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RN First Assistant. This individually designed practicum is taken after completion of NURS 580 to give the experienced operating room nurse 120 hours of practice experience as a surgical first assistant working under the supervision of a surgeon preceptor.

582 Nursing Care of Infants and Children (3:3:0). Prerequisite: Junior nursing courses. Corequisite: NURS 451, NURS 455. This senior elective nursing course has been designed for students with specific interests in the field of pediatric nursing. It focuses on the impact of illness and hospitalization on infants, children, and adolescents with emphasis on the family unit. Course content builds on previous knowledge of pathophysiological, sociocultural, and risk reduction factors related to the nursing care of infants, children and adolescents.

583/HSCI 583 Food and Culture: Biocultural Perspectives on Food and Nutrition (3:3:0). This course examines food and eating behaviors, diet, and nutrition from a cross-cultural perspective. It focuses on how and why people choose what to eat, the range and significance of cross-cultural variability in diet, how diets have changed in the evolutionary and recent past, and the health and social implications of those changes. Teaching strategies include lecture/discussion, guest lecturers, video presentations, audio/visual aids, student presentations, case study analyses.

585/HSCI 550 Entrepreneurship in Health Care (3:3:0). Presents an overview of models of entrepreneurship in health care. Opportunities for collaborative problem solving to support business development, entrepreneurial behavior, and leadership are provided. Innovative approaches to and alternatives for nursing practice and health care delivery are explored.

586 Parish Nursing I (3:3:0). Prerequisite: Students must be registered nurses. Introduces parish nursing as a developing specialty practice for professional nurses. Identifies basic skills for ministry in a faith community. Emphasizes the scope of practice, various theological concepts for health ministry, and application of assessment skills to the faith community. Examines the processes of case consultation and spiritual formation.

587 Parish Nursing II (3:3:0). Prerequisite: Students must be registered nurses. Focuses on skill development in spiritual assessment, ethical decision making, and effective use of prayer. Emphasizes health promotion, working with volunteers, and utilizing community resources. Self-care and professional identity for the parish nurse are addressed. Students continue the processes of case consultation and spiritual formation.

594 Special Topics in Nursing (3:3:0). Presents selected topics analyzing specialized areas in nursing. Content varies. Lecture, seminar, laboratory/workshop.

597 Approaches to Data Analysis in Nursing Research (3:3:0). Prerequisite: Admission to the graduate nursing program. Examines uni- and bivariate procedures appropriate for analyzing nursing research data. Emphasis is on selecting, applying, and computerizing procedures in relation to the level of data and type and size of the sample in nursing research. Lecture, computer lab. f,s,summer

610 Curriculum Development and Evaluation (3:3:0). Uses seminar/discussion forums to analyze and apply theory and principles for planning, developing, and evaluating curriculum. The course examines curriculum as a creative, planning, and social process.

611 Anthropology of Health (3:3:0). Explores crosscultural issues of health and illness from the standpoint of medical anthropology theory. Cultural dimensions of the developmental cycle and health care systems are discussed.

620 Advanced Psychiatric/Mental Health Nursing (3:3:0). Designed to build upon basic psychiatric/mental health nursing knowledge and skills in assessment, diagnosis, therapeutic intervention, and management. Focus is on enhancing the fundamental roles of the Psychiatric/Mental Health Advanced Practice Nurse, including practice, teaching, consultation, supervision, and research in relation to clients and their families.

623 Clinical Concepts in Community-Oriented Primary Care (3:2:1). Theoretical and clinical application of community-oriented primary care concepts with a focus on health promotion, and clinical preventive and screening strategies common to the roles of the Advanced Practice Nurse (APN). Students learn to work in and appreciate the contributions of interdisciplinary groups to improve health indicators for targeted underserved populations through comprehensive community assessment, implementation, and evaluation of health promotion and disease prevention programs. Students learn how to influence health policy, community development, and empowerment with a sensitivity for cultural diversity (lecture, seminar, group work, clinical).

630 Acute Care Nursing for Advanced Practice (3:3:0). Focuses on acute care nursing for advanced practice with individuals and their families diagnosed with potentially life-threatening alterations in health. Emphasis is on risk factors, physical symptoms, evidence-based interventions, and functional capacity. Emphasis also is on patient and family dynamics, psychosocial, economic, and cultural factors, and their impact on care.

640/HSCI 640 Dimensions of Communication in a Technologically Enhanced Health System (3:3:0). Examines the effects of technological innovation on the communication and interdisciplinary collaboration of stakeholders in health care systems of the new millennium.

645 Gerontological Nursing 1 (3:3:0). Prerequisites: NURS 660, NURS 755, NURS 794. This course provides content related to nursing care of older adults with emphasis on advanced practice and issues relevant to improved health care of the elderly. The focus is on biological, psychological, and sociocultural elements that influence the aging process and the onset of age-related illnesses.

646 Gerontological Nursing 2 (3:3:0). Prerequisite: NURS 645. This course builds upon content in NURS 645 and focuses on health care deviations and nursing interventions in advanced gerontological nursing practice. Age-related illnesses and common disorders are discussed within the context of health behaviors, healthy adaptation, cultural sensitivity, developing appropriate coping strategies, and family, community and nursing supports.

654 Nursing Administration Financial Management (3:3:0). Investigates managerial technologies related to the financial planning and control functions of mid-level nurse administrators. Content develops knowledge and skills necessary for effective participation in financial manage
ment as related to business plan development, program budget planning, and control.

657 Perspectives in Nursing Education (3:3:0). Uses seminar approach to provide an overview of nursing education. Topics include the U.S. university, hallmarks of nursing education, educational philosophies, learning theory and principles, issues and trends in nursing education, and current research.

658 Practicum and Seminar in Nursing Education (3:62:7). Prerequisites: Admission to the graduate nursing program or post-master’s status; NURS 657, NURS 610, or EDCT 701. Uses a seminar/discussion approach and practicum experience to analyze the role and functions of the nurse practitioner. Emphasis is on the application of teaching strategies, and legal and ethical issues in nursing education.

660/PHIL 510 Seminar in the Ethics of Health Care (3:3:0). Examines the moral dilemmas within the health care profession, with special emphasis on patients’ rights, professionals’ obligations to other professionals, and issues of social justice in health care. Methods of moral deliberation based on ethical knowledge and justification are applied to ethical dilemmas in health care.


685 Advanced Nursing Research Methods (3:3:0). Prerequisites: Admission to the graduate nursing program, pre-or corequisite: NURS 755, and a graduate-level bivariate statistics course. In this course, the student examines principles and methods of research in problem identification, theoretical framework, design, data collection, and analysis. Students develop a nursing research proposal.

686 Projects in Nursing Research (2:2:0). Prerequisite: NURS 790. In this course, students apply the knowledge gained in NURS 790 and implement the research proposal designed in NURS 790.


690 Independent Study in Nursing (1-3:0:0). Prerequisites: Admission to graduate nursing program and permission of associate dean for academic programs. Studies in depth a selected area of nursing theory, research, or practice under the direction of faculty. May be repeated, total credit hours earned may not exceed six.

720 Practicum in Family Primary Care Nursing I (4:2:2). Prerequisites: NURS 552, 554, HCS 206, and PHARM 207. Performance of beginning-level nurse practitioner clinical decision-making skills in assessment and the management of families and individuals across the life span, with emphasis on health maintenance and health promotion.

721 Practicum in Assessment and Management of the Developing Family (6:8-3:5). Becomes 8 credits in Fall 2000. Prerequisites: NURS 552, 554, HCS 206, PHARM 207, NURS 720, and NURS 623 (or as corequisite). Students must be admitted to the family nurse practitioner track. Consists of the theoretical and clinical application of health assessment, health maintenance/promotion, anticipatory guidance, diagnosis, and management of common primary health care concerns through clinical decision-making skills focused on childbearing and childbearing families.

722 Practicum in Family Primary Care Nursing II (8:3:5). Prerequisites: NURS 720 and 721. Perform advanced clinical decision making in the role of the family nurse practitioner. Family primary care problems throughout the life span are assessed and managed, particularly families with elderly and medically underserved members.

746 Practicum in Adult Primary Care Nursing I (3:2: 6-8). Becomes 6 credits in Fall 2000). Pre- or corequisite: NURS 623. Development of the ability to function at a beginning level in the role of the nurse practitioner. Performance of advanced skills in assessment and the development of plans for health maintenance and promotion for adults.

748 Practicum in Adult Primary Care Nursing II (8:3:5). Prerequisite: NURS 746. Enables the nurse practitioner student to assume increased responsibility in the delivery of primary care to adults. Special emphasis is given to the primary care needs of elderly and medically underserved groups.

750/HSCI 750 Legal Issues Relevant to Health Care Administration (3:3:0). Provides students with a general understanding of the United States legal system and sources of law, with a particular emphasis on laws that govern or are applicable to the health care industry and general administration. Students examine the changing health care models and delivery systems and the laws affecting such systems.

762 Managed Care Concepts for Primary Care Practice (1-4:1-4:3:12). Prerequisite: Acceptance into the nurse practitioner track. By permission of instructor only. Presents managed care concepts specific to primary care practice through self-paced learning modules, seminars, and selected nondirect care internship experiences in managed care settings.

763 Administrative Theory in Nursing (3:3:0). Prerequisite: Admission to the graduate nursing program. Prerequisites or corequisites: NURS 755 and Management/Organizational Theory. Uses administrative theory and management principles and processes as related to roles and functions of the nurse in management in health-related agencies.

765 Practicum in Nursing Administration I (3:1:8). Prerequisites: Admission to the graduate nursing program and NURS 755. Prerequisite or corequisite: NURS 763. Applies administrative theory and management principles and processes in a selected health-related agency. Roles and functions of the nurse in management are explored. Lab arranged.

766 Administrative Strategies in Nursing (3:3:0). Prerequisite: NURS 763. Explores roles and functions of the nurse in management as the nurse manager develops pat-
440 Nursing (NURS)

terns of nursing care, articulating nursing education, and nursing service.

768 Practicum in Nursing Administration II (3:1:8). Prerequisites: NURS 763 and 765. Prerequisite or corequisite: NURS 766. Implements and integrates the roles and functions of the nurse in management. Emphasis is on using appropriate management principles and processes in a selected health-related agency. Lab arranged.

773 Advanced Clinical Nursing I (3:3:0). Foundational theory relevant to the emerging roles in advanced clinical nursing, focusing on therapeutic nursing interventions in a variety of clinical specialties, with attention to health care needs of individuals, families, and communities.

775 Advanced Specialty Practice I (3:2:7). Pre or corequisite: NURS 530, NURS 755, NURS 773. This course focuses on advanced specialty practice in three specialty areas: oncology, chronic illness, and gerontology. Content in NURS 773 is applied in the specialty area through case clinical practice and studies.

776 Advanced Clinical Nursing II (3:3:0). Expansion of selected content included in NURS 773 for the delivery of advanced nursing care in a variety of settings. Emphasis is on the development and evaluation of the advanced practice nursing role in complex health care systems.

778 Advanced Specialty Practice II (3:2:7). This course focuses on advanced specialty practice in one of three specialty areas: chronic illness, gerontology, or oncology. Content in NURS 776 is applied in specialty areas through clinical practice and case studies.

780 Practicum in Gerontological Primary Care Nursing I (3:0:3). Prerequisite or corequisite: NURS 746. Demonstrates the ability to function at a beginning level in the role of the gerontological nurse practitioner. Performance of advanced skill in geriatric assessment with a special emphasis on the delivery of health promotion and disease prevention services (practicum of at least 100 clinical hours and case analysis conferences).

781 Practicum in Gerontological Primary Care Nursing II (3:0:3). Prerequisites or corequisites: NURS 748, NURS 780. Demonstrates the ability to function at an advanced level in the role of the gerontological nurse practitioner in varied settings, including primary care, long term care, and sub-acute care (practicum of at least 100 clinical hours and case analysis conferences).

800 Qualitative Research Methods in Nursing and Health Care (3:3:0). Examines qualitative methods used in nursing and health care research including ethnography, grounded theory, historical and phenomenological methods. Data collection and analysis issues are explored. Computer analysis is required.

866 Public Health Policy (3:2:1). Considers structure and process of public health policy formulation, policy analysis, and research methods within the scholarship framework of discovery, integration, and application. Contextual factors influencing policy development are examined with particular emphasis on political dynamics, application of ethical principles, and health services research. Selected state and federal policy issues are analyzed and implications for health professionals, health organizations, and the public are delineated. (Lecture/field experience)

870 Nursing and Health Care Administration I (3:3:0). Prerequisites: Organization behavior course (MGMT 600, PUAD 620, LRNG 700, or equivalent) and NURS 955. Examines the theoretical basis of scholarship and practice in the leadership and management of health systems and nursing organizations. Includes the discovery of concepts and forces influencing the organization and performance of health care systems.

871 Nursing and Health Care Administration II (3:3:0). Prerequisite: NURS 870. Analyzes and applies selected concepts related to nursing and health system leaders and managers as well as factors influencing the performance of health systems and organizations.

874 Internship in Health Care Administration/Policy/Ethics (5:1:4). Prerequisite: At the end of course work and before NURS 994; written advanced application and permission of instructor by due dates (March/November 1) in advance of semester. Student participates in an internship experience of at least 150 hours with a leader in the field of nursing, health care administration, policy, and/or ethics. Participatory activities require integration and application of principles, frameworks, and state of the art technologies in science to the executive preceptor role.

875 Research Internship (1:0:1). Provides a guided research experience of 45 hours during which a student participates as a member of a research team engaged in scientific inquiry. Designed to enhance the students' professional socialization in research scholarship at the doctoral level.

920/HSCI 920 Qualitative Research in Nursing and Health Care (3:3:0). Corequisites or prerequisites: NURS 955/HSCI 960; familiarity with e-mail and computers. Philosophical foundations and approaches to qualitative research in nursing and health care administration, health care policy, and health care ethics analyzed within the scholarship of discovery, integration, application, and teaching. Computer analysis is required. Lecture/discussion.

925/HSCI 925 Methodological Issues in Nursing and Health Care Qualitative Research (3:3:0). Prerequisite: NURS 920/HSCI 920 or an equivalent course and permission of the instructor. Explores, analyzes, and synthesizes conceptual, methodological, and ethical issues in qualitative research within the scholarship of discovery, integration, application, and teaching. Seminar.

930/HSCI 930 Quantitative Methods in Nursing and Health Care (3:3:0). Prerequisite: NURS 955/HSCI 960, and a multivariate statistics course (HSCI 800 or equivalent). Examines advanced principles and special problems in quantitative research methodology. Emphasis is on measurement as it relates to nursing and health care administration, health care ethics, and health policy research. Computer analysis is required.

955/HSCI 950 Philosophical Bases of Inquiry (3:3:0). Prerequisite: Admission to nursing doctoral program or permission of the instructor. Philosophical bases of the discipline and practice of health-related disciplines are examined within the scholarship of discovery, integration, application, and teaching. Comparison of nursing and health science philosophy with relevant related discipline philosophies also are examined.

994 Nursing Research Seminar (3:3:0). Prerequisite: Completion of all course work except NURS 999. Seminar.
for doctoral students to accompany the development of a research proposal. Development of the research problem with analysis and critique of methodology is discussed.

998 Doctoral Dissertation Proposal (1:1:0). Prerequisite: Completion of all course work except NURS 999. Provides faculty assistance on an individual basis to complete research proposal planned in NURS 999. The final research proposal forms the basis for the doctoral dissertation. May be repeated up to four credits.

999 Doctoral Dissertation (9:0:0). Prerequisite: NURS 994. Provides continued faculty assistance on an individual basis toward the completion of the approved dissertation.

George Washington University Courses:

PHARM 207 Pharmacology (4:4:0). Discusses drugs and their actions. Principles of pharmacology and drugs, including their therapeutic and toxic action and their fate in the body are studied. Admission is by permission of the instructor.

552/NURS 552 Advanced Physiology and Pathophysiology (5:4:1). System-focused advanced physiology and pathophysiology analyzing health deviations across life span. Knowledge is applied to interpret changes in normal function that results in symptoms indicative of illness. This systematic assessment is foundational to clinical decision-making and management of health deviations. Lecture, clinical laboratory, and practicum are presented.

HCS 206 Clinical Decision Making (2:2:0). Corequisite: NURS 352. Analyzes varied cases using student participation in decision-making formulation. Students learn to correlate pathophysiology with symptom manifestation. Emphasis is on interpreting historical and physical examination data, laboratory data, and radiographic studies relevant to the health problems discussed. Appropriate pharmacologic and non-pharmacologic therapies are discussed in conjunction with the theoretical basis for selecting specific therapies.

Operations Research (OR)

School of Information Technology and Engineering


441/MATH 441 Deterministic Operations Research (3:3:0). Prerequisite: MATH 203 or permission of instructor. A survey of deterministic methods for solving "real-world" decision problems. The linear programming model and simplex method of solution, duality, and sensitivity analysis; transportation and assignment problems; shortest path and maximal flow problems; and an introduction to integer and nonlinear programming are covered. Emphasis is on modeling and problem solving.


481/MATH 446 Numerical Methods in Engineering (3:3:0). Prerequisites: MATH 213 or 213, and MATH 203 or 322, or equivalent. Modern numerical methods and software. Emphasis is on problem solving through software and assessing the quality of solutions obtained. Topics include computer arithmetic, linear equations and least squares data fitting, interpolation, nonlinear optimization, and differential equations. The course involves extensive computer use.

498 Independent Study in Operations Research (13:0:0). Prerequisite: 60 credits; must be arranged with an instructor and approved by the department chair before registering. Directed self-study of special topics of current interest in operations research. May be repeated for a maximum of 6 credits if the topics are substantially different.

499 Special Topics in Operations Research (3:3:0). Prerequisite: 60 credits and permission of instructor. Specific prerequisites vary with nature of topic. Topics of special interest to undergraduates. May be repeated for a maximum of 6 credits if the topics are substantially different.

540 Management Science (3:3:0). Prerequisites: MATH 108 and STAT 250 or DESC 200, or equivalent. Operations research techniques and their application to managerial decision making. Mathematical programming, Markov processes, queuing theory, inventory models, PERT, CPM, and computer simulation are covered, as well as use of contemporary computer software for problem solving. A case-study approach to problem solving is used. OR/MS and SE/MS majors do not receive credit.

541 Operations Research: Deterministic Models (3:3:0). Prerequisite: MATH 203 or equivalent. Survey of deterministic methods of solving "real world" decision problems. The linear programming model and simplex method of solution, duality, and sensitivity analysis, transportation and assignment problems, shortest path, minimal spanning tree, and maximal flow problems; and an introduction to integer and nonlinear programming are covered. Emphasis on modeling and problem solving. Students who have taken OR 441/MATH 441 will not receive credit.

542 Operations Research: Stochastic Models (3:3:0). Prerequisite: STAT 344 or MATH 351, or equivalent. A survey of probabilistic methods for solving decision problems under uncertainty. Probability review, reliability, queuing theory, inventory systems, Markov chain models and Markov decision processes, and discrete-event simulation are covered. Emphasis is on modeling and problem solving. Students who have taken OR 442/MATH 442 do not receive credit.

635 Discrete System Simulation (3:3:0). Prerequisite: OR 542 or STAT 354 or 344, or equivalent, and knowledge of a scientific programming language. Computer simulation as a scientific methodology in operations analysis, with emphasis on model development, implementation, and analysis of results. Discrete-event models, specialized languages, experimental design, and output statistics are covered. Extensive computational work is required.

640 Global Optimization and Computational Intelligence (3:3:0). Prerequisite: MATH 203 or equivalent and knowledge of a scientific programming language. An introduction to global optimization in the context of large-scale,
nonconvex mathematical programs and numerical methods for the solution of such problems. Topics covered include: high-level survey of traditional mathematical programming algorithms; critical comparison of metaheuristics and artificial intelligence (AI) algorithms to traditional mathematical programming algorithms; probabilistic search, multi-start methods, statistical tests of performance and confidence, simulated annealing, genetic algorithms, neural networks, Tabu search, homotopies and tunneling; the traveling salesman problem, the Steiner problem, Stackelberg-Cournot-Nash mathematical games and other classical nonconvex optimization problems.

641 Linear Programming (3:3:0). Prerequisite: OR 541 or permission of instructor. An in-depth look at the theory and methodology of linear programming: Computational enhancements of the revised simplex method; sparse-matrix techniques, bounded variables and the dual simplex method. Alternative interior point methods are described and the computational complexity of various algorithms is analyzed.

642 Integer Programming (3:3:0). Prerequisite: OR 541 or permission of instructor. Cutting plane and enumeration algorithms for solution of integer linear programs; bounding strategies and reformulation techniques; heuristic approaches to the solution of complex problems; knapsack problems, matching problems, set covering and partitioning problems; applications to problems in OR/MS, such as capital budgeting, facility location, political redistricting, engineering design, and scheduling.

643 Network Modeling (3:3:0). Prerequisites: OR 541 or permission of instructor. An introduction to network problems in operations research, computer science, electrical engineering, and systems engineering. Solution techniques for various classes of such problems are developed. Topics include minimal-cost network flow, maximal flow, shortest path, and generalized networks; plus stochastic networks, network reliability, and combinatorially-based network problems. The complexity of each problem class is also analyzed.

644 Nonlinear Programming (3:3:0). Prerequisites: MATH 213 or equivalent and OR 541 or permission of instructor. Nonlinear optimization theory and techniques applicable to problems in engineering, economics, operations research, and management science. The course covers convex sets and functions, optimality criteria and duality; algorithms for unconstrained minimization, including descent methods, conjugate directions, Newton-type and quasi-Newton methods; and algorithms for constrained optimization, including active set methods and penalty and barrier methods.

645/STAT 645 Stochastic Processes (3:3:0). Prerequisite: OR 542, STAT 544, or permission of instructor. Selected applied probability models including Poisson processes, discrete- and continuous-time Markov chains, renewal and regenerative processes, semi-Markov processes, queuing and inventory systems, reliability theory, and stochastic networks. Emphasis is on applications in practice as well as analytical models.

647 Queuing Theory (3:3:0). Prerequisite: OR 542, STAT 544, or permission of instructor. A unified approach to queuing organized by type of model. Single- and multiple-channel exponential queues; Erlangian models, bulk and priority queues, networks of queues; general arrival and/or service times; and statistical inference and simulation of queues are covered. Extensive use of computational software.

648 Production and Inventory Systems (3:3:0). Prerequisites: OR 541 and 542, or permission of instructor. An analysis of production and inventory systems. The use of mathematical modeling for solutions of production planning and inventory control problems is introduced. Also included are stochastic inventory systems of lot sized reorder type; periodic review and single-period models; application of dynamic programming theory to deterministic and stochastic cases; and static and dynamic production-planning models.

649 Topics in Operations Research (3:3:0). Prerequisite: Permission of instructor. An advanced topic chosen according to interests of students and the instructor from dynamic programming, inventory theory, queuing theory, Markov and semi-Markov decision processes, reliability theory, decision theory, network flows, large-scale linear programming, nonlinear programming, and combinatorics. May be repeated for a maximum of 6 credits if the topics are substantially different.

651 Military Operations Research I: Cost Analysis (3:3:0). Corequisites: OR 541 or 542. While drawing on other disciplines (e.g., managerial accounting, econometrics, systems analysis, etc.), cost analysis uses operations research to assist decision makers in choosing preferred future courses of action by evaluating selected alternatives on the basis of their costs, benefits, and risks. Cost analysis is distinctly different from cost estimating in that projecting future courses of action almost always requires mathematical modeling. Topics include analysis overview, economic analysis, estimating relationships (factors, simple and complex models), acquiring and verifying cost data, cost progress curves, life cycle costing, scheduling estimating, effectiveness and risk estimation, relationship of effectiveness models and measures to cost analysis.

652 Military Operations Research Modeling II: Effectiveness Analysis (3:3:0). Corequisites: OR 541 or 542. Examines the issues and modeling underlying military decisions at the Military Service, Joint Staff, and Department of Defense level. Analytical methods with applications to theater campaign analysis, equipment and weapon system modernization, force structure development, strategic mobility and deployment, small scale contingency operations, logistics, and requirements determination are considered. Optimization, simulation, and statistical techniques are stressed. Realistic problems are presented and solved by the students as case studies. Display of results and presentation techniques for military decision makers are emphasized.

671/SYST 671 Judgment and Choice Processing and Decision Making (3:3:0). Prerequisite: STAT 510 or 554 or permission of instructor. A study of the intuitive nature of human judgment and decision making, and some methods currently being used for improving individual and group decisions. The nature of judgment emphasizing limitations on human information processing abilities, and the use of decision-analytic techniques to improve decision making are covered.

675/STAT 678/SYST 675 Reliability Analysis (3:3:0). Prerequisite: STAT 544 or 554 or permission of instructor. An introduction to component and system reliability, their relationship, and problems of inference. Topics include component lifetime distributions and hazard functions, parameter estimation and hypothesis testing, life testing, accelerated life testing, system structural functions, and system maintainability.
### Operations Research (OR) • Parks, Recreation, and Leisure Studies (PRLS) 443

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<tr>
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<tr>
<td>677/STAT 677/SYST 677 Statistical Process Control</td>
<td>3:3:0</td>
<td>Prerequisites: STAT 544 or 554, or permission of instructor. An introduction to the concepts of quality control and reliability. Acceptance sampling, control charts, and economic design of quality control systems are discussed, as are system reliability, fault-tree analysis, life testing, repairable systems, and the role of reliability, quality control and maintainability in life-cycle costing. The role of MIL and ANSI standards in reliability and quality programs is also considered.</td>
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<tr>
<td>670 Project Course in Operations Research, Systems Engineering and Computational Modeling</td>
<td>3:3:0</td>
<td>Prerequisites: 21 graduate credits in OR or SYST. This course is designed to be the capstone course for both the master’s program in operations research and the capstone course for the certificate in computational modeling. It can also be used in lieu of an individual research project in the master’s program in systems engineering. The focus is on model development and implementation involved in the practice of operational modeling. A key activity is the completion of a major applied group project. Work includes project proposal planning, completion, documentation, and presentation.</td>
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<tr>
<td>573 Decision and Risk Analysis</td>
<td>3:3:0</td>
<td>Prerequisite: OR 542 or MBA 658. Application of analytic reasoning and skills to practical problems in decision-making. Topics include problem structure, and analysis and solution implementation, emphasizing contemporary approaches to decision analytic techniques.</td>
</tr>
<tr>
<td>700 Computational Methods in Engineering and Statistics</td>
<td>3:3:0</td>
<td>Prerequisites: MATH 203 and 213 or equivalent, modern numerical methods and software. Numerical methods have been developed to solve mathematical problems that lack explicit closed-form solutions or have solutions that are not amenable to computer calculations. Examples include solving differential equations or computation probabilities. This course discusses numerical methods for such problems as regression, analysis of variance, nonlinear equations, differential and difference equations and nonlinear optimization. Applications in statistics and engineering are emphasized. The course involves extensive computer use.</td>
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<tr>
<td>690 Optimization of Supply Chains</td>
<td>3:3:0</td>
<td>Prerequisites: graduate standing, mathematics through linear algebra, and STAT 344. This course focuses on both supply chain optimization from an enterprise-wide perspective, and supply chain optimization from a business-to-business e-commerce concern. Thus the course is concerned with optimizing the value of goods and services and assuring a reasonable return on such sales. The course describes both heuristic and exact algorithms for scheduling, production, inventory management, logistics, and distribution. New software that enables such optimization is presented, as are manufacturing and service examples from the public and private sectors. New techniques to handle risk, quality of data, and robustness of solutions are presented. Students perform case studies using state-of-the-art software.</td>
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<td>741 Advanced Linear Programming</td>
<td>3:3:0</td>
<td>Prerequisites: OR 541 and 641. Recent developments in linear programming. The course highlights advances in interior point methods and also addresses developments in the simplex method. Projective methods, affine methods, and path-following methods are examined, including Karmarkar’s original work. The relationships between these methods are discussed, as well as their relationships to methods in nonlinear programming. Also discussed are advances in data structures and other implementation issues. Students have the opportunity to test software and solve large-scale linear programs.</td>
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<td>750 Advanced Topics in Operations Research</td>
<td>3:3:0</td>
<td>Prerequisites: OR 541 or 542 and a 600-level course that will vary with the content of the course. Special topics, applications, and/or recent developments in operations research. Contents vary and may include topics in optimization, stochastic methods, or decision support that are not covered in the standard OR curriculum. May be repeated for credit when topics are distinctly different.</td>
</tr>
<tr>
<td>751 Advanced Topics in Operations Research for Planning, Scheduling, and Network Design</td>
<td>3:3:0</td>
<td>Prerequisite: OR 642 or 643 or 690. An introduction to network and combinatorial optimization problems in logistics, computer science, electrical engineering, and systems engineering. Solution techniques for various classes of such problems are developed. Topics include scheduling algorithms, capital budgeting, minimal cost network flow, optimal routings, and generalized networks. Scheduling algorithms, network reliability, stochastic networks and combinatorially-based network problems are discussed.</td>
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### Organizational Learning—See LRNG

**Parks, Recreation, and Leisure Studies (PRLS)**

**Graduate School of Education**

- 110 Exploring Outdoor Adventure (2:2:0).
- 115 Introduction to Fly Fishing (1:1:0).
- 117 Rock Climbing (2:2:0).
- 119 Trap and Skeet Shooting (2:2:0).
- 120 Hiking, Orienteering, and Cooking (2:2:0).
- 170 Introduction to Whitewater Kayaking (1:1:0).
- 173 Basic Coastal Kayaking (2:2:0).
- 175 Introduction to Rowing (1:1:0).
- 180 Whitewater Canoeing (2:2:0).
- 181 Whitewater Canoeing II (2:2:0).
- 190 Downhill and Cross-Country Skiing (1:1:0).
- 210 Introduction to Recreation and Leisure (3:3:0). Open to nonmajors. Traces the development of current concepts of recreation and leisure and their implications and consequences. Covers the influences of philosophy, religion,
Parks, Recreation, and Leisure Studies (PRLS)

405 Planning, Design, and Maintenance of HFRR Facilities (3:3:0). Prerequisites: PRLS 310 or POI and 60 credits. Covers quantity, location, and design standards for facilities. Includes safety, functionality, durability, and maintenance demand criteria in planning and design; programmatic and operational objectives to be met, including user comfort and convenience, crowd management, and traffic flow; and space relationships. Includes field study of local facilities.

410 Administration of HFRR Organizations I (3:3:0). Prerequisite: 60 hours. Focuses on the operation and management of health, fitness, and recreation services organizations. Covers management and leadership theories and techniques, problem solving and decision making, organizational communications, design of organizational structures, and budgeting.

411 Administration of HFRR Organizations II (3:3:0). Prerequisite: PRLS 410 and 60 hours. Focuses on planning techniques for health, fitness, and recreation organizations. Covers program and organizational marketing principles and strategies; service quality assessment and organizational evaluation techniques; and organizational financing.

416 Issues and Trends in Therapeutic Recreation (3:3:0). Prerequisite: PRLS 325. Explores the role of leisure in human development with a specific focus on the leisure needs, demands, and services for people with disabilities in community settings. Presents basic concepts associated with leisure, aging, physical challenge, targeting leisure services, research, and public policy. Field experience is required.

450 Research Methods (3:3:0). Prerequisite: SOCI 313 or permission of instructor and 60 credits. Covers the development of empirical research designs for both practical and theoretical problems in health, fitness, and recreation resources management. Includes literature review of hypothesized relationships and formulation of research proposals.

460 Sport and Recreation Law (3:3:0). Prerequisite: 60 hours. Emphasizes safety, liability, and risk. Covers current law and liability issues for administrators of HFRR facilities and programs.

480 Special Topics in Parks, Recreation, and Leisure Studies (3:3:0). Covers selected topics reflecting interest in specialized areas of parks and outdoor recreation or therapeutic recreation.

490 Internship (12:0:0). Prerequisites: 90 hours: HEAL 205, 323, and 350; PHED 200; PRLS 210, 310, 316, 317, and 410 (pass/fail basis). Provides paid or voluntary work experience in a park and recreation agency for a minimum period of 10-12 weeks of full-time employment. Applies course work, theories, and research to work settings. Work sites are chosen by students after approval of faculty supervisors. Includes meetings and assignments before as well as during the internship.

499 Independent Study (1-3:0:0). Provides individual study of topic area in leisure research, theory, or practice under the direction of faculty.

501 Introduction to Natural Resources Law (3:3:0). Prerequisite: PRLS 460 or graduate status or permission of instructor. Examines selected legal issues involving conflicting use and preservation demands on our nation's limited natural resource base, particularly those involving public lands, open space, and recreation resources. Uses case studies of recent court decisions.

503 Disability Rights Law in Sport and Recreation (3:3:0). Prerequisite: PRLS 460 or graduate status or permission of instructor. Provides an overview of several ma-
jor law and policy issues related to the provision of community recreation services to special populations. The primary focus is the Americans with Disabilities Act and related federal legislation.

526 Environmental Education and Resource Interpretation (3:3:0). Prerequisites: PRLS 402 or permission of instructor and 90 credits. Covers methods for communicating and disseminating information pertaining to the use of natural recreation resources. Covers the design and implementation of educational materials and programs to enhance understanding and appreciation of cultural, historical, and natural resources.

531 Natural Resources Recreation Planning (3 credits). Covers the origins and evolution of recreation use philosophy, policies, and service of public estate management. Covers planning for a spectrum of opportunities, from wilderness to developed sites, with attention to financial consideration and to sustainable use of cultural and visual resources.

533 Visitor Services (3 credits). Covers the motivation of resource-based recreation participants. Covers visitors' expectations and perceptions, with emphasis on implication for service quality, staff training, and other management responsibilities. Also covers use and user conflicts and placement, information and interpretive service, and human and other interpretive service resources.

535 Evaluating Recreation Outcomes (3:3:0). This web-based technology course applies qualitative and quantitative research methods to the evaluation of programs provided to visitors and users of public lands for outdoor recreation. Covers needs assessment, application of meaningful measures for formative and summative evaluations, and requirements of the Government Performance and Results Act.

560 Liability and Risk Management (3 credits). Covers liability and risk; federal jurisdiction, legal apparatus, and decision making; and analysis of resource-based recreation case law.

598 Confronting the Digital Domain (3:3:0). Contact department for course information.

National Forest Land Management Courses

542 Foundations of Federal Land Management (1 credit). Covers the history of national land policy and the nature of management activities on federal lands. Examines policies, trends, and management needs. Covers intra- and interagency management of land management programs. This course is available on the Internet (http://dlp.gmu.edu) without charge. Registration and payment is required for academic or agency credit.

635 Recreation Special Uses and Appeals (3 credits). Covers the management of extensive and varied commercial and noncommercial demands on federal lands. Covers policies and procedures used by federal land managers; implementation, effects, and problems of permit systems; and appeal provisions.

643 Special Uses Management on Federal Lands (4 credits). Covers special use authority and authorizations, and policies, regulations, and directives in processing applications. Covers coordination and administration of special uses and integration with land and resource management plans. Includes agriculture, industry, community, aviation, water, treasure trove, and cultural uses.

644 Linear Uses and FERC Licenses on Federal Lands (3 credits). Covers regulation, legislation policies, and directives governing linear uses. Covers FERC licensing of hydroelectric power generation and distribution; rights-of-way for oil, gas, and electric transmission and railroads, communication, trams, conveyors, roads, and trails; and FERC consultation, exemption, and licensing.

645 Valuation and Land Ownership Adjustment (5 credits). Covers land ownership authority, coordination, and adjustment processes; land valuation and rules; and processes of appraisal, title exchange, purchase, donation, transfer, sale, and condemnation of properties.

646 Right-of-Way Acquisition (3 credits). Covers authorities and procedures for right-of-way acquisition from public agencies and private landowners. Covers planning coordination and project scheduling requirements, steps in the acquisition process, and cooperative development and use of roads.

647 Land Status, Boundaries, Claims, and Withdrawals (3 credits). Covers land survey and status record systems; programs for maintaining and managing boundaries; the handling of claims and encroachments; and the land status record system and Bureau of Land Management master title plat system.

648 American Indian Rights and Claims (3 credits). Covers American Indian sovereignty, Alaska Native corporations, and colonization; treaties, rights, and claims; cultural resources and Indian laws; and consultation with tribal governments. This course is available on the Internet at http://dlp.gmu.edu.

Philosophy (PHIL)

Philosophy and Religious Studies

100 Introduction to Philosophy (3:3:0). Introduction to the nature of philosophical reasoning and some of the main problems of philosophy.

111 Individual and Society (3:3:0). Examination of philosophical issues revolving around the relationship between the individual and society, drawing from such thinkers as Plato, Hobbes, Locke, Rousseau, and Marx. Issues include the concept of individual rights, the legitimacy of political authority, and the competing demands of individual liberty, equality, and the common good.

112 Ethics and the Cybersociety (1:1:0). Examination of a variety of ethical issues associated with new developments in information technology, including privacy rights, intellectual property rights, and the effect of information technology on society.

151 Introduction to Ethics (3:3:0). Consideration of some of the perennial issues in ethical theory.

155 Issues in Environmental Ethics (3:3:0). Philosophical examination of a variety of issues in environmental ethics, such as the moral status of animals, the moral significance of nature, our duties to protect wilderness areas, the moral status of economic reasoning, and morally acceptable population policies.
156 What Is Art? (3:3:0). Introduction to philosophical reflection on the arts by looking at the critical issues in the history of aesthetics. Applying these considerations to specific works and exploring these works in terms of their historical contexts and influences. Concentrates on one form of art or one period and always emphasizes questions of critical evaluation and art historical analysis.

173 Logic and Critical Theory (3:3:0). Basic concepts and techniques of deduction, emphasizing the modern treatment of such topics as quantification and rules of inference, with study of the classical treatment. Basic principles of induction, informal fallacies, and uses of logic in everyday life.

253 Philosophy and Literature (3:3:0). Fulfills literature requirement. Examination of the differences and relations between literary and philosophical texts. Examines texts from a given period in the history of literature and philosophy. Topics include the presence of common issues in literary and philosophical writings, the influence of philosophical ideas on the production of literary texts and literary theory, and the development in literary texts of issues that are possible objects of philosophical inquiry.

254 Contemporary Ethical Problems (3:3:0). Topics include homosexuality, abortion, drugs, civil disobedience, capital punishment, and the rights of the individual versus the rights of society.

273 Introduction to Deductive Logic (3:3:0). Introducory study of the principles and methods associated with deductive reasoning. Throughout this course, students examine alternative techniques for proving the validity of arguments, techniques that are drawn from principles of syllogistic reasoning, propositional logic, and predicate logic. Other topics may include the language of deduction, the logical relationships between statements, and the requirements for a formal language system.

300 Foundations of European Civilization (3:3:0). Up to three credits in seminars listed under EUST 300 may be credited toward the philosophy major.

301 History of Western Philosophy: Ancient (3:3:0). Classical Greek philosophy, including pre-Socrates, Socrates, Plato, and Aristotle.

302 History of Western Philosophy: Medieval (3:3:0). Figures and problems of medieval philosophy. Study of leading thinkers from the 5th to the 15th centuries.

303 History of Western Philosophy: Modern (3:3:0). Figures and problems of modern philosophy. Study of philosophers such as Descartes, Locke, Berkeley, Hume, Kant, and Hegel.

305 Business Ethics (3:3:0). Examination of some of the moral problems that arise with regard to the responsibilities of various segments of the business community, including employers, management, stockholders, to one another, to the consumer, and to society at large.

309 Medicine and Human Values (3:3:0). Examination of some of the major moral issues involved in the practice of medicine and arising from research in the life sciences. Topics include medical experimentation, eugenics, definition of death, euthanasia, abortion, distribution of scarce resources, transplants, organ donation, and psychiatric medicine. May not be taken by students who have previously taken PHIL 310.

311 Philosophy of Law (3:3:0). Prerequisite: Three credits of philosophy or permission of instructor. Investigation of theories of natural law, legal positivism, and legal realism as they pertain to some of the central philosophical questions about law.

312 Philosophy of Technology (3:3:0). Prerequisite: Three credits of philosophy or permission of instructor. Philosophical examination of modern technology in its broadest human context. Several alternative philosophies of technology are considered. Examines the relationships between technology and religion, economics, and politics. Ethical issues raised by the use of technology are also examined. Typically, the course focuses on the ethical issues raised by the use of one kind of technology.

313 Philosophy of Religion (3:3:0). Prerequisite: Three credits of philosophy or permission of instructor. Study of classical appeals to philosophy in support of belief in god's existence (Philo, Augustine, Anselm, Aquinas, Descartes); the fideism of Hume and the metaphysical agnosticism of Kant; the concept of religious experience in the philosophies of Hegel, Schleiermacher, and Kierkegaard; and the problem of religious language in contemporary empirical philosophy.

323 Classical Western Political Theory (3:3:0). Exploration through lecture and discussion of developments in the Western tradition of political thought from the time of the Greek city-state to late medieval Christendom, focusing on such topics as the nature and purpose of politics, the relationship between the individual and the state, the political significance of religion and tradition, and the concept of natural law.

324 Modern Western Political Theory (3:3:0). Exploration through lecture and discussion of developments in the Western tradition of political thought from the Renaissance to the middle of the 19th century, focusing on such topics as the rise of individualism in political theory, early developments in social control theory, theories of radical popular sovereignty, and early criticisms of liberal theory.

325 Karl Marx's Social and Political Thought (3:3:0). Prerequisite: Three credits of philosophy or permission of instructor. Study and evaluation of Marx's social and political ideas based on writings selected from several phases of his career. Examination of relation of Marx's thought to post-Marxist socialist theory and practice.

326 Liberty, Equality, and Community (3:3:0). Prerequisite: Three credits of philosophy or permission of instructor. Investigation of three alternative theories of justice, egalitarianism, libertarianism, and communitarianism through a critical examination of important recent texts.

327 Contemporary Western Political Theory (3:3:0). Exploration through lecture and discussion of recent developments in the Western tradition of political thought from the middle of the 19th century to today. Different sections of this course will focus on one or another of the various political theories that have been influential during this period, such as liberal, libertarian, conservative, communitarian, Marxist, feminist, and postmodern thought. This course can be retaken for credit when the subject matter is different.

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332 Twentieth-Century Analytic Philosophy (3:3:0).
Prerequisites: Three credits of logic and PHIL 303 or permission of instructor. Examination of the attempts of 20th-century philosophers to solve philosophical problems by an analysis of language. Figures and movements covered include Russell, Moore, Wittgenstein, logical positivism, and ordinary language philosophy.

335 Nineteenth-Century Philosophy (3:3:0). Prerequisite: Three credits of philosophy or permission of instructor. Development of German Romanticism and Idealism during a brilliant period in the history of the West rivaled only by ancient Greece. Kant, Fichte, Hegel, Kierkegaard, Schopenhauer, and Nietzsche mount a revolt against the rationalism and scientism of the modern world.

336 Contemporary Continental Thought: Existentialism (3:3:0). Prerequisite: Three credits of philosophy or permission of instructor. Examination of existential philosophy from its 19th-century origins to its 20th-century expressions. Philosophers studied include Kierkegaard, Nietzsche, Sartre, De Beauvoir, and Buber.

337 Twentieth-Century Continental Thought: Phenomenology (3:3:0). Prerequisite: Three credits of philosophy or permission of instructor. Examination of the phenomenological way of doing philosophy, its findings in regard to the "life-world," questions of "first philosophy," and the subject matter of the social sciences, as well as critical difficulties in its development. Texts by Husserl, Heidegger, Merleau-Ponty, Sartre, Schutz, and Derrida.

338 Woman: The Philosophical Questions (3:3:0). Prerequisite: Three credits of philosophy or permission of instructor. Exploration of the meaning and politics of the question of woman that puts the idea of woman into question. Recognizing the historical context of this issue, the ways in which the structures of patriarchy situate woman as the other and determine the meanings of sexuality, subjectivity, the body, and language are examined. One overriding theme of this course is the relationship between the "woman" question and other central issues of contemporary philosophy.

340 Hermeneutic Philosophy (3:3:0). Prerequisite: Three credits of philosophy or permission of instructor. Study of the development of hermeneutic philosophy in works by Heidegger, Gadamer, and Ricoeur, as an effort toward coming to terms with the historicity of human experience. Implications for interpretive understanding of artworks, institutions, events, texts, and the human condition.

350 Classicism and Romanticism (3:3:0). Up to three credits of listed European studies seminars may be credited toward the major. Examination of Classicism and Romanticism through literary and other cultural forms of expression in 17th-, 18th-, and 19th-century Europe.

355 Contemporary Ethical Theory (3:3:0). Prerequisite: PHIL 151 or permission of instructor. Major trends and issues in recent moral philosophy.

356 Philosophy of Art (3:3:0). Prerequisite: Three credits of philosophy or permission of instructor. Basic problems that arise from an inquiry into the meaning and value of art and our response to art.

357/SOCI 599 Philosophy of the Social Sciences (3:3:0). Prerequisite: Three credits of philosophy or permission of instructor. Philosophical issues relating to competing methodologies for the social sciences. Analysis and critique of mainstream positivism and behaviorism, paradigm theory and scientific revolutions; interpretive understanding and hermeneutical science; phenomenology and the social construction of reality; ethnomethodology and situational meaning; analytic philosophy and action theory; the "idea" of a social science; sociology of knowledge and theory of ideology; and Western Marxism and critical theory.

371 Philosophy of Natural Sciences (3:3:0). Prerequisite: Three credits of philosophy or permission of instructor. One semester of logic recommended. Study of aims and methodology of science. Among the questions of concern are, What constitutes a good scientific explanation? What grounds are used for comparing rival theories? Is there a special method of scientific discovery?

372 Philosophical Methods (3:3:0). Prerequisite: Three credits of philosophy or permission of instructor. Study of the relationship between a philosopher's method, doctrine, and concept of truth. Philosophers studied vary but include representatives from among the empirical, analytical, phenomenological, hermeneutical, and structuralist movements.

373 Theory of Knowledge (3:3:0). Prerequisite: Three credits of philosophy or permission of instructor. Discussion of basic problems concerning the nature of knowledge, with study of the relation of knowledge to perception, belief, and language.

374 Philosophy of Mind (3:3:0). Prerequisite: Three credits of philosophy or permission of instructor. Investigation of such theories as dualism, behaviorism, and materialism as they pertain to some of the central philosophical questions about mind.

375 Metaphysics (3:3:0). Prerequisite: Three credits of philosophy or permission of instructor. Study of basic problems concerning being in general and foundations of individual being, traditional treatments of such problems and criticism of the possibility of such knowledge. Selected readings from figures such as Plato, Aristotle, Aquinas, Spinoza, Leibniz, Kant, Bradley, Heidegger, and others.

376 Symbolic Logic (3:3:0). Prerequisite: PHIL 173 or MATH 110 or permission of instructor. Study of predicate calculus by means of a step-by-step construction of artificial languages. Topics include procedures for constructing a calculus, proof techniques, significant properties of predicate calculi, and procedures for recognizing phrases.

377 Metaphysical Foundations of Science (3:3:0). Prerequisite: 60 credits or permission of instructor. Exploration of metaphysical questions concerning the nature of physical reality, as presented within major scientific theories. Questions are explored within the scientific/metaphysical principles of Kepler, Galileo, Boyle, Newton, Kant, Faraday, Einstein, and Bohr.

391, 392 Special Topics in Philosophy (3:3:0), (3:3:0). Examination of topics of current interest, such as death and dying, the rights of children, or philosophical controversies in modern physics.

421 Seminar (3:3:0). Limited to philosophy majors with nine credits of philosophy, but others may be admitted if the topic is sufficiently close to their fields of study. Topics vary.

425, 426 Independent Study (3:3:0), (3:3:0). Prerequisites: Philosophy majors with 60 credits and 15 credits of philosophy and permission of department.
450 The 20th Century in Europe (3:3:0). Examination of the main currents of European life and thought in the 20th century. Study of the principal influences and events of the period, culminating in an assessment of contemporary European problems and values.

470 Seminar: Philosophical Examination of Social Issues and the Law (3:3:0). Prerequisite: Three hours in philosophy or permission of instructor. Philosophical study of social issues that are subject to legislation and judicial review. Analysis of the purpose and function of law in society lays the groundwork for reflection on specific issues such as abortion, euthanasia, capital punishment, divorce, child care, and health care.

510 Seminar in Ethics of Health Care (3:3:0). Prerequisite: 90 credits, graduate standing, or permission of instructor. Examination of moral dilemmas within the health care profession on ethical theories and principles. Special emphasis on patients' rights, social justice of health care, and evolving health care technologies.

512 Issues in Philosophy and Literature (3:3:0). Prerequisites: 90 credits, 6 credits of 300-level English and 6 credits of 300-level philosophy, or permission of instructor. Possible topics include structuralism, technology, form and matter, conceptions of the future. Course is cross-listed and team taught.

520 Current Issues in Philosophy of Science (3:3:0). Prerequisite: Graduate standing or permission of instructor. Advanced exploration of the current issues addressing the structure of scientific knowledge. The fundamental question is, What are the rational standards for acquiring knowledge of the physical world? This question is explored from rival philosophical perspectives: the logical-empiricist perspective of the Received View, represented by R. Carnap and C. Hempel; the problem-solving perspective of the historicists T. Kuhn and L. Laudan; and the rationalism of W. Newton-Smith; and the antirealism of V. van Fraassen.

531 Freud and Philosophy (3:3:0). Prerequisite: Six credits of philosophy, a course in personality theory, or permission of instructor. Exploration of philosophical aspects of Freud's thought, focusing on Freud's philosophy of human nature and culture and its influence on contemporary thought.

555 Environmental Ethics (3:3:0). Prerequisites: Graduate standing, or permission of instructor. Examination of ethical principles affecting environmental issues with special emphasis on the problems encountered by environmental biologists.

560 Philosophical Foundations of Science (3:3:0). Prerequisite: Graduate standing or permission of instructor. Focuses on metaphysical questions concerning the nature of physical reality, as presented within major scientific theories of the modern era. Questions are explored within the scientific/metaphysical principles of Kepler, Galileo, Boyle, Newton, Kant, Faraday, Einstein, and Bohr.

573 Current Issues in Theory of Knowledge (3:3:0). Prerequisite: Graduate standing. Advanced exploration of conditions and limits of knowledge, from the perspective of contemporary philosophy. Is there any infallible, or fallible but at least reasonable, foundation for achieving an understanding of the world and of our minds? This question is examined from the perspective of sense datum theory, coherentism, and various naturalized epistemologies. The nature of a priori knowledge (e.g., from mathematics and logic) is also examined.

574 Philosophical Issues in Cognitive Science (3:3:0). Prerequisite: 90 credits or graduate standing plus 12 credits in philosophy and any of the disciplines relative to cognitive science (such as psychology or computer science) required for undergraduates and recommended for graduates, or permission of instructor. Careful examination of some philosophical issue or issues relevant to contemporary studies of the mind. Typical issues examined include the mind-body problem, philosophical and psychological implications of work in artificial intelligence, and philosophical issues in psycholinguistics.

591 Special Topics in Philosophy (3:3:0). Examination of specific topics in philosophy that are both of central interest in that field and of interdisciplinary interest. Topics are selected with special reference to the areas of technology, aesthetics, philosophy of religion, ethics, and social and political philosophy.

611 Philosophy of Law (3:3:0). Prerequisite: Graduate standing or permission of instructor. Examination of the major jurisprudential theories that underpin law in Western society. After examining the theories, students apply them to contemporary social and political problems.

615 Postmodernist Thought (3:3:0). Prerequisite: Graduate standing or permission of instructor. In recent decades, the term "postmodern," which was first used by art critics in the late 19th century, has been taken up by prominent contributors to the arts, social thinkers, and philosophers, to describe developments in their fields, as well as to describe the current period. This course examines three thematic concerns found in work that is identified with postmodern issues: what modernity defines itself in contrast to or against, the status of "man," and the status of "subjectivity."

656 Happiness and the Quality of Life (3:3:0). Prerequisite: Graduate standing or permission of instructor. Examination of the role that concepts of happiness and the good life have played in ethical theory. Focuses on the development of consequentialist ethical theories from Aristotle's eudaimonic theory to contemporary versions of utilitarian theory. Examines the theories of the self and personal identity implied by these ethical theories. Throughout the semester, these theories are used to critically assess modern social structures.

658 Feminist Theory (3:3:0). Prerequisite: Graduate standing or permission of instructor. Analysis of the critique of patriarchy offered by contemporary continental feminist philosophers. Examines contemporary moral, political, and epistemological issues in feminist theory.

681 Philosophical Figures (3:3:0). Prerequisite: Graduate standing. Examination of a major philosophical author of crucial philosophical texts and their influence on philosophical thought. May be repeated for a maximum of six credits.

691 Special Topics in Philosophy (1-6:1-6:0). Prerequisite: Graduate standing or permission of instructor. Topics vary.

693 Directed Readings in Philosophy (3:0:0). Directed readings and research on a specific topic in philosophy chosen by student and instructor. May be repeated for a maximum of six credits.
### Physical Education (PHED) 449

**Physical Education (PHED)**  
Graduate School of Education

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<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
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<td>Fencing (1:1:0).</td>
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<td>Intermediate Racquetball (1:1:0).</td>
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**Open to non-majors.** Traces the historical foundations of health, recreation, and physical education.
| 201         | Developmental Motor Patterns (3:3:0).            
Analyze motor skill development and prescription of activities from immature to mature stages.
| 202         | Teaching Skillful Movement (3:3:0).              
Plans and presenting lessons on numerous motor skills using varied teaching strategies in a peer teaching setting.
| 250         | Water Safety Instruction (2:1:0).                |
| 255         | Scuba Diving (1:1:0).                            |
| 300         | Kinesiology (3:3:0). Prerequisites: BIOL 124 and 125.  
Covers the anatomical and mechanical study of human movement.
| 304         | Sport, Culture, and Society (3:3:0).            
Covers sport from an educational, political, economic, and cultural perspective.
| 306         | Psychomotor Learning (3:3:0). Prerequisite: BSED status.  
Covers psychological aspects, learning theory, and practice conditions for learning motor skills.
| 308         | Adapted Physical Education (3:3:0). Prerequisites: BSED status and BIOL 124 and 125.  
Introduces disabilities in public schools. Covers national standards, federal legislation, IEPs, and developmental inclusion models.
| 328         | Introduction to Athletic Training (3:3:0).       
Introduces students to the profession of athletic training. Areas studied include the role of the athletic trainer in sports medicine, mechanisms of athletic injuries, tissue response to injury, blood-borne pathogens, introductory techniques of the assessment and evaluation of athletic injuries and emergency procedures, general illnesses common with athletes, and dermatological conditions.
| 329         | Clinical Experiences in Introductory Athletic Training (3:3:0).  
Introduces students to clinical skills commonly used in athletic training. Topics include athletic training room organization and procedures; protective sports equipment; construction of protective devices; and application of protective taping, braces, wrapping, and protective pads. Assignments include the application of skills with athletic teams.
| 330         | Prevention and Care of Athletic Injuries (3:3:0). Prerequisites: BIOL 124 and 125.  
Covers preventive, rehabilitative, and medical management of athletic injuries.
Covers injury evaluation and treatment modalities in athletic training.
| 332         | Therapeutic Modalities (3:3:0). Prerequisites: BIOL 124 and 125.  
Focuses on the physical principles, physiological effects, indications, and contraindications of therapeutic modalities used in athletic training. Covers indications, contraindications, physiological effects, special programs, and resistance methods used in the prevention and rehabilitation of athletic injuries.
| 333         | Treatment and Rehabilitation Clinical Techniques (3:3:0).  
Pre- or corequisites: PHED 332, 338, and a 2,500 major GPA. Provides practical experience in the standard operating procedures of therapeutic modalities commonly used in athletic training and special programs and rehabilitation methods used in the prevention and rehabilitation of athletic injuries. Assignments include the application of skills with athletic teams.
| 334         | Athletic Injury Recognition of the Upper Extremity, Head, and Neck (3:3:0). Prerequisites: BIOL 124 and 125.  
Provides an analysis of injury mechanisms of specific injuries to the upper extremity, head, and spine.
| 335         | Clinical Evaluation Skills for the Upper Extremity, Head, and Neck (3:3:0). Corequisites: PHED 334 and a 2,500 major GPA.  
Provides an analysis of injury evaluation and muscle isolation techniques for specific injuries to the upper extremity, head, and spine. Assignments include the application of skills with athletic teams.
| 336         | Athletic Injury Recognition of the Lower Extremity and Thorax (3:3:0). Prerequisites: BIOL 124 and 125.  
Provides an analysis of injury mechanisms of specific injuries to the lower extremity and thorax.
| 337         | Clinical Evaluation Skills for the Lower Extremity and Thorax (3:3:0). Corequisites: PHED 336 and a 2,500 major GPA.  
Provides an analysis of injury evaluation and muscle isolation techniques for specific injuries to the lower extremity and thorax. Assignments include the application of skills with athletic teams.
| 338         | Rehabilitation of Athletic Injuries (3:3:0). Prerequisites: BIOL 124 and 125.  
Focuses on the indications, contraindications, physiological effects, special programs, and resistance methods that are used in the prevention and rehabilitation of athletic injuries.

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365 Measurement and Evaluation of Physical Fitness (3:3:0). Prerequisites: BIOL 124 and 125. Covers selection, administration, evaluation, and construction of measurements and evaluation instruments and techniques in physical education. Also covers statistical analysis of data and survey of selected instruments.

373 Individual Sports in Physical Education (3:0:3). Prerequisite: BSED status. This course is designed to improve teacher candidates' motor skills and knowledge of selected individual and lifelong activities and sports.

375 Team Sports in Physical Education (3:0:3). Prerequisite: BSED status. This course is designed to improve teacher candidates' motor skills and knowledge of selected team and group activities and sports.


404 Middle and High School Instruction in Physical Education (3:3:0). Prerequisites: PHED 201, 202, 306, 373, 375, and 403; BSED status. Examines school curriculum, assessment, content, and teaching practices for middle and high school physical education programs. Requires field experience.

410 Social/Psychological Aspects of Health and Fitness (3:3:0). Covers research, trends, and techniques of health and fitness from a behavioral perspective.

413 Management Skills in Athletic Training (3:3:0). Prerequisites: PHED 200, 328, 329, 332, 333, 334, 335, 336, and 337; PRLS 405 and 410; a 2.500 major GPA. Provides practical experience in the administration of an athletic training program on the collegiate, clinical, professional, and secondary school levels.

415 Student Teaching in Physical Education (9:0:0). Prerequisites: Completion of all courses in the approved program; acceptance into student teaching. Provides supervised clinical experience of a full semester in approved schools. Requires experiences in elementary (seven weeks) and secondary (seven weeks) school settings. Includes participation of one week in preservice workshops and related activities and weekly seminar sessions.

441 Practicum in Athletic Training (3:0:0). Prerequisites: PHED 200, 328, 329, 330, 332, 333, 334, 335, 336, and 373; PRLS 405 and 410; a 2.500 major GPA; permission of instructor. Applies techniques and procedures in the care and prevention of athletic injuries in a selected environment under certified athletic trainer supervision. Involves at least 100 hours of participation for each credit in athletic training.

442 Practicum in Physical Education (1:3:0:0). Prerequisites: 90 credits, or 60 credits and permission of instructor. Provides supervised professional practice in a selected area of interest. Students may repeat this course, but no more than 3 credits may be given. Each credit requires a minimum of 60 hours of participation in the specialty over a period of six weeks. Areas selected with faculty advisor approval.

450 Physiology of Exercise (3:3:0). Prerequisites: BIOL 124 and 125 and PHED 300. Covers human physiological responses to environmental changes and exercise.

499 Independent Study in Physical Education and Fitness (1-3:0:0). Prerequisites: 90 credits and permission of instructor. Provides study of a problem area in physical education research, theory, or practice under the direction of faculty. May be repeated, but no more than 3 total credits may be earned.

Physics (PHYS)

Physics and Astronomy

101 Light and Sound in Our World (3:3:0). Nature of light, color and sound, electromagnetic spectrum, optical instruments, mechanisms of vision and hearing, color addition and subtraction, synthesis of musical sounds, interference of waves, polarization, the Doppler effect, lasers, and holography.

102 Sports Physics (3:3:0). Introduction to the laws of physics in the context of sports. Physics topics to be studied include two-dimensional motion, forces, conservation of energy, and momentum in the application to sports. Sports include football, basketball, baseball, swimming, and tennis.

103, 104 Principles and Development of Modern Physics (4:3:3). PHYS 103 is a prerequisite to PHYS 104. For nonscience majors. Topics include mechanics, relativity, cosmology, atomic physics, electricity and magnetism, nuclear physics, and elementary particles. Emphasis on historical, philosophical, and social aspects of modern physics.

121 Uses of Physics (1:1:0). Introductory course intended for both majors and nonmajors. Describes the uses of physics to a number of disciplines and professions, including medicine, information technology, energy, and environmental technology.

122 Inside Relativity (1:1:0). Introductory course describing Einstein's theories of special and general relativity intended for majors and nonmajors.

123 Inside the Quantum World (1:1:0). Introductory course describing quantum theory intended for majors and nonmajors.

124 Experimental Explorations in Physics (1:0:2). Introductory nonmathematical course intended primarily for physics majors. Experimental studies of phenomena in mechanics, electricity and magnetism, and optics. Stresses development of familiarity with methods and techniques of measurement and with data evaluation.


225 Problems in Physics I (1-3:0:0). Prerequisites: 24 credits and 3.000 GPA in physics and mathematics. Individual study of physics problems of current interest. May be taken three times.

243, 245 College Physics (3:3:0), (3:3:0). (One-hour recitation.) Two-semester basic physics course with emphasis on topics of classical and modern physics of particular importance to science majors. Principles of mechanics, heat, electricity, magnetism, optics, and atomic and nuclear physics are discussed.
244, 246 College Physics Lab (1:0:3), (1:0:3). Corequisites: PHYS 243 (for 244) and 245 (for 246). Laboratory portion of two-semester basic physics course.

251 Introduction to Computer Techniques in Physics (2:2:0). Prerequisite: PHYS 160. Introduction to the use of computers in physics based on examples from mechanics and astronomy.

260 University Physics II (3:3:0). (One-hour recitation.) Prerequisite: PHYS 160; corequisite: MATH 213. Waves, electricity, and magnetism.

261 University Physics II Laboratory (1:0:3). Corequisites: MATH 213 and PHYS 260. Experiments in mechanics, electricity, and magnetism.

262 University Physics III (3:3:0). (One hour recitation) Prerequisite: PHYS 260; corequisite MATH 214. Thermodynamics, optics, and modern physics.

263 University Physics III Laboratory (1:0:3). Corequisites: MATH 214 and PHYS 262. Experiments in optics and modern physics.

265 Advanced University Physics II Laboratory (2:0:3). Corequisites: MATH 213 and PHYS 260. Credit may be received for PHYS 261 or 265. Experiments in mechanics, electricity, and magnetism with emphasis on data analysis using spreadsheets and Matlab.

266 Introduction to Thermodynamics (1:1:0). Prerequisites: PHYS 260. Laws of thermodynamics, kinetic theory of gases, heat engines, and entropy. Students may not receive credit for both PHYS 262 and 266.

303 Classical Mechanics (3:3:0). Prerequisites: PHYS 160; corequisite: MATH 213. Motion of a particle in one, two, and three dimensions; systems of particles; noninertial coordinate systems; and equations of Lagrange and Hamilton.


306 Wave Motion and Electromagnetic Radiation (3:3:0). Prerequisite: PHYS 262 and MATH 213. Vibrating string, plane waves, interference, diffraction, polarization, electromagnetic waves, dispersion, and relativity.

307 Thermal Physics (3:3:0). Prerequisite: PHYS 262. Classical concepts of energy and temperature, basic definitions, first and second laws of thermodynamics, properties of pure substances, and equations of state. Introduction to classical and quantum statistics and their application to physical systems.

308 Modern Physics with Applications (3:3:0). Prerequisite: PHYS 262. Study of modern physics with emphasis on applications. Topics include introductory quantum physics; modern optics; lasers; binding and energy bands in solids; electrical, thermal, and magnetic properties of solids; semiconductors; radioactivity; nuclear reactions; radiation detectors; and applications of nuclear physics to other sciences.

310 Physics of Semiconductor Materials and Processing (3:3:0). Prerequisites: PHYS 160, 260, 262 or permission of instructor. Survey of the electronic and structural properties of semiconductors and the physics of semiconductors. Topics to be discussed include crystal growth, crystal defects, thin films, thermal properties, lithography, and characterization.

326 Problems in Physics II (1:0:0). Prerequisites: 60 credits and 2.500 GPA in physics and mathematical sciences. Individual study of physics problems of current interest. May be taken three times.

328/ASTR 328 Introduction to Astrophysics (3:3:0). Prerequisites: PHYS 303, 305, 308, and MATH 214. Topics include physical concepts; magnitudes of stars; Hertzsprung-Russell diagram; stellar radiation; stellar structure and stellar evolution; white dwarfs, red giants, supernovas, neutron stars, black holes; interstellar matter, dust, and molecules; cosmic rays and magnetic fields; galactic structure, galaxies, quasars, and intergalactic matter; high-energy astrophysics, cosmology, and general relativity; and models of the universe.

390 Topics in Physics (1-4:0:0). Selected topics in physics not covered in fixed content courses.

402/PHYS 502 Introduction to Quantum Mechanics and Atomic Physics (3:3:0). Prerequisites: PHYS 308 or permission of instructor. Experimental basis of quantum mechanics; the wave function; systems in one, two, and three dimensions.

405, 406 Honors Thesis in Physics (3:0:0). Prerequisites: 21 credits of physics courses. PHYS 262, 305, 308, and admission to the Physics Department Honors Program. PHYS 405 is a prerequisite for PHYS 406. Project chosen and completed under the guidance of a faculty member, which results in a thesis. An oral progress report is required for PHYS 405. Oral and written presentations are required for PHYS 406. A student may receive no more than six credits of PHYS 405, 406, 408, and 409.

407 Senior Laboratory in Modern Physics (3:0:9). Prerequisite: 21 credits of physics courses. Experiments in modern physics involving advanced techniques in electronics, optics, nuclear physics, and solid state. Typical experiments include the Frank Hertz Experiment, Hall Effect, electron paramagnetic resonance, and Mossbauer Effect.

408 Senior Research (2-3:0:0). Prerequisite: 21 credits of physics courses. Student works under the guidance of a faculty member on a research project in experimental or theoretical physics. May be taken twice with permission of the Physics Department. A student may receive no more than six credits of PHYS 405, 406, 408, and 409.

409 Physics Internship (3:0:0). Prerequisites: 75 credits, 21 credits of physics courses, and permission of department. See department for other requirements and application procedures prior to enrollment. On-the-job experience for physics majors in industry or government laboratories including summer programs. A student may receive no more than six credits of PHYS 405, 406, 408, and 409.

416 Special Topics in Modern Physics (1:2:0). Prerequisite: 21 credits of physics courses. Topics of current interest in modern physics with emphasis on the breadth of physical understanding needed to approach many of today's problems.

417/GEOL 417 Geophysics (3:3:0). Prerequisites: GEOL 101, 102, 201, 301; MATH 113, 114; and PHYS 160. Corequisites: MATH 213 and PHYS 260, 261. Seismologi-
452 Physics (PHYS)

428/ASTR 428 Relativity and Cosmology (3:3:0). Prerequisites: PHYS 262, MATH 214 or 216, and PHYS 303, 305 or permission of instructor. Special relativity, four-dimensional space-time, general relativity, non-Euclidian geometries, geodesic and field equations, tests of general theory of relativity, black holes, cosmology, models of the universe, remnant blackbody radiation, big bang cosmology, thermodynamics, and the universe.

502/PHYS 402 Introduction to Quantum Mechanics and Atomic Physics (3:3:0). Prerequisite: PHYS 308 or permission of instructor. Experimental basis of quantum mechanics, the wave function, and systems in one, two, and three dimensions.

510 Computational Physics I (3:3:0). Prerequisites: PHYS 303, 305 and FORTRAN or C++ programming. Study and development leading to computer simulations of various physical systems. Requires the study and development of computational techniques and numerical algorithms to obtain both numerical results and visualization of these results. Application to individual physical processes taking place in a variety of physical systems. In computational physics research, individual physical processes are only components of a larger simulation.

512/CSI 687 Solid State Physics and Applications (3:3:0). Prerequisite: PHYS 402 or 502. Crystal structures, binding, lattice vibrations, the free electron model, metals, semiconductors and semiconductor devices, superconductivity, and magnetism.

513 Applied Electromagnetic Theory (3:3:0). Prerequisites: PHYS 305, 306 and MATH 313, 314 or equivalent. Classical electromagnetic theory with applications. Topics include electrostatics, magnetic fields and materials, electromagnetic wave propagation, waveguides, transmission lines, radiation, and antennas.

533/Chem 620 Modern Instrumentation (3:3:0). Prerequisites: PHYS 513 and an electronics course. Topics include sensors for radiation, particles, electric and magnetic fields, pressure, and motion; electronic instruments, computer data collection, instrumentation noise and noise reduction methods, and specialized instrumentation systems for various areas of applied physics.

540 Nuclear and Particle Physics (3:3:0). Prerequisite: PHYS 402 or 502. Accelerators, detectors and related electronics; nuclear and elementary particle structure; symmetries and conservation laws; the electromagnetic, weak, and hadronic interactions; nuclear models; the quark model; and nuclear science and technology.

575/CSI 655 Atmospheric Physics I (3:3:0). Prerequisites: PHYS 305, 262, and 260 or equivalent. Introduction to basic physical and chemical processes that operate in the Earth's atmosphere. Emphasis on those concepts that provide a global description of the current atmospheric state and those processes that relate to global change and atmospheric evolution. Topics include equilibrium structure, radiative transfer models, thermodynamics of various atmospheric layers, and the various processes defining these layers.

590 Selected Topics in Physics (1-6:0-6:0). Prerequisite: Graduate standing or permission of instructor. Selected topics from recent theoretical developments and applications. Satisfies the needs of the professional community to keep abreast of current developments.

600 Special Topics in Physics (1-6:0:0). In-service course to strengthen and update teachers' knowledge of physics and astronomy.

611 Electro-optics (3:3:0). Prerequisites: PHYS 502 and 513. Optical modulators, display devices, types and operation of lasers, mode locking, Q-switching, photodetectors, and optical fibers.

612 Physics of Modern Imaging (3:3:0). Prerequisite: PHYS 513. Study of imaging methods using acoustic and electromagnetic waves to probe extended objects, and mathematical transformations to produce images from the scattered waves. Topics include classical imaging, physical optics, Fourier transform, holography, tomography, seismic mapping, underwater acoustic imaging and mapping, side-looking radar, antenna arrays, and applicable computer methods.

613/CSI 780 Computational Physics II (3:3:0). Prerequisites: PHYS 303, 305, and 510; PHYS 502 or equivalent recommended. Study of diverse physical systems with emphasis on modeling and simulation. Study and development of numerical algorithms and techniques to obtain both numerical results and visualization of these results. Projects undertaken will draw from such areas as many-body orbital dynamics, molecular interactions, quantum systems, radiative transfer in high-temperature plasmas, stellar interiors, hydrodynamics, and cosmology.

620 Continuum Mechanics (3:3:0). Prerequisites: PHYS 510. Study of continuum mechanics; topics include physical concepts, mathematical formulation and solution, elastic materials, ideal fluids, viscous fluids, waves in continuous media, turbulence, thermal convection, stability considerations, high-temperature gas flows, radiative processes for momentum and energy transport, shocks, and computational fluid dynamics.

676 Atmospheric Physics (3:3:0). Prerequisites: PHYS 303, 305, and 308; MATH 314. Covers the basic conservation laws of mass, momentum, and energy; and a scaling analysis of the equations of motion and thermodynamics. Balanced flows in the atmosphere (e.g., the geostrophic wind and the thermal wind relationships) are discussed. Concepts of circulation and vorticity; the role of the atmospheric boundary layer in mass, momentum, and energy transfer; synoptic scale motions; and the role of gravity and Rossby waves in controlling the general circulation of the atmosphere are covered.

701 Theoretical Physics (3:3:0). Prerequisites: PHYS 502, 510, 513, or permission of instructor. Study of the physical basis for selection of particular mathematical tools in physics; topics include curvilinear coordinates, tensors, matrices, differential equations, special functions, complex variables, and group theory.

705 Classical Mechanics (3:3:0). Prerequisites: PHYS 502, 510, 513, or permission of instructor. Study of classical mechanics; topics include Lagrangian mechanics, Hamiltonian mechanics, canonical transformations, Hamilton-
Jacobi theory, nonintegral systems, rigid body dynamics, and normal modes of vibration.

711/CHEM 730/CSI 782 Statistical Mechanics (3:3:0). Prerequisites: PHYS 502 and 510, or permission of instructor. Statistical methods, systems of particles, thermodynamics, macroscopic parameters, the ideal gas, kinetic theory, quantum statistics, and transport processes.

722/CSI 785 Electromagnetic Theory (3:3:0). Prerequisites: PHYS 513 and 510, or permission of instructor. Advanced study of electric and magnetic fields; topics include electrostatic fields, magnetostatic fields, boundary-value problems in field theory, multipoles, simple radiating systems, relativistic electrodynamics, and radiation by moving charges.

728/CSI 788 Simulation of Large-Scale Physical Systems (3:3:0). Prerequisites: PHYS 613 or equivalent, and FORTRAN or other high-level language programming. Study of diverse large-scale physical systems with emphasis on the modeling and simulation of these multifaceted systems. Study and development of numerical algorithms and techniques to obtain both numerical results and visualization of these results. Projects will be drawn from such areas as many-body dynamics, molecular dynamics and interactions, atmospheric structure and dynamics, high-temperature plasmas, stellar structure, hydrodynamics systems, galactic structure and interactions, and cosmology.

732/CSI 784 Quantum Mechanics (3:3:0). Prerequisite: PHYS 502 or permission of instructor. Study of the fundamental concepts of quantum mechanics, time evolution, Schroedinger and Heisenberg formalism, harmonic oscillators, propagators, Feynman path integrals, rotations and angular momentum, angular momentum eigenvalues and eigenstates, Bell's inequality, symmetries, conservation laws, degeneracy, perturbation theory, WKB methods, and scattering theory.

736/CHEM 736/CSI 783 Computational Quantum Mechanics (3:3:0). Prerequisite: PHYS 502, 510, or permission of instructor. Study of the fundamental concepts of quantum mechanics from a computational point of view, review of systems with spherically symmetric potentials, many-electron-atom solutions to Schroedinger's equation, electron spin in many-electron systems, atomic structure calculations, algebra of many-electron calculations, Hartree-Fock self-consistent field method, molecular structure calculations, scattering theory computations, and solid-state computations.

780/CSI 789 Topics in Computational Physics (3:3:0). Prerequisite: Permission of instructor. Selected topics in computational physics not covered in fixed-content computational physics courses. May be repeated for credit as needed.

796 Directed Reading and Research (1-6:0:0). Prerequisites: Admission to master's program and permission of instructor. Reading and research on a specific topic in physics or related field under the direction of a faculty member. May be repeated as needed.

798 Research Project (3:0:0). Prerequisites: Nine graduate credits and permission of instructor. Project chosen and completed under the guidance of a graduate faculty member, which results in an acceptable technical report.

799 Master's Thesis (1-6:0:0). Prerequisites: Nine graduate credits and permission of instructor. Project chosen and completed under the guidance of a graduate faculty member, which results in an acceptable technical report and oral defense. Graded S/NC.

Psychology (PSYC) 453

700 Basic Concepts in Psychology (3:3:0). Prerequisite to all other courses in psychology. Introduction to psychology as a scientific discipline. Includes an examination of concepts and methods in learning, motivation, development, personality, and measurement.

110 Seminar in General Psychology (1:1:0). Corequisite: PSYC 100. Seminar exploring applications, implications, methods, and findings of psychology. Students must be enrolled concurrently in PSYC 100. In-class work includes discussion that enriches the PSYC 100 lecture material, exploration of controversial issues in psychology, use of technology to broaden knowledge of psychology, and in-depth discussions of topics on which the instructor has special expertise. Short papers are required.

211 Developmental Psychology (3:3:0). Prerequisite: PSYC 100 or permission of instructor. Review of major developmental theories including perspectives of childhood, adolescence, adulthood, and old age.

230 Industrial and Organizational Psychology (3:3:0). Prerequisite: PSYC 100 or permission of instructor. Examination of application of psychological principles and methods to problems commonly encountered in business and industry.

231 Social Psychology (3:3:0). Prerequisite: PSYC 100 or permission of instructor. Study of human behavior development in a social matrix, including such topics as socialization, cultural behavior, group norms, and attitude formation.

260 Basic Research Methods in Psychology (1-3:0:0). Prerequisite: Six credits of psychology or permission of instructor and department. Introduction to research methods in psychology in the context of assisting faculty with research, individualized sections by arrangement with faculty. Methods taught vary but generally include basic data collection and recordkeeping methods in research. Course culminates in a paper describing techniques learned. No more than six credits in PSYC 260, 350, and 460 can be used toward a psychology major.

300 Statistics in Psychology (4:3:2). Prerequisites: Six credits of psychology including PSYC 301 as a prerequisite or corequisite, and three credits of mathematics course work, or permission of instructor. Descriptive and inferential statistics in design, analysis, and interpretation of psychological research with practical application using computers in laboratory.

301 Research Methods in Psychology (3:2:2). Prerequisites: Six hours of psychology or permission of instructor. Students are strongly encouraged to take PSYC 300 concurrently. General research design in psychology, with an emphasis on experimental design and control. Topics include use of human participants in research, reliability and validity, observational methods, and survey and longitudi-
nal designs. Laboratory work will include designing and running research studies and writing manuscripts using appropriate style and format. PSYC 301 is a writing-intensive course.

304 Principles of Learning (4:3:2). Prerequisite: PSYC 300 (grade of C or better) or permission of instructor. Principles of animal learning, including such topics as classical and operant conditioning, discrimination learning, and animal cognition. Laboratory projects require working with animal subjects. PSYC 304 is a writing-intensive course.

309 Sensation, Perception, and Information Processing (4:3:2). Prerequisite: PSYC 300 (grade of C or better) or permission of instructor. Principles of perception, including topics such as psychophysics, perceptual organization, perceptual learning, and perceptual constancies. Laboratory projects demonstrate and investigate perceptual phenomena. PSYC 309 is a writing-intensive course.

313 Child Psychology (3:3:0). Prerequisite: Six credits of psychology including PSYC 100 or permission of instructor. Study of human psychological development from conception to adolescence including such topics as genetic factors, emotional and intellectual growth, and environmental influences.

314 Adolescent Psychology (3:3:0). Prerequisite: Six credits of psychology including PSYC 100 or permission of instructor. Study of the biological and cultural changes accompanying adolescence, including the effect of these changes on emotional, intellectual, and social development.

317 Cognitive Psychology (3:3:0). Prerequisite: Six hours of psychology or permission of instructor. An in-depth overview of important topics in cognitive psychology, including memory, attention, pattern recognition, problem solving, reasoning, and psycholinguistics.

320 Psychological Tests and Measurements (4:3:2). Prerequisite: PSYC 300 (grade of C or better) or permission of instructor. Examination and application of principles underlying the theory, interpretation, and administration of psychological tests, including a study of tests of intelligence, achievement, and ability.

321 Counseling Psychology (3:3:0). Prerequisite: PSYC 325 or permission of instructor. Review of the theories and methods in psychological counseling.

322 Behavior Modification (3:3:0). Prerequisite: PSYC 324 or permission of instructor. Examination of experimental principles of human and animal learning within the theoretical framework of applied behavior analysis, including the design, implementation, and evaluation of operant intervention programs across a wide variety of human situations.

323 Clinical and Social Psychology Research Techniques (4:3:2). Prerequisite: PSYC 300 (grade of C or better) or permission of instructor. Review and application of research techniques including interviewing, survey analysis, and process analysis. PSYC 323 is a writing-intensive course.

324 Personality Theory (3:3:0). Prerequisite: PSYC 100 or permission of instructor. Introduction to classical and contemporary theories of personality and a comparative evaluation of major theories in terms of relevant research studies.

325 Abnormal Psychology (3:3:0). Prerequisites: PSYC 100 and one of PSYC 211, 231, or 324 or permission of instructor. Study of development of abnormal behavior patterns, including such topics as methods of diagnosis and prevention of serious mental disorders such as psychosomatic disorders, psychoses, character disorders, and mental retardation.

326 Therapeutic Communication Skills (3:3:0). Prerequisite: PSYC 325 or permission of instructor. Introduction to understanding and use of basic therapeutic communication skills used in clinical and counseling psychology.

327 Psychology in the Community (3:3:0). Prerequisite: Psychology major with a minimum of six psychology credits and permission of the associate chair for undergraduate studies. Individual placements in applied psychology settings. A maximum of six credits of PSYC 327, 328, 421, 422, 548, and 549 can be applied to the psychology major.

328 Psychology in the Community Laboratory (1:0:0). Prerequisite: Psychology major with a minimum of six psychology credits and permission of course instructor and associate chair for undergraduate studies. Corequisite: Enrollment in psychology course for which this is service learning component. Course comprises one-hour service learning component linked to selected psychology courses. A maximum of six credits of PSYC 327, 328, 421, 422, 548, and 549 can be applied to the psychology major.

330 Psychology of Adjustment (3:3:0). Prerequisite: PSYC 100 or permission of instructor. PSYC 330 cannot be taken for credit by psychology majors. Nature of effective and faulty patterns of adjustment. Factors in healthy and unhealthy personality development, unique motivation patterns of individuals, and influence of personally significant groups on adjustment. Resources for personal growth and application of contemporary psychological principles to achievement of increased intellectual, emotional, and social competence.

350 Directed Reading and Research in Psychology (1-3:0:0). Prerequisites: PSYC 100, 300, and permission of instructor and department. Library research in psychology, culminating in a substantial formal paper; individualized sections by arrangement with faculty. No more than six credits in PSYC 260, 350, and 460 can be used toward psychology major.

362 Psychology of Women (3:3:0). Prerequisites: PSYC 100 and BIOL 103, 104, or permission of instructor. Behavior and attitudes of women; influence of sex chromosomes and sex hormones on behavior, influence of culture on sex role differentiation, and theories of sex role development.

372 Physiological Psychology (3:3:0). Prerequisites: PSYC 100 (grade of C or better) and BIOL 103-104, or permission of instructor. Survey of neuroscience, including basic neuroanatomy, neural and synaptic transmission, neural mechanisms underlying normal and abnormal behavior, and biological mechanisms of drug action.

373 Physiological Psychology Laboratory (1:0:2). Prerequisite or corequisite: PSYC 372 or permission of instructor. Functional anatomy and physiology of the brain, including dissection of brain and eye, and a demonstration and practice in research methods for studying physiological mechanisms underlying behavior.

414 Behavior Disorders of Childhood (3:3:0). Prerequisites: PSYC 313 and 325, or permission of instructor. Re-
view of the theories, methods, and research dealing with emotional and behavioral disorders of children.

415 Psychological Factors in Aging (3:3:0). Prerequisite: PSYC 100 or permission of instructor. Examination of the sensory, perceptual, intellectual, and personality changes that occur in older people. Common adjustment problems as well as more serious adjustment difficulties are discussed. Applications of various personality theories of aging.

421, 422 Undergraduate Practicum in Psychology (3:3:0), (3:3:0). Prerequisites: PSYC 325 and 326 and permission of Clinical Review Committee. No more than six credits in PSYC 327, 328, 421, 422, 548, and 549 can be used toward the psychology major. Supervised experience in application of psychological principles requiring work in a nonclassroom situation.

423 Group Psychotherapy Techniques (3:3:0). Prerequisite: PSYC 324 or permission of instructor. Review of theory and methods of group therapy with emphasis on humanistic and interpersonal approaches, including applications to family therapy, alcoholism, and drug abuse.

435 Personnel Training and Development: A Psycholog- ical Perspective (3:3:0). Prerequisite: PSYC 230; or prerequisite or corequisite: PSYC 330 or permission of instructor. Overview and critique of training methods currently used in industry from the viewpoint of psychological theory, including simulations, on-the-job training, supervisory leadership skills training, computer-assisted learning, and programmed texts. Principles of needs analysis, program development, and program evaluation are discussed within the framework of industrial psychology.

460 Independent Study in Psychology (1-3:0:0). Prerequisites: 15 credits of psychology including PSYC 301 (grade of C or better), a 2.500 GPA in psychology, and a written proposal approved before registration by instructor and the department. No more than six credits in PSYC 260, 350, and 460 can be used toward the psychology major. Advanced research methods in psychology in the context of individual student projects or assisting with research on faculty projects; individual sections by arrangement with faculty.

461 Special Topics (3:3:0). Prerequisite: See course description in Schedule of Classes. Selected topics reflecting interest in special areas. Announced in advance.

465 History and Systems in Psychology (3:3:0). Prerequisite: 18 credits in psychology including PSYC 301 (grade of C or better) or permission of instructor. Historical background and major theoretical systems in modern psychology. Approaches include behaviorism, cognitive/information processing approaches, and psychodynamic theories.

467 The Psychology of Working in Groups and Teams (3:3:0). Prerequisite: 60 credits including PSYC 100 or permission of instructor. Teaches students both the knowledge and the skills necessary to meet the communication, interpersonal and task-related challenges that arise when functioning in work teams. Through readings, classroom activities, and applied problem-solving exercises, students will acquire or refine the team-related competencies. Thus students will study the theory of group and team processes while gaining insight from feedback on their behavior in exercises in order to become a more effective member of a team.

472 Advanced Physiological Psychology (3:3:0). Prerequisite: PSYC 372 or permission of instructor. Rotating topics. Physiological mechanisms underlying behavior. Selected topics include neuronal bases of learning and memory and biological bases of reinforcement and addiction. May be repeated once with approval of instructor.

490 Psychology Honors I. (3:3:0). Prerequisite: Admission to Psychology Department Honors Program. Review of current topics and issues in psychology, including historical overview, theory and supporting data, and their influences on behavior. Topics will vary.

491 Psychology Honors II. (3:3:0). Prerequisite: PSYC 300, 301, and 490. Introduction to advanced statistics, research methodologies, statistics packages, computing and information technology, and library technology appropriate for psychological research and pedagogy. Students are required to complete a proposal in preparation for admission to Psychology Honors III.

492 Psychology Honors III (3:3:0). Prerequisite: PSYC 491 and approval of proposal for final honors project or thesis. Completion of final honors project or thesis. Student must complete the project or thesis, present an oral defense before the committee, and a poster to the class. All students are expected to prepare a proposal to present their project or thesis at a regional or national conference or to prepare a manuscript for publication in an appropriate journal.

499 Senior Thesis (3:0:0). Prerequisite: Psychology major with 90 credits, an experimental psychology lab course, 3.000 GPA in psychology, PSYC 460, permission of instructor, and prior approval of thesis proposal. Directed research on a topic agreed on by student and advisor. Student should take PSYC 460 with the same advisor to develop a thesis proposal before registering for PSYC 499. Student must complete a thesis and defend it orally before the advisor and two faculty members. With permission of department, students may take a second semester for a maximum of six credits.

506 Theories of Personality (3:3:0). Prerequisite: PSYC 324 or permission of instructor. Comparative review of prevalent theories of personality with special emphasis on their fundamental models and their similarities and differences.

527 Introduction to Neurobiology (2:2:0). Prerequisite: Completion of 60 credits, including PSYC 372 or BIOL 213 and BIOL 303. Introduction to neurobiology with overview of the embryological development of the nervous system in an evolutionary context. Regional and systems neuroanatomy is introduced by study of the mammalian visual system with a comparative perspective.

530 Cognitive Engineering: Cognitive Science Applied to Human Factors (3:3:0). Prerequisite: An experimental lab course or permission of instructor. Application of cognitive theory to understand and predict the interactions among human cognition, artifact (i.e., tools and systems), and task. Recent research and case studies that emphasize empirical research, analytical modeling techniques, systems design, and the development of tools and methods are discussed.

531 Mammalian Neurobiology (3:2:3). Prerequisite: PSYC 527. Functional anatomy of the brains of mammals, with emphasis on regional and systems neuroanatomy of

541 Survey Research (3:3:0). Prerequisite: PSYC 300 or SOCI 221, or permission of instructor. Introduction to theory, method, and practice of survey research; students complete a survey research project.

548, 549 Practicum in Gerontology (3:0:0), (3:0:0). Prerequisite: Completion of three of the required courses in the gerontology certificate program or permission of instructor. No more than six credits in PSYC 327, 328, 421, 422, 548, and 549 can be used toward the psychology major. Practical experience in a gerontological setting under supervision of a qualified professional for 150 contact hours per three credits.

555 Evolution of Brain and Behavior (3:3:0). Prerequisites: Completion of 60 hours, including either PSYC 372, or BIOL 213 and 303. Survey of comparative neuroanatomy of vertebrate brains in the context of evolutionary biology and in correlation with the evolution of behaviors and adaptations.

557 Psychometric Methods (3:3:0). Prerequisites: PSYC 611 and 612, or permission of instructor. Examination of the concepts of psychological measurement with emphasis on predictor test and criterion development. Discussion of reliability, validity, and specialized techniques used to develop tests of ability, interest, and personality.

558 Neuronal Bases of Learning and Memory (3:3:0). Prerequisite: PSYC 372 or permission of instructor. Examination of neuronal mechanisms involved in learning and memory, in animals ranging from invertebrates to humans.

559 Behavioral Chemistry (3:3:0). Prerequisite: PSYC 372 or permission of instructor. Neurochemistry and neuroendocrinology, including neurotransmitter synthesis, genetic aspects of neural functioning, mechanisms of action of neurotransmitters and second messenger systems, regulation of neuroendocrine systems, neuroendocrine effects on behavior, and neuroimmunology.

560 Advanced Applied Social Psychology (3:3:0). Prerequisite: PSYC 231 or permission of instructor. Study of major trends in social psychological research with emphasis on the ethical and practical problems posed by human experimentation. Topics include attitude measurement, attitude change, conformity, social perception, and small group interaction.

561 Behavioral Biology of Substance Abuse (3:3:0). Prerequisite: PSYC 372 or equivalent. Overview of the biological effects of substance abuse and the biological mechanisms underlying addiction. Topics include alcohol, cocaine, marijuana, and other drugs; genetics of addiction; and neural systems underlying addiction and withdrawal.

592 Special Topics (3:3:0). Special topics reflecting interests in specialized areas. Topic announced in advance.

597 Directed Reading and Research (1-3:0:0). Prerequisite: Permission of instructor. Directed reading or research for M.A. students in psychology. Independent reading or research on a topic agreed on by student and faculty member. May be repeated for a total of no more than six credits. A maximum of nine credits of 597, 792, 798, and 799 may be applied to a master's degree.

611 Advanced Statistics (4:3:2). Prerequisite: A screening test is given on the first evening of the class. This test must be passed to take the course. Open only to degree students. Integrates basic psychological statistics with an overview of research methodology (including experimental, quasi-experimental, field approaches, and measurement issues) from an advanced perspective. Lab work includes the use of computer packages for data handling and analyses. Students must enroll in 611 and 612 in sequential semesters.

612 Advanced Statistics (4:3:2). Prerequisite: A grade of A or B in PSYC 611. Open only to degree students. Integrates basic psychological statistics with an overview of research methodology (including experimental, quasi-experimental, field approaches, and measurement issues) from an advanced perspective. Lab work includes the use of computer packages for data handling and analyses. Students must enroll in 611 and 612 in sequential semesters.

614 The Psychology of Aging (3:3:0). Prerequisites: PSYC 100 and undergraduate or graduate course in aging. Review of the experimental literature in psychology of aging, including intellectual functioning, personality and adjustment, minor and major adjustment problems, and role changes in later life.

616 General Psychopathology (3:3:0). Prerequisite: PSYC 325. Intensive survey of the current psychiatric nomenclature (DSM-III) of major types of psychopathological disturbances.

617 Child Psychopathology (3:3:0). Prerequisites: PSYC 313 or 211, and 325. Intensive survey of major types of psychopathological disturbances of infancy and childhood.


633 Evaluative Research in Psychology (3:3:0). Prerequisite: PSYC 300 or permission of instructor. Examination of research techniques that are specifically designed to evaluate the human effectiveness of organizations and mental health programs.

635 Topics in Organizational Psychology (3:3:0). Prerequisite: PSYC 230, PSYC 632, or MGMT 610. Selected topics reflecting interest in a specialized area of organizational psychology, announced in advance. Emphasis on recent experimental research literature related to the selected topic.

636 Survey of Industrial Psychology (3:3:0). Prerequisite: PSYC 300 or permission of instructor. Intensive survey of the historical and current issues in the major areas of applied (nonclinical) psychology.

638 Training: Psychological Contributions to Theory, Design, and Evaluation (3:3:0). Prerequisite: PSYC 636 or permission of instructor. Focus on the application of learning principles derived from psychological research in the development of training models and techniques of skill acquisition. Discussion of research designs and empirical results appropriate to training evaluation.
639 Survey of Organizational Processes (3:3:0). Prerequisite: PSYC 230 or 632. Trains students at a conceptual/theoretical and an empirical level in organizational processes. Includes individual, interpersonal, intragroup, and intergroup phenomena as they exist in the context of organizational settings.

640 Techniques in Industrial/Organizational Psychology (3:3:0). Prerequisite: PSYC 300 or permission of instructor. Skills-oriented course that enables students to construct instruments and perform functions critical to both researchers and practitioners in industrial/organizational psychology. Focuses on conducting job analysis interviews, developing and scoring task inventories, using critical incident and KSAO methods, and constructing performance appraisal and selection instruments.

645 Research Methods in Human Factors and Applied Cognition (3:3:0). Prerequisites: PSYC 530 and 611. Hands-on approach to selected current and/or classical human factors/applied cognition research methods (exact methods are announced in advance). Potential methods include cognitive task analysis, usability evaluation methods, critical incident analysis, reliability analysis, workload measures, verbal protocol analysis, and engineering models of human performance. May be repeated for credit.

646 Issues and Methods in Longitudinal Developmental Research (3:3:0). Prerequisites: PSYC 611, 612 and six credits of graduate developmental psychology. Examine techniques for measuring developmental change across the lifespan.

648 Developmental Psychopathology (3:3:0). Prerequisite: Six credits of graduate developmental psychology. In-depth look at the emerging discipline of developmental psychopathology. Specific disorders and contexts are discussed to illustrate how knowledge of normal development enhances how understanding of deviant development and how knowledge about maladaptive behavior illuminates principles underlying adaptive functioning.

652 Quantitative Methods II: Analysis of Variance (3:3:0). Prerequisites: PSYC 300 and either 304, 305, or 309. Basic concepts in experimental design, fundamental assumptions in analysis of variance, and analysis of variance and covariance designs. Multiple comparison tests are also reviewed.

654 Naturalistic Methods in Psychology (3:3:0). Prerequisites: PSYC 300 and either 304, 305, or 309. Theory and techniques involved in studying people in their natural environment. Primary emphasis is on quasi-experimental designs and methods of systematic observation.

666 Cognitive and Perceptual Development (3:3:0). Prerequisites: Six credits of child psychology and a course in experimental psychology, or permission of instructor. Survey of theory and research on the development of perception, language, memory, concepts, problem solving, and academic skills in children.

667 Behavior in Small Groups and Teams (3:3:0). Prerequisite: PSYC 231. Theories, methods, and topics relevant to individual behavior in a small group setting. Effects of the individual on the group, effects of the group on the individual, and interaction effects among individuals.

668 Personality: Theoretical and Empirical Approaches (3:3:0). Prerequisite: PSYC 324 or permission of instructor. Presents a comprehensive overview of current theoretical and empirical approaches to personality. Areas of special relevance to clinical, developmental, and industrial/organizational psychology will be emphasized.

669 Social and Emotional Development (3:3:0). Prerequisite: Six credits of developmental psychology or permission of instructor. Survey of theory and research relevant to the development of social relationships, emotional expressiveness and regulation, aggressive and altruistic behaviors, sex roles, and morality. Influences on such development, including parents, other adults, peers, siblings, and the broader culture will be emphasized.

671 Role and Function of the School Psychologist (3:3:0). Prerequisite: Open only to school psychology M.A. students or by permission of instructor. Roles and functions of the school psychologist within the educational environment. Certification and ethical standards of the school psychologist and current issues and trends are considered.

673 Consultation and Behavior Modification (3:3:0). Prerequisite: Open to practicing school psychologists and students in school psychology or permission of instructor. Examines the theory and practice of behavior modification and consultation in the school environment.

678 Topics in School Psychology (1-6:0:0). Prerequisite: Open to practicing school psychologists and advanced students in school psychology or by permission of instructor. Selected topics reflecting a specialized area of school psychology. Content varies. May be repeated for a total of nine credits.

684 Psychological Counseling Techniques (3:3:0). Open to practicing school psychologists or psychology graduate students with a prior course in counseling. Application of various counseling approaches and techniques to the school-age child and adolescent. Students gain experience in counseling techniques used in schools and contemporary practice.

701 Cognitive and Affective Bases of Behavior (3:3:0). Open only to degree students. Survey of concepts in learning, cognitive, and affective processes, including theories and supporting data and their influences on behavior.

702 Biological Bases of Behavior (3:3:0). Open only to degree students. Survey of physiological bases of behavior, including such topics as neural conduction and the role of specific neurotransmitters.

703 Social Bases of Behavior (3:3:0). Open only to degree students. Survey of social influences on behavior, including group processes, person perception, and attitude formation.

704 Life-Span Development (3:3:0). Open only to degree students. Survey of theories and research regarding life-span development and personality formation.

705 Historical and Philosophical Issues in Psychology (3:3:0). Open only to degree students. Important historical and systematic approaches to psychology and their relationship to the philosophy of science, structure of theory, and philosophical issues in psychology.

709 The Measurement of Intelligence (4:3:2). Open only to school psychology M.A. students. Permission of department required. Prerequisites: PSYC 617 or 822 and PSYC 320 or equivalent; corequisite: PSYC 611. Administration, scoring, and interpretation of the major infant, child, and
710 Psychological Assessment (4:3:2). Open only to school psychology M.A. students. Prerequisites: Satisfactory completion as certified by the School Psychology Committee of PSYC 617, 709, 822, or 810 and permission of department. Study of major instruments used in clinical assessment, and their nature, problems, and predictive value; administration and scoring of the major techniques for evaluation of personality and organicity; and principles of interpretation of these procedures.

712 Child Neuropsychological Assessments (3:3:0). Open to practicing school psychologists, school psychology graduate students, Ph.D. developmental students, or by permission of instructor. Survey of basic theoretical and applied knowledge of the conceptualization and assessment procedures of the brain-behavior relationship in the school-age child and adolescent.

722 Advanced Child Assessment (4:3:2). Open only to school psychology M.A. or Ph.D. students. Prerequisites: PSYC 709 and 710 or PSYC 810 and 811, five intellectual assessments at the Psychological Clinic, and permission of department. Problems involved in the diagnostic assessment of children with various handicapping conditions such as brain dysfunction, learning disabilities, retardation, and emotional disturbances.

730 Practicum in Applied Psychology (1-6:0:0). Open only to degree students in psychology. Prerequisite: Permission of department. Apply in writing to the area coordinator 60 days prior to the beginning of the semester. Practical experience in an organizational setting as assigned. Prerequisite: PSYC 709, 710, and permission of instructor. Survey of basic theoretical and applied knowledge of the conceptualization and assessment procedures of the brain-behavior relationship in the school-age child and adolescent.

733 Issues in Personality Psychology (3:3:0). Prerequisite: PSYC 636 or permission of instructor. Examination of the psychological literature on job analysis, job evaluation and compensation, performance appraisal, training, and EEOL selection issues. Methodological and psychometric issues in the interpretation and evaluation of personnel psychology research receive particular attention.

734 Seminar in Human Factors and Applied Cognition (3:3:0). Prerequisite: Six graduate credits in human factors and applied cognition or permission of instructor. Emphasizes current research and application of human factors, ergonomics, applied cognition, and applied perception. May be repeated for credit.

735 Psychological Perspectives on Organizational Development (3:3:0). Prerequisite: Three graduate credits in industrial/organizational psychology or permission of instructor. Theories and methods in industrial/organizational psychology as they relate to organizational change and development. Actual training in organizational diagnosis and change through supervised field work.

736 Research in Human Performance Assessment (3:3:0). Prerequisite: Three graduate credits in industrial/organizational psychology or permission of instructor. Reviews taxonomic issues in the description and prediction of human performance. Concepts and methods in assessment of human abilities are discussed. Emphasis is on the cognitive, psychometric, physical, and sensory-perceptual capacities required to perform human tasks.

737 Psychology of Human-Technology Interaction (3:3:0). Prerequisite: Six graduate credits in human factors and applied cognition or permission of instructor. Emphasizes current research and development in human-computer interaction, cognitive systems engineering, cognitive ergonomics, and cognitive engineering. May be repeated for credit.

738 Simulation and Training (3:3:0). Prerequisite: PSYC 530, graduate experimental course in psychology, or PSYC 701. Human factors seminar focusing on training issues from the perspective of the human factors professional. Special attention is given to the role of hardware and simulation techniques in the design of technical training programs.

739 Seminar in Industrial/Organizational Psychology (3:3:0). Prerequisite: PSYC 230, PSYC 636, or permission of instructor. Rotating topics (e.g., leadership theories and management development, performance appraisal) to be announced in advance. May be repeated for credit.

741 Psychology of Work Motivation (3:3:0). Prerequisite: PSYC 230 or permission of instructor. Examination of the psychological literature of the need, cognitive, and reinforcement theories of motivation; organizational attachment (commitment, absenteeism, and turnover); job design and quality of work issues. Methodological and psychometric issues in the interpretation and evaluation of work motivation research are emphasized.

750 School Psychology Practicum (1-6:0:0). Open only to school psychology M.A. students. Prerequisite assessment courses: PSYC 709, 710, and 722 and testing experience in the Psychological Clinic. Apply in writing for permission of department 60 days prior to the beginning of the semester. Practical experience in school psychology.

754 Quantitative Methods III: Psychological Applications of Regression Techniques (3:3:0). Prerequisites: PSYC 611 and 612. Psychological applications of regression techniques are reviewed in a variety of contexts including experimental, field, and survey settings.

755 Statistical Packages for Psychology (3:3:0). Prerequisites: PSYC 611 and 612, PSYC 652 or 653 or equivalent. Introduction to manipulation techniques of statistical analysis appropriate for applied problems in psychology with three widely used statistical packages: BMD, SPSS, and SOUPAC.

756 Quantitative Methods IV: Multivariate Techniques in Psychology (3:3:0). Prerequisites: PSYC 611 and 612 or equivalent; PSYC 755 recommended. Survey of multivariate statistical techniques as applied to psychological research. Emphasizing analysis of complex designs and interpretation of multivariate data analyses resulting from computer processing.

766 Advanced Topics in Sensation and Perception (3:3:0). Prerequisite: PSYC 530 or 701. Emphasizes current research in sensation and perception. May be repeated for credit.
768 Advanced Topics in Cognitive Science (3:3:0). Prerequisite: PSYC 530 or 701. Emphasizes current research in cognitive science. Topics may include computational cognitive models, the nature of expertise, diagrammatic reasoning, display-based problem solving, visual attention, decision making, goal-based versus event-based cognition, and situated action. May be repeated for credit.

780 Applied Developmental Psychology (3:3:0). Prerequisites: PSYC 704, or three credits of other graduate developmental psychology courses and permission of instructor. Examines how developmental theory, knowledge base, and methodology can be used to promote the health and welfare of individuals across the lifespan. Topics include contemporary social issues and child development, research in applied settings, developmental assessment and intervention, and program evaluation.

786 Assessment and Treatment in Gerontology (3:3:0). Prerequisite: Course in the psychology of aging. PSYC 320 and PSYC 423, or equivalent courses. Functional assessment of older adults including the conceptual and methodological problems involved. Intervention strategies with older adults are examined, including interviewing, group work with older persons, milieu therapy, reality therapy, and the design of supportive environments.

790 School Psychology Internship (3-12:0:0). (Formerly PSYC 765 and EDUC 665.) Prerequisite: Completion of required courses in school psychology and permission of program coordinator. One-school-year, supervised field experience in which the advanced school psychology student functions as a full-time staff member within a school system. Student completes a paper on a practical research project involving an alternative school psychology role in the school system. Enrollment is for a total of 9 credits (thesis option) or 12 credits (nonthesis option) in increments of 3 credits according to placement. Students enrolled in PSYC 799 are not required to complete the practical research project.

792 Practicum in Developmental, Physiological, and School Psychology (1-6:1:0). Open to degree students in developmental, physiological, or school psychology M.A./Ph.D. programs. Interested students must apply to the area coordinator 60 days before registration. Prerequisites: Three credits of graduate developmental psychology, school psychology, or advanced standing in school psychology. Supervised experience in developmental, physiological, or school psychology.

798 Thesis Proposal (1-6:0:0). Prerequisite: Permission of instructor. Work on a proposal for master's thesis. May not be repeated for credit. No more than six credits of 798 and 799 may be applied to the master's degree. A minimum of nine credits of 798, 799, 597 or 792 may be applied toward the master's degree. Graded S/NC. 799 Master's Thesis (1-6:0:0). Research on approved master's thesis topic under the direction of a thesis committee with approval of the chair. Graded S/NC.

800 Studies for the Doctor of Philosophy in Education (variable credit). Prerequisite: Ph.D. admission to study in psychology. Program of studies designed by student's discipline director and approved by student's doctoral committee that brings the student to participate in the research of the discipline director and results in a paper reporting the original contributions of the student. Paper is presented in a subsequent Ph.D. summer seminar. Enrollment may be repeated.

810 Intellectual Assessment (4:3:2). Open only to clinical psychology Ph.D. students. Administration, scoring, and interpretation of individual adult and child assessment procedures. Problems of assessment and theories of intelligence are reviewed.

811 Personality Assessment (4:3:2). Open only to clinical psychology Ph.D. students. Prerequisite: PSYC 810. Administration, scoring, and interpretation of adult and child projective and objective tests of personality functioning.

816 Neuropsychological Assessment (3:3:0). Prerequisites: PSYC 702, 810 and 811, or 709 and 710. Nature of brain-behavior relationships in adults and children. Concentrates on the major assessment techniques including Luria Nebraska, Halstead-Reitan, and Michigan Neuropsychological batteries.

822, 823 Psychopathology I, II (3:3:0), (3:3:0). Open only to clinical psychology Ph.D. students. Provides an intensive integration of the psychopathology literature with mastery of the current psychiatric nosology.

830 Theories of Psychotherapy (3:3:0). Open only to clinical psychology Ph.D. students. Prerequisites: PSYC 822 and 823. Review of the major approaches to psychotherapy, including the psychoanalytic, humanistic-existential, and cognitive-behavioral approaches. Students study individual, group, and family therapy from each of these perspectives.

831 Cognitive Therapy (3:3:0). Open only to clinical psychology Ph.D. students. Survey of procedures for altering emotional distress and behavioral dysfunction within the conceptual framework of social cognitive theory and cognitive behavioral therapy.

832 Group, Marital, and Family Psychotherapy (3:3:0). Open only to clinical psychology Ph.D. students. Prerequisites: PSYC 822, 823, and 830. Introduction to the major models of group, marital, and family functioning as well as current approaches to group, marital, and family psychotherapy.

840, 841 Community Psychology: Theory and Practice (3:3:0), (3:3:0). Open only to clinical psychology Ph.D. students. Introduction to the history, concepts, and practice of community psychology. Course work and practical focus on community mental health theory, consultation, prevention, program planning and evaluation, and human service management.

842 Clinical Neuropsychology: Foundations of Brain- Behavior Relations (3:3:0). Prerequisites: PSYC 702 or permission of instructor. Provides a framework for understanding how the human brain is organized and mediates cognitive and emotional processes. Reviews links between brain anatomy and functions and changes caused by brain injury and neurological disorders.

843 Special Topics in Clinical Neuropsychology (1:1:0). Prerequisites: PSYC 702 or permission of instructor. Provides an overview of the latest theories and findings regarding the etiology, diagnosis, and management of patients with brain disorders. Topics provide an integrated approach that uses information from allied medical and surgical disciplines.

844 Clinical Neuropsychology: Basic Assessment (3:3:0). Prerequisites: PSYC 720, 810 or 709. Enrollment in the
Clinical Ph.D. program or permission of instructor. Introduces students to core neuropsychological tests and procedures, which codify cognitive or emotional deficits associated with brain damage and disorders. Focuses on the selection, administration, scoring, and interpretation of assessment tools; skills in report writing are developed.

845 Clinical Neuropsychology: Advanced Assessment (3:3:0). Prerequisite: PSYC 844. Provides more advanced and intensive training in the assessment process, and includes interviewing techniques and interpreting specialized cognitive and personality tests. Case presentations of patients with different neurological disorders as well as demonstrations of family interviews.

850 Teaching Practicum in Psychology (1:1:0). Workshop in effective teaching of selected undergraduate psychology courses. Required of and designed to guide graduate teaching assistants assigned to teach an undergraduate course (not a lab) for the first time. Topics include course planning, syllabus development, lecture resources, effective lecturing skills, use of audio visuals, leading of a classroom discussion, construction and grading of exams, student writing, instructional technology, and handling of student questions and problems. Individual critiques of teaching.

880 Clinical Foundations (3:3:0). Open only to clinical psychology Ph.D. students. Focus on basic clinical/interpersonal skills, including basic therapy skills, psychodiagnostic interviewing, mental status exam, and interview management skills. Includes exposure to a variety of clinical settings and clients.

881 Assessment and Psychotherapy Supervision (3:3:0). Open only to clinical psychology Ph.D. students. Prerequisite: Permission of clinical director. Entails the administration, scoring, and interpretation of psychological tests for adults and children in a professional setting under supervision. Must be repeated three times for 12 credits and may be repeated for up to 18 credits.

890 Seminar in Professional Psychology (3:3:0). Prerequisite: Doctoral students in psychology. Each section limited to students in one concentration of Ph.D. program. See area coordinator for requirements for section in each track. May be repeated for credit. Graded S/NC.

892 Special Topics in Psychology (3:3:0). Open only to Ph.D. students. Selected topics reflecting specialized areas in psychology. Content varies. May be repeated.

897 Directed Reading and Research (1-3:0:0). Clinical psychology Ph.D. students may not take this course for elective credit. Independent reading on a topic agreed on by a student and a faculty member. May be repeated. May not be repeated for degree credit by students who also register for PSYC 799.

998 Doctoral Dissertation Proposal (variable credit). Work on a research proposal that forms the basis for a doctoral dissertation. May be repeated. No more than 24 credits of PSYC 998 and 999 may be applied to doctoral degree requirements. Graded S/NC.

999 Doctoral Dissertation (variable credit). Research on an approved dissertation topic under the direction of dissertation committee. May be repeated. No more than 24 credits of PSYC 998 and 999 may be applied to doctoral degree requirements. Graded S/NC.

Public Administration (PUAD)

Public and International Affairs

502 Administration in Public and Nonprofit Organizations (3:3:0). Graduate introduction to the field of public administration. Focuses on structure, functions, and processes of the executive branch agencies of national, state, and local governments. Emphasis on nonprofit organizations as co-actors with government in the policy-making/policy implementation nexus.

504 Managing in the International Arena: Theory and Practice (3:3:0). Theoretical and empirical examination of the international system that both affects and is affected by the decisions, behaviors, and subsystems of state and nonstate (organizational) actors.

505 Introduction to Management of Nonprofits (1-3:3:0). Examination of nonprofit organizations and their role in contemporary society. The aspects of nonprofits that make them unique are explored to include voluntary governance, tax-exempt status, nonprofit corporation law, accounting practices, fund raising, finance, and management of volunteers. Emphasis is on the board/executive relationship and the value of establishing and maintaining a nonprofit organization's reputation.

509 Justice Organizations and Processes (3:3:0). Examination of the structures, practices, and performance of organizations involved in the administration of justice (law enforcement, courts and legal agencies, corrections, regulatory and related agencies, private organizations). Explores the applicability of various theoretical perspectives on organizational processes and considers the extent to which processes operate as a system. Focus is on comparing formal goals and system expectations to actual practice.

510 Policing in a Democratic Society (3:3:0). Fundamental issues in policing a democratic society. Topics include the police mission; impact of the police subculture; defining, recognizing, and measuring good police work; moral hazards of policing (corruption, brutality, and deception); the promotion of integrity, discretion, and control; impact of police practices on crime and disorder; securing the support of the public; and the legitimacy of police, community policing, and other reforms.

611 Problem Solving and Data Analysis I (3:3:0). Prerequisite: Undergraduate statistics course and passing grade on screening exam. Techniques and skills available to and used by public managers to solve policy-related problems or to analyze policy-related data. Focus is on problem definition, research design, and problem solving under conditions of uncertainty in the public sector.

612 Problem Solving and Data Analysis II (3:3:0). Prerequisite: PUAD 611. Techniques and skills available to and used by public managers to solve policy-related problems or analyze policy-related data. Focus is on data gathering and analysis, use of computers, systems theory and analysis, and operations research.

615 Administrative Law (3:3:0). Law as a guiding and controlling force in public-sector operations. Covers application of legal processes to administrative practices and situations, and administrative determination of private rights and obligations.
620 Organization Theory and Management Behavior (3:3:0). Consideration of behavior within the context of public organization and the consequent changes required in management. Focus on such issues as perception, attitude formation, motivation, leadership, systems theory, communication and information flow, conflict theory, and decision theory.

621 Principles and Practices in Government Organization and Management (3:3:0). **Prerequisite: PUAD 620.** Major management theories applicable to the American federal system. Emphasis is on organization, structure, and operations. The relationships of theories to management practices in contemporary American administration is explored.

622 Program Planning and Implementation (3:3:0). **Prerequisite: PUAD 620.** Practical exploration of implementing public law in the American federal system. Construction of organizational apparatus, development of operational plans, and systems of control and evaluation necessary to implement government programs are studied. Emphasis is on coordinating tasks and resources required for effective program implementation.

634 Management of International Security (3:3:0). Examination of theory and practice of managing international security. Emphasis is on interplay of organizational structure and bureaucratic dynamics in the international context. Theory and practice of crisis management and coordination and comparison of security methods and techniques are presented.

636 The NGO: Managing the International Nonprofit Organization (1-3:3:0). Unique aspects of nonprofit organizations operating in international environments, particularly in relief and development work. Relationship between the NGO and U.S. and foreign governments is examined. International philanthropy, cross-cultural understanding, and key managerial concerns such as communications, planning, human resource management, control, group process, and project evaluation are covered.

640 Public Policy Process (3:3:0). Processes of making public policy, including detection of public issues, consideration of alternatives, and adoption and implementation of solutions. Highlights the major actors in the policy process, as well as the environment within which they work.

643 Public Policy Research (3:3:0). **Prerequisite: PUAD 640.** Examination of major concepts, designs, and methods used in applied policy research. The underlying logic of policy inquiry, and the use of quantitative and qualitative techniques, is explored. Includes case applications of each of the major styles of inquiry, and the steps in planning, administering, and reporting policy research.

644 Public Policy Models (3:3:0). **Prerequisite: PUAD 640.** Approaches to modeling policy problems. Includes an analysis and comparison of the dominant paradigms in the policy sciences. Assumptions and implications of different models and their utility for analysis, implementation, and evaluation are reviewed.

651 Virginia Politics, Policy, and Administration (3:3:0). **Prerequisite: PUAD 502.** Cultural, demographic, constitutional, and socioeconomic environment of public administration in Virginia. Governmental agencies, legislative functions, executive leadership, staff agencies, state-local relationships, intrastate regionalism, and administrative customs peculiar to Virginia are covered.

654 The Community, Marketing, and Public Relations (3:3:0). **Prerequisite: PUAD 502 or 505.** Focuses on marketing concepts and communications issues of a nonprofit as they apply to the identification of its market, its ability to formulate a public image and reputation, and its capability to raise money and retain membership or volunteers.

655 Philanthropy and Fund Raising (3:3:0). **Prerequisite: PUAD 502 or 505.** Examines the history of philanthropy and its relationship to the nonprofit, government, and commercial sectors in the United States. The principles of financial development are studied including governance, development of organizational capacity, and the identification of funding sources and donor motivations. Provides an understanding of the many fund-raising techniques that generate financial support for nonprofits and the context in which these methods may be used.

657 Association Management (3:3:0). **Prerequisite: PUAD 502 or 505.** The practical application of management theory within the context of professional and trade associations. The legal structures, tax-exempt status, and general organizational structure are covered. Topics include volunteer management, budgeting and accounting practices in associations, fund raising, media relations, media and event planning, and human resource management.

659 Nonprofit Law, Governance, and Ethics (3:3:0). **Prerequisite: Graduate standing.** Overview of the nonprofit governance as well as basic contract, labor, and tax law issues within nonprofit corporation law. Relationship between the board and the executive is covered, and ethics topics typical to nonprofit organizations such as self-dealing, fiduciary responsibility, and human resource issues.

660 Public and Nonprofit Accounting and Finance (3:3:0). Study of fundamental normative debates in the public and nonprofit financial management arena with a focus on resulting implementation principles and techniques in governmental accounting, financial reporting, budget and revenue decisions, debt management, cash and investment management, pensions and employee benefits, and risk management.

661 Public Budgeting Systems (3:3:0). Survey focusing on the policy and theoretical framework of revenue and expenditure choices at all levels of government. Topics include development, theories, and structure of budgeting; political, economic, and managerial aspects of public budgeting; public policy implications; and budgetary reform movements and their successes and failures.

664 Advanced Topics in Nonprofit and Public Financial Management (1-3:3:0). **Prerequisite: PUAD 660 or permission of instructor.** Focus on advanced issues in fiscal management systems, with attention to the accounting and fiscal features of nonprofit and public systems. Students will compose and read financial statements and examine such issues as investment policies, endowment management, and enterprise income. Elements of financial management such as raising money, budgeting, and control are discussed, with attention to conflicts among charitable, competitive, and public regarding norms.

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670 Human Resources Management in the Public Sector (3:3:0). Prerequisite: PUAD 502. Overview of the range and complexity of functions, responsibilities, and expectations of human resource staff and line managers within the public sector. Focus is on human resources management within the context of political, legal, and managerial systems. Human resource functions, such as hiring, performance, and development, are also presented.

671 Public Employee Labor Relations (3:3:0). Public employee labor relations, including unionization, representational elections, bilateral policy negotiations, administration of agreements, management rights, union and membership security, the strike issue and grievance procedures, impact on public administration, and assessment of future developments.

680 Managing Information Resources (3:3:0). Prerequisite: Admission to M.P.A. program or permission of instructor. Examination of how managerial and analytical functions in public organizations can be performed via end-user computer applications. Provides in-depth coverage of selected database and decision support packages, and gives attention to logic and integration of application software.

691 Justice Program Planning and Implementation (3:3:0). Prerequisites: PUAD 502 and 509. The development and construction of organizational systems to implement government policies and programs. Emphasis on dealing with real-world challenges, constraints, and opportunities to create feasible plans, performance-monitoring systems, and secure multiple agency coordination. Applications of planning and implementation principles to actual projects in justice agencies.

700 Ethics and Public Administration (3:3:0). Prerequisites: Admission to M.P.A. program and 18 credits. Topics of ethical dimensions including constitutionalism, democratic values and traditions, standards of conduct and ethics, and conflicting values of public officials and social equity of public programs.

701 Cross-Cultural and Ethical Dimensions of International Management (3:3:0). To be taken in the final two semesters of the M.P.A. program. Examination of normative issues in management of programs in international context. Emphasis is on interplay of cultural, sociopolitical, legal, and ethical factors and on management and policy problems arising from conflicting goals, values, and inequities among nations and regions.

720 Performance Measurement (3:3:0). Methods used by managers to systematically assess performance. Includes practical tools such as focus groups, survey research, cost/benefit analysis, benchmarking, and comparison methods for revealing outcomes and impacts. Prepares managers to use information more effectively in developing programs and services and formulating policy, and covers reporting techniques to communicate performance results.

727 Seminar in Risk Assessment and Decision Making (3:3:0). Prerequisite: 12 graduate credits. Examination of decision making under risk and uncertainty. Readings introduce the major intellectual perspectives on the topic and are drawn from a variety of disciplines, including biology, economics, law, and psychology. Emphasis is on making actual decisions under uncertainty.

729 Issues in Public Management (1-3:1-3:0). Prerequisites: PUAD 502 and nine graduate credits. May be repeated with different topic. Current issues in management of public organizations in contemporary American government. Practical applications of theories and analysis to managerial problems are included. Competence in improving management in selected government settings is emphasized.

730 Professional Development Workshop (1-3:1-3:0). Exploration of external and internal factors that are reshaping public and nonprofit organizations. Investigation of processes and techniques that managers and staff can use to respond to rapid environmental change. Emphasis is placed on case studies and the application of techniques and processes.

731 International Political Economy (3:3:0). Prerequisite: 12 graduate credits. Theories and issues pertaining to the production and distribution of wealth and power in the modern world. Explores the history of political economy as a field of study and applies concepts to current issues.

732 Managing Technology Transfer (3:3:0). Prerequisite: 12 graduate credits. Examination of how governments, businesses, and international organizations manage cooperation and competition in the transfer of technology. Case studies on East-West, West-West, and North-South relations are included.

738 Issues in International Security (1-3:3:0). Prerequisites: PUAD 504 and nine graduate credits. May be repeated with different topic. Examination of issues of topical interest in the general area of international security. Possible topics include nuclear strategy, disarmament, American defense policy, and international terrorism.

739 Issues in International Management (1-3:3:0). Prerequisites: PUAD 502 and nine graduate credits. Examination of significant current issues in public international management. Emphasis is on practical applications of theories and analysis of problems in the public international management arena. Competence in improving management practices in international management settings.

741 Policy Analysis (3:3:0). Prerequisites: PUAD 502, 611, 612, and 640. Introduction of concepts and techniques for formal policy analysis, development of skills in applying policy analysis techniques through case studies, and exploration of the legitimacy and utility of policy analysis.

742 Program Evaluation (3:3:0). Prerequisites: PUAD 502 and 611. Practical exploration of assessment techniques used in studying the results of public programs and policies, including evaluation of implementation strategies and impacts. Draws on multiple approaches such as cost analysis, field research, experiments, productivity analysis, surveys and questionnaires, and qualitative studies.

749 Issues in Public Policy (1-3:3:0). Prerequisites: PUAD 502 and nine graduate credits. Examination of significant current issues in public policy in contemporary American government. Emphasis is on practical applications of theories and analysis to policy problems. Competence in improving policy analysis in selected government settings is also emphasized.

750 Federalism and Changing Patterns of Governance (3:3:0). Prerequisites: PUAD 502 and nine graduate credits. Examination of broad trends in governance, including
both the theory and practice of various governance choices. Choices include privatization, decentralization of governmental activity, grants-in-aid and growth of mandates, changing role of state and local governments, proposals for reforming federalism, and regulatory reform.

759 Issues in Local Government Administration (1-3:3:0). Prerequisites: PUAD 502 and nine graduate credits. May be repeated with different topic. Management and policy formulation in American local governments. Addresses environments, institutions, and actors involved. Contemporary problems, such as education, criminal justice, transportation, land use, economic development, and environmental impact, are examined.

769 Issues in Public Financial Management (1-3:3:0). Prerequisites: PUAD 502 and nine graduate credits. Current issues in budgeting and financial management in contemporary American government. Practical applications of administration and management issues and policy choices at all levels of government are emphasized.

781 Information Management: Technology and Policy (3:3:0). Prerequisite: PUAD 680 or permission of instructor. Examines the challenges that organizations encounter as they move to a more technologically sophisticated information and communication environment. Organizational policy issues evolving from new technologies, including privacy, security, authentication, content control, intellectual property, and taxation, are studied, focusing on the effectiveness of previous policy solutions and analyzing proposed solutions.

791 Justice Program Evaluation (3:3:0). Prerequisites: PUAD 611 and 612. Practical exploration of assessment techniques used in studying the need for and consequences of justice programs and policies. Covers needs assessments, process, and impact evaluations. Includes design and measurement issues for assessing the performance of justice programs and interpretation and presentation of results. Course emphasizes designing a program evaluation for a justice agency.

794 Internship (1-6:0:0). Prerequisite: 12 PUAD credits or permission of instructor. Open only to M.P.A. students. Contact internship coordinator one semester before enrollment. Work-study programs with specific employers. Credit is determined by the department.

796 Directed Readings and Research (1-3:0:0). Prerequisites: 18 PUAD credits and permission of instructor. Reading and research on a specific topic under the direction of a faculty member. Written report is required; oral examination over the research and report may be required. May be repeated once.

799 Issues in Justice Administration (1-3:1-3:0). Prerequisites: PUAD 502 and nine graduate credits. Exploration of current issues in justice administration. Consideration of diverse perspectives on current and emerging issues concerning the administration of justice. Emphasis on use of theory and evidence to evaluate different viewpoints on issues. Course topics vary, typically focusing in one or more areas such as the following: law enforcement, corrections, legal issues and public law, crime control, conflict resolution, victimization experience, technological innovation, public participation in the justice process, and cross-national comparison of justice systems.

821 Doctoral Seminar in Theories of Organization and Bureaucracy (3:3:0). Prerequisite: PUAD 620 or equivalent, or permission of instructor. Examination of key issues in organization theory and behavior. Issues include organization design, interorganizational coordination, intelligence and decision-making systems, leadership and motivation theories, and theories or organizations as agents of political and social change. Case studies are used.

840/PUBP 840 Research Seminar in Policy Governance (1-2:2:0) to (4:3:1) (variable credit). Prerequisite: Admission to doctoral program or permission of instructor. A survey of the major institutions that formulate and implement public policy in the United States. Examines translation of public preferences into public policy and decisions about which societal and economic functions are most appropriately carried out by governments and which are best accomplished by private institutions and individuals.

841/PUBP 841 Research Seminar in Policy Governance II (2-4:2:0:3-0:1). Prerequisite: Admission to doctoral program. This course is the second of a two-semester sequence (PUAD 840, 841) in the governance and public management policy concentration. The division of responsibilities between the several levels of government and between the public and private sectors. Focuses on the impact of these divisions on the development of public policy in several policy areas, such as urban governance, environmental policy, and health care.

998 Doctoral Proposal Research (1-6:0:0). Prerequisite: Permission of advisor. Work on a research proposal that forms the basis for a doctoral dissertation.

999 Doctoral Dissertation (1-24:0:0). Prerequisite: Permission of participant’s dissertation committee. Registration for the total credits may be spread over a multisemester contiguous period. Ph.D. candidates must register for at least three credits each semester until the dissertation is completed.

Public Affairs (PUAF)

Public and International Affairs

850 Studies for the Ph.D. in Education (variable credit). Prerequisite: Admission to the Ph.D. in Education program to study in public affairs. Program of studies is designed by student's discipline director and approved by the student's doctoral committee, which allows the student to participate in the research of the discipline director and results in a paper reporting the original contributions of the student. Enrollment may be repeated.

Public Policy (PUBP)

School of Public Policy

550 Topics in Public Policy (1-3:3:0). Focuses on selected topics in public policy not covered in fixed-content public policy courses.

601 Theory and Practice of Regional Economic Development (3:3:0). Focuses on traditional theories of economic development (economic base, growth pole, infrastructure investment, location theory, central place theory) as well as nontraditional perspectives, emphasizing application of theory to practice through case studies.
602 Regional Economic Development and Technology (3:3:0). Introduces students to the role of technology in economic development policy and practice. Examines the processes of technological development and change in enterprises and collaboration among industry, government, and academic institutions through case studies.

605 State and Local Government Policy and Economic Development (3:3:0). Examination of state and local government policies and processes designed to promote local economic development including: institutional arrangements, financing and tax incentives, non-financial strategies and approaches, land use, environmental and other relevant regulations, and relationships across government and non-governmental organizations.

650 Peace Operations I (3:3:0). The first course of a two-semester sequence on international peace operations. Focuses on the emerging theory of peace operations, including peace making activities of the United Nations and other diplomatic initiatives; peace building activities of international organizations and nongovernmental organizations; and peace support provided by international militaries.

651 Peace Operations II (3:3:0). The second course of a two-semester sequence on international peace operations. Focuses on the application of the emerging theory of peace operations, including peace making activities of the United Nations and other diplomatic initiatives; peace building activities of international organizations and nongovernmental organizations; and peace support provided by international militaries. Several guest lectures from past and present peace operations provide practical information for future staff of peace operations.

700 Theory and Practice in Public Policy (4:4:0). Theories of public policy emphasizing both the historical intellectual development of the discipline and the role that theory and ethics may be expected to play in public policy making. Assumptions made by policy professionals will be examined reflectively against a broad range of philosophical, social, political, and economic imperatives currently impacting the public policy environment.

702 Comparing Political Institutions (4:4:0). Examines political institutions and processes from a comparative and international perspective and the role of the political environment in economic policy decisions, trade and investment. The issues of generalizability, objective knowledge and understanding, the nature of evidence, and how they impact public policy are also examined.

703 Organizational Informatics in Public Policy (4:4:0). Helps policy professionals develop proficiency in technological skills necessary for effective practice by teaching the latest developments in organizational informatics and web-based student-teacher interaction. The course uses information technology to understand real-world policy problems.

704 Statistical Methods in Policy Analysis (4:4:0). A graduate-level introduction to the statistical methods and techniques used in the policy sciences. Topics include descriptive statistics, sampling and probability theory, graphical data display, estimation and significance testing, contingency tables, bivariate regression and correlation, and multiple regression, with an introduction to computer-based statistical analysis.

705 Advanced Statistical Methods in Policy Analysis (3:3:0). Prerequisite: PUBP 704 or equivalent. Classical regression methods and their application to public policy analysis. Simple and multiple regression, analysis of variance, time series, and simultaneous equation structural models. The problems associated with applications include specification error, multicollinearity, qualitative variables, heteroskedasticity, serial correlation, and structural identification. The course allows students to develop analysis skills by discussing sample empirical studies and models using advance statistical computer software.

706 Environmental Decisions: Modeling Rational Judgment (3:3:0). Prerequisite: PUBP 705. Discusses decision aids for environmental or other policy makers to make and defend decisions soundly and economically. Integrates public policy and environmental science with decision analysis; i.e., prescriptive models that quantify the knowledge and values a person or institution does (or should) bring to bear on a decision. Simple aids, based on decision theory, are applied to real consulting cases.

709 Research Design and Writing (3:3:0). Help students revise a draft scholarly paper into a form that would be acceptable in a refereed public policy journal. Focuses on how to find a researchable question, identify appropriate methods, build a bibliography, outline an argument, find supporting evidence, etc.

710 Topics in Public Policy (1-3:3:0). Focuses on selected topics in public policy not covered by fixed-content public policy courses.

711 Rational Choice and Uncertainty: Modeling Judgment (3:3:0). Introduces the basics of decision analysis. Examines quantitative modeling of judgment to aid evaluation of perplexing or controversial options involving conflicting objectives or outcomes. The course also covers assessing uncertainty about events and quantities, directly and indirectly; changing uncertainty in the light of new evidence; gathering information before making a decision; and combating alternative ways of making the same judgment. Topics apply to public policy, personal, legal, medical, and other decisions.

712 Policy Systems Analysis and Management Science (3:3:0). Introduces students to analytical models and analysis that can be applied to support decisions. The primary emphasis is on understanding the techniques of operation research/management science, cost benefits, and cost-effectiveness for public decision making. The mathematical details of the algorithms used to solve the models are not emphasized except as they contribute to understanding the reliability and validity of these methodologies. Through case studies and computer solutions, students should gain an appreciation of when, where, and how to use the models. Finally, students demonstrate their understanding of these techniques by applying them to a term research project on a government program.

713 Policy and Program Evaluation (3:3:0). Examines how the programs of public agencies are proposed, established, operated, and evaluated. Covers the role of research in the program evaluation process, including alternative methodologies for policy assessment. Considers demand estimation, the supply and pricing of publicly produced goods and services, and the role of subsidies in nonmarket environments.
714 Topics in Transportation Policy, Operations & Logistics (3:3:0). Current issues in transportation policy, operations and logistics in the U.S. and abroad. Practical applications of theories and analysis to policy problems are included. Competence in improving policy in selected domains is emphasized. Note: may be taken up to three times and simultaneously for sections addressing different subject matter.

715 Introduction to Transportation Systems (3:3:0). Transportation is a service that contributes substantially to the well being of advanced economies. The resource requirements and byproducts of transportation also pose sobering environmental challenges for society. This course examines the history and development of transportation systems, their contribution to and impact on society, the institutions and practices that govern their planning, design, construction, operation, maintenance, and retirement from service, the policy and managerial challenges that they pose, and the tools and techniques available for addressing them.

716 Transportation Operations & Logistics (3:3:0). Provides a survey of freight logistics issues, methods, problems, and strategies. Topics include: origins of logistics, industry structure, pricing, underwriting, rate making, compliance, inventory effects, just-in-time inventory management (JIT), materials requirements planning (MRP), customer service and order processing operations, sales functions and operations, dispatch/fleet manager functions and operations, rate-setting between three parties, typical document flow (electronic and paper), routing and scheduling; route selection, satellite load tracking—through dispatch—customer web inquiry, role of ITS in route selection, toll system use, congestion, training activities, logistics markets.

717 Analysis for Transportation Managers (3:3:0). Introduces basic methods of transportation analysis and evaluation and relates these to a policy framework. Methods covered include descriptive statistics, hypothesis testing, contingency tables (Chi-Square analysis), regression, optimization, demand elasticities and the gravity model. Sources of transportation data and research design are also covered. While the student will learn the mathematical base and logic of each technique, the application of these methods to relevant policy and management problems will be the primary emphasis of the course. Students will be required to complete a series of assignments along with a research proposal focused on applying one or more of the methods to a problem of their own interest.

718 Transportation Planning and Policy (3:3:0). Introduces highway, rail, air and water transport planning in the United States. Students will learn about the legislative, organizational, fiscal, legal and political environment within which planning for transportation facilities and services takes place. The course will also introduce the student to some of the technical and analytical methods for transportation planning. While the focus of the course is largely on the public sector, some consideration of commercial transport planning and the role of the private sector in helping to design, manage, and finance transport systems is also considered.

719 Transportation Law (3:3:0). Legal issues in transportation policy, operations and logistics are pervasive. Laws are a fundamental part of the general context of business and govern a vast range of issues from labor relations, environment, controls, right of way procurement and eminent domain, liability, rights and responsibilities in international contracts and services. Regulation of price and service was also a long tradition in the U.S. beginning in the 19th century, and abandoned in most respects beginning in the late 1970s. This course examines the legal environmental of transportation. Topics include: basic legal concepts and institutions, history and evolution of price and service regulation, environmental law and regulation, labor relations, and property.

720 Managerial Economics and Policy Analysis (3:3:0). Introduces microeconomics theory and its application in analyzing public policy issues. The course is intended to provide the student with the capability to understand economic literature and theories.

721 Transportation Economics (3:3:0). Provides a basis for understanding the economics of the transport system and how transportation relates to urban and regional development. The course treats transport generically, but includes case studies of specific modes.

722 Practicum in Transportation Policy, Operations, and Logistics (3:3:0). Engages students in an in-depth field study of ongoing transportation policy, operations, or logistics situations, and the design and delivery of actions to manage or resolve problems and opportunities. The range of application areas for these practica depends jointly on the particular interests of the student body and opportunities faculty identify for “clients” or real-world projects. Illustrative domain areas include surface transportation (highways and transit), airports, and aviation.

723 Metropolitan Transportation Policy (3:3:0). Recent changes in federal legislation have led to renewed importance for transportation policy and planning. Considerations of clean air, economic development, congestion management, and changing urban form have greatly increased the importance of well-planned transportation facilities and policies. This course introduces students to basic methods of transportation policy analysis and evaluation. Some specific topics include data collection, simplified demand estimation techniques, transportation choice modeling, transportation supply analysis, and ex-ante and ex-post evaluation methods.

724 Intelligent Transportation Systems & Technology (3:3:0). Provides an overview of intelligent transportation systems (ITS), which include a wide range of information technology applications to surface transportation. Categories of ITS include traffic management systems, traveler information systems, fleet control systems, commercial vehicle regulation systems, transit systems, rural systems, and vehicle control systems. Key institutional and policy issues involve the appropriate federal role in ITS, state and local government collaboration; public-private partnerships; how privacy interests can be protected as ITS surveillance and enforcement technologies become increasingly sophisticated; and how driver information systems, including cell phones, can be used to optimal advantage without burdening drivers with “information overload.”

725 International Transportation Logistics (3:3:0). The increasing internationalization and globalization of markets is producing new challenges for transportation services. The challenges are not only in terms of offering efficient and effective freight transportation options, but also in terms of the international movement of people both as part of international trade and as part of direct consumer...
services such as tourism. Technology shifts have created new supply conditions to meet the new demands of international commerce that transcend transportation to embrace communications. The changes are also embedded in new institutional structures, including liberalized regulatory regimes and the emergence of international bodies such as the WTO that are beginning to influence the trade in transportation services themselves. This course is concerned with making an efficient match between these new demands on transportation and the ways they can be met. Topics covered embody a multidisciplinary approach to international transportation logistics drawing on economics, law, information technology, and network analysis. Subjects covered include international supply-chain management, global performance indicators, international inter-modal transportation, air-freight logistics, new technologies, and border-crossing issues.

726 Telecommunications Policy (3:3:0). This course examines salient issues associated with Telecommunications and Electronic Commerce in the context of public policy questions facing decision makers—in government, education and business. Examples: privacy, electronic signatures, digital divide, bandwidth auctions, IP telephony, CRM, Bluetooth, Internet taxation, etc.

727 Transportation Evaluation (3:3:0). Transportation impinges on many aspects of life, some economic, some social and some political. The provision and operation of transportation services, therefore, involves a wide-range of trade-offs. The aim of this course is to look at the range of evaluation techniques and concepts that are applied in making decisions over such matters as transportation investments, transportation operating strategies and public policy as it affects transportation. The course will involve considering both the theory and concepts involved, together with more detailed assessments of standard evaluation methods used in the US and elsewhere. A number of case studies will be reviewed in depth.

728 Fleet Operations (3:3:0). Provides an overview of the most important factors affecting fleet operations today. Topics include: goals for government fleet operations, goals for privately owned fleets (truck, rail, air, water modes), pro-forma cost analysis, fleet operations including route and vehicle and operator selection, asset-based versus non-asset based fleets, fleet design and make-up based on multiple objectives, scheduled maintenance requirements and trade-offs, shared capacity issues (trailers, containers, consolidators), reverse logistics policies, costs, operations, environmental constraints on fleets (fuels, waste, emissions), fuel logistics (purchasing, location, cost), fleet decision-making (en-route changes, delays, and environmental challenges), competitive and market challenges and opportunities in fleet management.

729 Transportation Asset Management (3:3:0). Introduces the main elements of Transportation Asset Management, a subject that has attracted significant attention, both in the U.S. and internationally over the past decade. It is a response to a number of developments that have challenged the traditional framework for transportation service delivery, including changes in the transportation environment; a shift in the public’s attitude towards the provision of public goods; and extraordinary advances in communication and computer technologies. The adoption of transportation asset management poses significant challenges on both the organizational structure and the existing knowledge-base within transportation agencies. This course provides an overview of these challenges and introduces theoretical frameworks within which the challenges may be analyzed.

730 National Policy Systems and Theory (1-4:3:0). Provides an inquiry into the policy-making environment, organized around the U.S. federal system. The seminar examines the nation’s policy systems and its key components: the actors, institutions of governance, outside groups, and other influential interests. Special emphasis is placed on the dynamic character of policy making. In addition, different policy theories are discussed in the context of current political realities.

731 Macroeconomic Policy Assessment (3:3:0). Covers monetary theory, theories of consumption and saving, budget deficits, economic growth, international finance, and monetary and fiscal policy. Investigates national income and product accounts, savings, investment, and income as well as alternatives to Keynesian principles. Evaluates theories of inflation, investment, capital accumulation, and non-proportional growth.

736 The Global Information Economy and the Digital Divide (3:3:0). Discusses many of the institutional, social and policy issues involved in the development of a global information economy and society. Economic development needs, public institutional capacity, non-governmental networks will be examined critically, and the course will deal with the implications of universal access to the Internet and equality of use in areas such as online delivery of government services, privacy, online voting, e-government, and others. The course will also focus on efforts to ameliorate the digital divide sponsored by major multilateral agencies like the World Bank and the United Nations. Development of public policies for democratic governance in a complex networked world will be emphasized.

737 Cases and Concepts in E-Government (3:3:0). Electronic government has become a significant public policy issue worldwide. It offers the prospect of dramatic improvements in the delivery of government services, but also portends major debate about government intrusion. This course covers the emerging public policy issues associated with electronic government: job displacement in the public sector, privacy, procurement and supply chain management, voter profiling, scope of government services, challenges to “digital democracy,” Internet-based voting, land management, the “digital divide,” and others.

738 Information, Technology, and Institutional Change (3:3:0). Examines role and character of information in institutions as foundation to understanding role of IT in economy, society and politics. Considers theories of and practice of information in institutions, organizations and markets, and assesses effects of information technology changes on key economic, social and political institutions, such as firms, markets, communities, non-profit organizations and government.

741 U.S. Financial Policy Processes and Procedures (3:3:0). Examines the design and operation of expenditure and revenue systems at all three levels of government in the U.S. (federal, state and local). Mobilizing and allocating resources through the planning, adoption, and execution of the budget is stressed. In addition to the theory and policy objectives of tax and spending regimes, the course
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includes review of financial controls, performance measurement, cash and debt management, and accounting and financial reporting systems.

742 Transportation Safety and Security (3:3:0). Transportation safety has long been a paramount consideration in the design, construction, operation and regulation of transportation systems. In recent years, the security of transportation systems has become increasingly important, in light of breaches such as aircraft hijackings and truck bombs. This course examines transportation safety and security from a multimodal perspective for both passenger and freight. Topics include: historical context and policy framework, regulation, institutional issues, new security arrangements for preventing organized terrorist attacks, infrastructure design, vehicle design, operating protocols, and information systems.

743 National Security Management and Policy (3:3:0). Examines hierarchies in national security from the president to the military establishment, including the National Security Council, the Secretary of Defense, the Joint Chiefs of Staff, the CINCs (Commander-in-Chiefs of the Unified and Specified Commands), and the intelligence agencies. Covers policies involving national defense, peacekeeping operations, embargoes and other sanctions, defense conversion, and military acquisition policy. Also covers significant legislation affecting national security, such as the National Security Act of 1947 and the Goldwater-Nichols Act of 1986.

744 Federal Institutions and Management (3:3:0). Covers management and policy in the federal government. This course examines policy problems within the context of the national system of governance, including the political environment, the evolution and constitutional framework of American government, the U.S. Congress, the executive branch from the White House to the agencies, and the role of interest groups and political parties. Special attention is given to the implementation of legislation, the regulatory process, and intergovernmental relations.

745 Transportation and the Environment (3:3:0). This course, which is multi-disciplinary in orientation, examines the implications of transportation and looks at ways in which public policy has attempted to handle these implications and at ways in which policy may move in the future. It looks at all modes of transportation and at most of their environmental ramifications.

746 Maritime Transportation Policy, Operations and Logistics (3:3:0). Examines how the international maritime transportation system has evolved, and discusses its current challenges and options for future developments. Maritime shipping is an ancient enterprise that has dominated transportation since long before industrialization led to the development of steam propulsion, railroads, motor trucks, and airplanes. Topics include globalization, e-commerce, just-in-time manufacturing, quick response capabilities, integrated logistic systems, and the relevance of maritime transportation, especially in light of emerging technological advances.

747 Air Transportation Policy, Operations and Logistics (3:3:0). Aviation is a form of transportation with global reach. This course reviews the evolution of various forms of air transport (i.e., airlines, general aviation, and military aviation), and includes the following topics: the economics of airline economics, especially as they intersect with airline operations and the management of hub and spoke networks; air traffic control technologies and operations and their intersection with airline economics; safety and security technologies and regulations; the future of the various elements of air transportation; and the effects of deregulation on air travel.

748 Public Transportation Policy, Operations and Logistics (3:3:0). Public transportation plays an important role in providing mobility in both urban and rural areas. This course provides a general system description for the components comprising the typical publicly funded transit property. Topics include organizational structure, historical context, budget development including operating and capital budgets, personnel and labor relations, regulatory framework, operations management (bus and commuter rail), the reporting structure (e.g., appointed boards), customer service, and contracted operations. The course also discusses current topics of interest, such as security of transit systems and transit's role in the pursuit of air quality.

749 Highway Transportation Policy, Operations and Logistics (3:3:0). Highways have played a central role in the development of the American transportation system. In particular, the Interstate highway system has revolutionized both freight and passenger transport. This course examines the history and development of the highway system, the institutions responsible for its development and ongoing operation, its environmental impacts, and efforts to mitigate them, the emerging emphasis on operations and management of the highway system, and its role in the freight logistics and supply chain management system.

750 History of Military Operations Other than War (3:3:0). Focuses on the history of military activity in support of noncombat missions. Uses historical examples of the early days of the United States and colonial histories of Western and Eastern powers. This course also touches on the use of military force in support of multinational peace operations.

751 International Police Operations (3:3:0). Analyzes the role of international police monitors and domestic police forces in international peacekeeping operations. Examines the origins, mandates, planning, and deployment of international civilian police forces, the problems of coordinating these international police operations with international military forces and local security forces, the international role in developing democratically oriented police forces, the relationship of police to the entire judicial system, and the need to continue assistance to all parts of the judicial system beyond the initial intervention.

753 Ethics in Public Policy (3:3:0). Provides an inquiry into the ethical and moral issues in public policy. Explores issues that are controversial and often confusing to public policy makers such as health care, secrecy in government, surrogate motherhood, and disability. Perspectives are national, as well as global, and deal with the impact of culture and politics on ethical dilemmas confronting society. The course also looks at the dilemmas by which specific ethical systems are incorporated into governing bodies. Larger issues, such as war and peace, "just" and "unjust" wars, capital punishment, medical and legal ethics, and
755 National Security Decision-Making Policy (3:3:0). Applies behavioral, economic, strategic, and other decision theories to U.S. government and other actors in historical national security crisis cases and in current policy issues. We seek to explore the tension in decisions between rational goal seeking by actors vs. organizational process, and to develop usable decision tools.

756 Geostrategic Assessment Policy (3:3:0). A geopolitcal assessment of global threats to international order and security. The first half of the course focuses on geopolitical theories, elements of military power, and global social, demographic and political trends. The second half analyzes region-by-region political, military, economic, and social trends.

760 Science and Technology Policy in the 21st Century (3:3:0). This course investigates the role of science and technology in society, focusing on the issue of alternative public policies intended to influence the rate and direction of technological change in societies, and on the use of scientific and technical knowledge in public policy making more generally. The course uses historical and international comparative approaches to assess the politics and pragmatics of science and technology policy. Included in the course is material from the fields of policy analysis, as well as from organization theory, the economics of innovation, and the sociology of science and technology. Applications focus on areas of concern to the "new economy," such as biotechnology, networked telecommunications and computing, and the globalization of technology-based production.

761 Social Capital and Public Policy (3:3:0). This course looks at the literature on social capital, including classic works like Tocqueville's Democracy in America that, in effect, made use of the concept long before sociologist James Coleman brought it into wider use in the 1980s. One of the objectives of the seminar is to address questions such as the following: Is the concept merely a passing intellectual fad, or is social capital in fact a useful concept for understanding political and economic behavior? Are there measures of social capital, and if so, what are they? Can the concept be plugged into economic models? Can social capital be introduced to improve our ability to fashion or improve specific social policies in the areas of crime, education, family, social welfare, and other topics?

762 Social Institutions and Public Policy (3:3:0). The limited government involvement in social policies changed drastically during the 1960s, with an explosion of social programs designed to ameliorate poverty, reduce crime, eliminate racial segregation, and to generally lessen the adverse consequences of these conditions. These new social policies affect many institutions, including the family, schools and colleges, the criminal justice system, and government agencies themselves. Many of these policies have been controversial, with debates over their efficacy and whether they have cured or exacerbated the social problems they were designed to alleviate. This course examines the evolution and status of selected American social policies, including civil right policies, education reform, family policy, crime prevention, and other topics that can be chosen by students. Readings and discussions on policy issues are linked to readings and discussions on social theories and value systems that underpin these social policies.

768 Education and Public Policy (3:3:0). Explores current issues and policy initiatives in education policy at federal, state, and local levels, with emphasis on education reform. Issues and topics will vary somewhat from year to year to maintain currency. Typical policy issues to be addressed include raising academic standards, high-stakes testing, alternative governance including school choice and voucher policies, teacher quality and certification, the role of school resources in academic outputs, and equity topics.

770 Topics in Regional and Urban Development Policy (1-3:3:0). A seminar exploring the concept of leadership and institutional development in regional economic development. The first part involves presentations by faculty members on conceptual, theoretical, and methodological traditions regarding leadership and institutional development. The last part focuses specifically on the issue of leadership in the context of regional economic development.

771/SYST 691/EEP 601 Introduction to Enterprise Engineering and Policy (3:3:0). Prerequisite: INFS 614 or equivalent. Provides an overview of Extended Enterprise Integration. Lectures focus on the SAP architecture and the R/3 standard software solution. Laboratory requires students to complete an end-to-end implementation project with the Great Plains Software midrange ERP solution, Dynamics C/S+. For modeling, students must demonstrate complete proficiency in the Architecture of Information Systems (ARIS) methodology, and the supporting ARIS Toolset.

772/SYST 692/EEP 602 Decision Support for Enterprise Integration (3:3:0). Prerequisite: SYST 542 and SYST 691 or equivalent. Lectures focus on the use of "Business Intelligence" to enhance competitive advantage, development of an information driven set of controls to improve profitability, and emphasis on the creation of a balanced business with aligned corporate direction and strategic intent. Solutions provided within ERP systems are examined.

773/SYST 693/EEP 603 Supply Chain Integration and Management (3:3:0). Prerequisite: SYST 691 or equivalent. Lectures focus on two issues: supply chain integration from an information technology perspective, and supply chain management from a decision support perspective. The motivation for the course is the merging of enterprise computing with operations research, primarily through customer/supply chain management systems. Topics include ERP/Web integration, advanced planning, and customer relationship management.

774/SYST 694/EEP 604 E-Commerce Architectures (3:3:0). Prerequisite: SYST 691 or equivalent. Introduces network and system architectures that support high volume business to consumer web sites and portals. Provides insight into the structure of the modern web enabled storefront. Critical business and technology issues include Storage Area Networks (SANs), server clustering, load balancing techniques at the server and network level, fault tolerance, and recovery of database and application servers.

775/SYST 695/EEP 605 Economics of Electronic Commerce (3:3:0). Prerequisite: SYST 691 or equivalent. Focuses on gaining competitive advantage through Electronic Commerce implementation; the identification and growing of new market opportunities, as well as the electronic
enabling of existing business relationships; business-to-consumer relationships, as well as the economics of strategic procurement, ERP hosting, customer relationship management, catalog hosting, portal operations, and supplier management.

776/SYST 696/EEP 606 Customer Relationship Management (3:3:0). Prerequisite: SYST 691 or equivalent. Focuses on the "front office" and its integration with the "back office." The modern world of e-Commerce extends intra-enterprise integration [as implemented in Enterprise Resource Planning (ERP) systems] to include external constituents such as customers, partners, and suppliers. Course is focused on modern system support for the Demand Chain and the value creation process that results from integrating the front office systems (e.g., CRM) with the back office systems (ERP).

777/SYST 697/EEP 607 Critical Information Technology Infrastructures (3:3:0). Prerequisite: SYST 694 or equivalent. Design and implementation of high-speed network and application services in support of modern Enterprise Resource Planning (ERP) systems. Critical technologies include high-speed data communication, switched vs. routed data flow, workflow engines, business rule and web application servers, and load balancing technologies. A large-scale web enabled ERP system architecture will be examined in detail.

780 Evolution of the Washington Metropolitan Economy (3:3:0). Explores the evolution and future of the Washington metropolitan area economy, its historical context, the role of federal spending, tourism, the technology sector, international business, regional organizations, local government policies, and forecasts. The course evaluates the development patterns in the District of Columbia, Northern Virginia, and suburban Maryland.

782 International Financial Policy (3:3:0). Addresses the theory of international finance, its application to financial policy such as exchange rate regimes, and the institutions of international finance. It covers the operations of the International Monetary Fund and the World Bank, the development of the European Monetary Union, and the debate over "international financial architecture."

783 Global Governance (3:3:0). This course is a survey of important issues in global governance given changes in the contemporary world. It explores the dynamics and complexity of formal and informal actors, institutional arrangements, organizations, and the roles they play in the process of governance in the international sphere. Considers states, governmental and nongovernmental organizations, international regimes, social movements, regional associations, and multinational corporations as actors bearing on transnational authority. Various vehicles for international coordination and conflict are examined in terms of relevance and opportunities for global governance.

785 Urban Development Economics (3:3:0). Examines the changing structure and functions of the urban economy and develops the skills and knowledge for evaluating and remedying conditions inhibiting local economic development. The course includes case studies of redevelopment strategies, programs, and outcomes for inner-city neighborhoods, central and suburban business districts, waterfronts, and surplus military bases.

794 Internship (1-6:0:0). Prerequisite: 12 PUBP credits or permission of instructor. Open only to students in a PUBP degree program that requires an internship. Contact appropriate program director one semester before enrollment. Work-study programs with specific employers. Credit is determined by the appropriate degree program.

796 Directed Readings and Research (1-3:3:0). Independent reading and research at the doctoral level on a specific topic related to public policy as agreed to by a student and a faculty member.

799 Master's Thesis (1-6:0:0). Prerequisites: Degree candidacy in a Public Policy Master's program, completion of the required credits of graduate course work, and approval of a thesis proposal by the faculty advisor, two committee members, and the program director. Individualized Section form required. Original research endeavor related to the student's program concentration. Research must result in a document meeting Public Policy and university standards. Graded S/NC.

800 Culture and Policy (2:2:0 to 4:3:1). Provides a comparative overview of institutions and culture, focusing on the ways that the United States is exceptional when compared with other mature industrial societies. It presents culture and social structure as explanatory variables in accounting for these differences. It is also intended to give an overview of the analytical methods used in comparative public policy research, and to provide background on the political environment in which international trade and investment decisions are made. This course is intended primarily for first-year doctoral students in public policy. It may also be taken, with a reduced set of requirements, by master's students in the international commerce and policy program as ITRN 502.

801 Macro Policy (2:2:0 to 4:3:1). Demonstrates how macroeconomic, technological, demographic, and social forces affect the supply and demand for governmental services. Counterpart analysis of the impact of shifts in the patterns of international trade, the demographic composition of the population, and trends in the social structure are also examined. The course is intended to build an awareness of the need to factor alternative assumptions about the macroenvironment into policy planning, to show how macro events can affect both social welfare and policy performance indicators; and to suggest how national income accounting analysis and simple macroeconomic models can help to pinpoint impending trouble spots for public policy.

802 The Logic of Policy Inquiry (1-4:3:0). Prerequisite: Enrollment in doctoral program in public policy. Defines policy research problems, questions, and hypotheses. Explores modes of policy research, analysis, and rhetoric, including interdisciplinary research strategies. The course uses information sources to emphasize written communication of policy research results. The course also discusses professional practice issues.

804 Multivariate Statistical Analysis in Public Policy (4:3:0). Prerequisite: PUBP 704 or equivalent. Explores the multivariate techniques of contingency table analysis, reliability and validity assessment, factor analysis and scaling, multivariate regression and path analysis, the analysis of variance and covariance, and other selected multivariate techniques. Emphasis is on applying these techniques to real policy data using sophisticated statistical packages.
805 Public Policy Systems and Theory (4:3:0). Prerequisite: PUBP 730 or equivalent. An inquiry on an advanced level into the national and international policy-making environment with special emphasis on the dynamic character of the political arena. The seminar examines policy systems and their key components: the major actors, institutions of governance, and the influence of outside groups, political parties, and special interests.

806 Advanced Management Science for Public Organizations (4:3:0). Prerequisite: PUBP 712 or equivalent. The primary emphasis is to understand the techniques of operations research/management science, cost benefits, and cost effectiveness for public policy decision-making. Some familiarity with elementary calculus and linear algebra will help the students understand the mathematical basis of algorithms used to solve models and to help understand the reliability and validity of these techniques. Case studies and computer solutions are used to help the student understand when and how to use OR models.

807 Advanced Qualitative Research: Theory and Methods (4:3:0). Prerequisite: SOCI 530, SOCI 634, or equivalent. A course in advanced qualitative social research to prepare students who intend to use qualitative methods in their public policy Ph.D. dissertations. Methods covered include ethnography, the theory and practice of survey research, case study, and discourse analysis.

808 Advanced Economic Analysis for Policy Research (4:3:0). Prerequisite: PUBP 720 or equivalent. Aims to build analytical skills in the use of economic analysis for policy modeling. Designed for graduate students in public policy with competence in elementary calculus and matrix algebra. Reviews basic mathematical techniques and then covers basic consumer theory, demand estimation and forecasting, production theory, technological change and productivity analysis, market structure and competition, capital budgeting, and the role of the public sector.

810 Theory and Methods in Regional Policy I (2:2:0 to 4:3:1). Introduces and critiques the theory and methods used in regional policy analysis. Students learn about central place theory, growth pole theory, and economic base theory, as well as other theoretical constructs used in regional policy analysis. Further, methodological tools such as regional econometric modeling, multiobjective programming, shift-share analysis, economic base analysis, location quotient analysis, and input-output analysis are also introduced and examined. Finally, selected current regional public issues are examined using the theoretical and methodological constructs introduced in the first part of this course.

811 Theory and Methods in Regional Policy II (2:2:0 to 4:3:1). The second of two semesters of required concentration seminar sequence in regional development policy: Only students who have participated in the first semester of this sequence (i.e., PUBP 810) are admitted. In this seminar, students develop research papers that investigate some element or aspect of regional policy, with the goal of producing publishable papers. The students develop the focus of their papers based on work carried out in the first semester, and are expected to prepare a two-page proposal, followed by a detailed proposal and finally, the completed paper. Each of these are critiqued in the seminar, which is organized to conform to this process of review and critique. The instructor works with each of the students individually, as well as in the seminar sessions.

817 Policy Research Topics: Transportation Policy (2:2:0 to 4:3:1). This research workshop examines the development of policy research and relevant methodologies linked directly to faculty and student interests. Students identify cutting-edge policy concerns and execute a research program. The four-credit version of this course requires a discussion section and a research laboratory.

820 Technology, Science, and Public Policy I (2:2:0 to 4:3:1). The first of a two-semester core seminar sequence required for Ph.D. public policy students in the science and technology policy concentration. Covers literature relevant to science and technology policy. This core sequence begins with the postulate that technology has become a major casual force in the contemporary world. This seminar looks at the key formulations of the relationship of science, technology, and public policy.

821 Technology, Science, and Public Policy II (2:2:0 to 4:3:1). The second of a two-semester core seminar sequence in the science and technology policy concentration. Students develop research papers that investigate some element or aspect of science and technology policy. The course helps students identify and develop topics with the goal of producing publishable papers.

833 Topics in Public Policy (1-4:3:0). Focuses on selected topics in public policy not covered in fixed-content public policy courses.

840 Research Seminar in Policy Governance I (2:2:0 to 4:3:1). The first of a two-semester sequence (PUBP 840, 841) in the governance and public management policy concentration. Surveys the major institutions that formulate and implement public policy in the United States. The seminar examines linkages between the translation of public preferences into public policy and decisions about the societal and economic functions that are most appropriately carried out by governments and those that are best accomplished by private institutions and individuals. The four-credit course requires a discussion seminar and research laboratory.

841 Research Seminar in Policy Governance II (2:2:0 to 4:3:1). The second of a two-semester sequence (PUBP 840, 841) in the governance and public management policy concentration. Studies the division of responsibilities among the several levels of government and between the public and private sectors. The seminar focuses on the impact of these divisions on the development of public policy in several policy areas, such as urban governance, environmental policy, and health care.

850 Seminar in Public Policy (1:1:0). A weekly colloquium series, required of public policy Ph.D. students. Features a variety of speakers from universities, government, and nongovernmental profit and non-profit topics. Topics include policy formulation and analysis, as well as theoretical and methodological foundation.

860 Social Theory and Public Policy (2:2:0 to 4:3:1). Introduces social theory and how it affects public policy. Major theoretical frameworks in the social sciences are analyzed in relation to the role they can play in the formulation of public policies in such selected areas as poverty and inequality, the family, education, crime and drugs, and race and ethnicity.

861 Research Seminar in Culture and Policy (2:2:0 to 4:3:1). Emphasizes the integration of theory and method
into empirical research projects. Among the issues covered are the linkage between theoretical constructs and empirical literature, the derivation of research questions from an existing body of literature, and the selection of methods appropriate to answer those questions. The seminar requires both the development of concrete proposals for empirical research and the criticism of such proposals.

870 Organizational and Policy Aspects of Informatics (1-4:3:0). Examines the effects of informatics on national and international policy; setting international policy on informatics; ethical and social change in governments and organizations; shaping national policy in informatics; industry growth; and research methods from various scientific disciplines.

871 Organizational Processes and Technology (1-4:3:0).
Prerequisite: PUBP 870. Introduces the modern vertically- and horizontally-integrated organization. Focuses on the modern managerial policy aspects of creating, integrating, and managing modern information technology-enabled public and private sector organizations.

880 Global and International Public Policy (4:3:0). Explores the multiple dimensions of globalization and internationalization relative to public policy processes and consequences. Its aim is to offer substantive insight into contemporary public policy dynamics from a global and comparative perspective. Accordingly, it examines a broad range of international cultural, political, technological, and economic policy issues, and their interactions and implications at all levels of analysis. Engages relevant theoretical and methodological approaches and debates in order to provide students with tools for analyzing various world problems and policies.

881 International Trade Policy (4:3:0). Addresses international trade theory, trade policy analysis, regional economic integration, and the institutional arrangements governing world trade. It covers the World Trade Organization (including its constituent agreements in the areas of goods, services, intellectual property and trade-related investment measures), regional trade agreements such as NAFTA, dispute settlement regimes, and the relations between trade and the environment.

998 Research/Proposal for Dissertation (1-9:0:0). Requires work on a research proposal that forms the basis for a doctoral dissertation. May be repeated, although no more than 24 credits of PUBP 998 and 999 may be applied to doctoral degree requirements.

999 Dissertation (1-9:0:0). Requires research on an approved dissertation topic under the director on dissertation committee. May be repeated, although no more than 24 credits of PUBP 998 and 999 may be applied to doctoral degree requirements.

Reading Education (EDRD)

Graduate School of Education

300 Literacy and Curriculum Integration for Specialist Teachers (3:3:0). Provides a research-based introduction to K–12 content area reading, writing, and language arts. Emphasizes the integration of reading and other language arts across the curriculum. Field experience in public schools is required.

301 Facilitating Literacy in School or Community Settings (3:3:0). Corequisite: Requires 45 clock hours of school-based field experience during course. Provides background knowledge, teaching strategies, and support for students who wish to work with developing readers and writers in school or community settings. Emphasizes implementation strategies that foster and enrich literacy development; incorporation of trade books and technology resources into individual and small group work; and reflection on work as a literacy facilitator. Field experience in public schools is required.

500 In-Service Educational Development (1-6:0:0). See EDUC 500.

597 Special Topics in Education (3:3:0). See EDUC 597.

614 Teaching Reading in the Secondary School (3:3:0). Emphasizes reading and writing in content areas; reading/writing causes, classroom diagnosis, and remediation of reading problems; study skills; and rates of reading.

615 Teaching Reading/Writing in Multicultural/Multilingual Settings (3:3:0). Develops instructional competencies in reading/writing approaches for students from culturally and linguistically diverse backgrounds. Examines teaching reading/writing across the curriculum, biliteracy acquisition, historical and current reading/writing approaches for second language learners, preliteracy skills for younger and older English language learners, and special issues in developmental and diagnostic reading for language minority students.

618 Organization and Administration of Reading Programs (3:3:0). Prerequisites: EDRD 559 or 614, EDRD 611, and EDRD 613, or permission of instructor. Examines the roles of reading administrators (consultants, specialists, or language arts supervisors), the organization and implementation of reading programs and services, management techniques, and the development of skills necessary to implement reading programs.

619 Literacy in Content Areas (3:3:0). Prerequisites: Methods I (EDCI 567, 569, 572, or 573) and Methods II (EDCI 667, 669, 672, or 673). Corequisite: EDCI 790 Internship. Helps students understand the language and literacy process as it applies to teaching in secondary schools. Emphasizes reading and writing in the content areas and instructional strategies to support students' literacy development. Focuses on ways reading, writing, speaking, and listening are developed and used in the learning of discipline-specific curriculum, including adaptations for culturally diverse and exceptional learners.

630 Advanced Literacy Foundations and Instruction, Birth to Middle Childhood (3:3:0). Prerequisite: Admission to the literacy emphasis or permission of the program coordinator. Provides advanced study of literacy theory, research, and practice as it relates to younger learners. Addresses sociocultural, cognitive, linguistic, psychological, and developmental influences on children's literacy. Includes reading, writing, and oral communication.

631 Advanced Literacy Foundations and Instruction, Adolescence through Adulthood (3:3:0). Prerequisites: EDRD 630 and admission to the literacy emphasis or permission of the program coordinator. Provides advanced study of literacy theory, research, and practice as it relates to adolescents and adults. Addresses sociocultural, cognitive, lin-
472 Reading Education (EDRD) • Religious Studies (RELI)

guistic, psychological, and developmental influences on literacy. Includes reading, writing, and oral communication.

632 Literacy Assessments and Interventions for Groups (3:3:0). Prerequisites: EDRD 630 and 631; admission to the literacy emphasis or permission of the program coordinator. Provides literacy assessments and interventions for groups of learners. Includes an exploration of assessment tools for both classrooms and large populations. Class members conduct related practica in their own classrooms or in specified field settings.

633 Literacy Assessments and Interventions for Individuals (3:3:0). Prerequisites: EDRD 630, 631, and 632; admission to the literacy emphasis or permission of the program coordinator. Provides literacy assessments and interventions for individuals. Includes diagnosis and remediation for learners who find reading and writing difficult. An assigned practicum experience is required.

634 School-Based Leadership in Literacy (3:3:0). Prerequisites: EDRD 630, 631, 632, and 633; admission to the literacy emphasis or permission of the program coordinator. Prepares the reading specialist as a school leader. Expands knowledge of literacy gained in prerequisite courses and applies it to professional development work with teachers at their own school site.

635 School-Based Inquiry in Literacy (3:3:0). Prerequisites: EDRD 630, 631, 632, 633, and 634; admission to the literacy emphasis or permission of program coordinator. This is the capstone course in the literacy emphasis. Focuses on research-based inquiry related to literacy in school settings. Includes a review of the literature and a teacher inquiry project.

797 Advanced Topics in Education (3:3:0). See EDUC 797.


Religious Studies (RELI)

Philosophy and Religious Studies

100 The Human Religious Experience (3:3:0). Examination of the main forms of religious expression as embodied in several important religious traditions in the contemporary world. Religious experience, myth and ritual, teachings and scripture, and the ethical, social, and artistic aspects of religion are investigated, as well as the nature and function of religion in human society.

211 Religions of the Near (Middle) East (3:3:0). Survey of the religions of the Middle East. Focuses on Judaism, Christianity, and Islam from historical, comparative, and cross-cultural perspectives but may also include modern developments of those faiths such as Mormonism and Baha'ism, as well as Zoroastrianism and the religions of ancient Near Eastern cultures.

212 Religions of the Orient (3:3:0). Survey of the religions of India, Hinduism, Jainism, Sikhism, Buddhism, and the religions of the Far East, China, and Japan, including Daoism, Confucianism, Shinto, from their origins to the present.

231 Religion in America (3:3:0). Religious heritage in American culture, growth of denominations and sects, and interrelationship of religion and sociopolitical life.

251 Biblical Studies: The Old Testament/Hebrew Bible (3:3:0). Provides a working knowledge of the composition, dates, contents, and development of the books of the Hebrew Bible/Old Testament from the perspective of the history, religion, and society of ancient Israel. Where appropriate, connections to its later use in Judaism, Christianity, and Islam are made.


300 Approaches to the Study of Religion (3:3:0). Prerequisite: Three credits in philosophy, three credits in religious studies, or permission of instructor. Methods used in study of religious phenomena. Diverse assumptions of different perspectives and how they affect the understanding of religious phenomena. Illustrative readings from a variety of perspectives are critically evaluated, including the anthropological, historical, linguistic, literary, philosophical, psychological, and sociological approaches.

313 Hindu Religion and Philosophy (3:3:0). Hindu religious and philosophical developments from origins through formative periods.

314 Chinese Philosophies and Religious Traditions (3:3:0). Prerequisite: RELI 212 or permission of instructor. Survey of the major religious traditions and philosophical themes of China including Confucianism, Taoism, and Chinese Buddhism and Neo-Confucianism. Examines the foundation of the Chinese world view and spirituality by investigating the diverse religious traditions that have created tensions and harmony among them.

315 The Buddhist Tradition (3:3:0). Prerequisite: RELI 212 or permission of instructor. Survey of the Buddhist religious traditions. Main thrust of the course includes the historical development of Buddhism in India, China, and Japan, examining both Theravada and Mahayana traditions; philosophical and religious significance of Buddhism; and social and political implications of the Buddhist traditions in the South Asian and East Asian countries.

331 Civil Religion in America: The Americanization of God (3:3:0). Prerequisite: RELI 231 or permission of instructor. Development of American political religion, or religious nationalism/Americanism; the concept of America as a New Israel; and the myths, rituals, symbols, and liturgical calendar of the nation.

337 Mysticism: East and West (3:3:0). Prerequisite: Three credits in religious studies or permission of instructor. Comparative treatment of major expressions of mysticism in East and West through exploration of various ways of understanding mystical experience. Readings and discussion emphasize one or more of the Eastern (Hinduism, Buddhism, Taoism, Zen) and Western (Judaism, Christianity, Islam) traditions.
341 Global Perspectives on Spirituality and Healing (3:3:0). Prerequisite: 30 credits or permission of instructor. A cross-cultural investigation of human understandings of the relationship between spirituality and health. Beliefs about the spiritual causes of sickness and health and spiritual techniques of healing in a variety of world cultures are placed within the context of religious beliefs of those cultures.

RELI 351 Religions of the Ancient Near East (3:3:0). Prerequisites: RELI 100, 211, 212, 251 or 252, or permission of the instructor. Examination of the religions of the ancient Near East, ancient Egypt, Mesopotamia, the Levant (Syria-Palestine), or Asia Minor. Selection of the religions depends on the instructor.

352 Judaism between the Old and New Testaments (3:3:0). Prerequisite: RELI 211, 251, 252 or permission of instructor. Examination of Jewish religion, history, and literature from the Babylonian Exile to the third century C.E. Special attention is given to the development of the Hebrew Bible, Apocalyptic and Apocryphal literature, belief in resurrection and final judgment, the Dead Sea Scrolls, Jewish sects, and the emergence of Christianity and Rabbinic Judaism.

353 From Creation to Covenant (3:3:0). Prerequisite: RELI 211, 251, or 252, or permission of instructor. Studies the first five books of the Hebrew Bible/Old Testament, Genesis through Deuteronomy, that form the core of bibli­cal religion and the Judeo-Christian tradition. Topics include creation and the flood, the patriarchal narratives, the Exodus and the Covenant at Sinai, the laws that regulated worship and daily life, and the concepts of choice and holiness in Israel. Theories of composition and editorial history also are examined, as well as the continuing influence and relevance of these books in important aspects of religion and society.

354 The Prophets of Israel (3:3:0). Prerequisite: RELI 211, 251, or 252, or permission of instructor. Rise and development of prophecy in ancient Israel, with reference to examples of divination and the ancient prophecy of the Near East. Special attention is given to prophecy as religious, social, and literary phenomena through a close study of the prophetic books in the Hebrew Bible/Old Testament, their composition, structure, and message.

355 The Wisdom of Israel (3:3:0). Prerequisite: RELI 211, 251, or 252, or permission of instructor. Examination of the Wisdom Literature of the Hebrew Bible/Old Testament (Job, Proverbs, Ecclesiastes) to discover how they understand God, humans, and their world, the problems of suffering, divine justice, and skepticism, and how they contrast with the rest of the Hebrew Bible.

356 Jesus and the Gospels (3:3:0). Prerequisites: 3 credits in philosophy and religious studies, or permission of the instructor. Examines the Gospel accounts of Jesus within the context of first-century Christianity. A variety of historical and literary methods will be applied to gain an understanding of Jesus and the history and theology of the early church.

370 Judaism: Life and Thought (3:3:0). Prerequisite: RELI 211 or 251, or permission of instructor. A study of Judaism from ancient times to the present. Covers topics such as the religious, historical, and literary origins of Juda­ism B.C.E., Rabbinic Judaism, Jews in Mediaeval Chris-
of religious studies and their pertinence to discussions of the role of religion in contemporary social, cultural, and political life.

641 Drama in the World's Religions (3:3:0). Prerequisite: Graduate standing or permission of instructor. Examination of how drama is used in the religions of the world, past and present, to enact the myths, convey the concepts, and involve the worshippers. Ritual dramas, mystery, morality, and passion plays are studied, together with plays that explore profoundly religious themes.

657 "Scripture" in Religious Traditions (3:3:0). Prerequisite: Graduate standing or permission of instructor. Exploration of the phenomena of "sacred text" or "scripture," a widespread and important cultural phenomenon in the major religious traditions of the world.

Russian (RUSS)

Modern and Classical Languages

Placement: See Academic Testing section of Admission chapter.

101 Elementary Russian I (3:3:1). Designed for students with no knowledge of Russian. Introduction to Russian, including elements of grammar, vocabulary, oral skills, listening comprehension, and reading. Lab work required.

102 Elementary Russian II (3:3:1). Prerequisite: RUSS 101 or permission of department. Continuation of RUSS 101. Lab work required.

109 Intensive Elementary Russian (6:6:2). Equivalent to RUSS 101 and 102 taught in a single semester. Recommended for students who desire an intensive introduction to Russian. May not be taken for credit in combination with RUSS 101 and 102. Lab work required.

201 Intermediate Russian I (3:3:1). Prerequisite: RUSS 102, 109, appropriate placement score, or permission of department. Further development of skills in listening, speaking, reading, and writing. RUSS 201 and 202 must be taken in sequence. Lab work required.

202 Intermediate Russian II (3:3:1). Prerequisite: RUSS 201, appropriate placement score, or permission of department. Application of language skills to reading, composition, and discussion. Lab work required.

209 Intensive Intermediate Russian (6:6:2). Prerequisite: RUSS 102, 109, appropriate placement score, or permission of department. Equivalent to RUSS 201 and 202 taught in a single semester. May not be taken for credit in combination with RUSS 201 or 202. Lab work required.

302 Russian Conversation and Composition (3:3:0). Prerequisite: RUSS 202 or permission of instructor. Development of students' ability to express themselves orally on topics of current interest and everyday situations; composition provides practice in more difficult forms of expression.

303 Russian Advanced Conversation (3:3:0). Prerequisite: RUSS 202 or equivalent. Development of oral proficiency, including current colloquial expressions.

310 Readings in Russian Literature (3:3:0). Prerequisite: RUSS 202 or permission of instructor. Readings of Russian literary works in the original language with lectures, discussions, and examination in Russian. May be taken toward fulfillment of the general requirement in literature for baccalaureate degrees.

311 Contemporary Russian Short Fiction (3:3:0). Prerequisite: RUSS 202 or equivalent. Reading and discussion of recent short stories by the best-known Russian writers of today. Readings in original language, with lectures and discussion in Russian. May be taken toward fulfillment of the general requirement in literature for baccalaureate degrees.

325 Major Russian Writers (3:3:0). Prerequisite: ENGL 101 or equivalent, or permission of instructor. Study of the works of major Russian writers in translation. Course work in English. Writers to be studied vary. May be taken toward fulfillment of the general requirement in literature for baccalaureate degrees. May be repeated once for credit when the course content is different.

326, 327 A Survey of Russian Literature (3:3:0), (3:3:0). Prerequisite: 60 credits or permission of instructor. RUSS 326 consists of a survey of Russian literature from its beginning to 1880. RUSS 327 consists of a survey of Russian literature of the late 19th and 20th centuries. Course work in English. May be taken toward fulfillment of the general requirement in literature for baccalaureate degrees.

353 Russian Civilization (3:3:0). Prerequisite: 60 credits or permission of instructor. For non-Western credit. Civilization and culture of Russia and the former Soviet Union. Includes films, slides, and music in addition to readings and lectures. Course work in English.

354 Contemporary Post-Soviet Life (3:3:0). Prerequisite: 60 credits or permission of instructor. For non-Western credit. Social life, art, economics, education, view of life, and personal aspirations of the Russian citizen today. Course work in English.

380, 381 Advanced Russian I, II (3:3:0), (3:3:0). Prerequisite: RUSS 202, 209, or equivalent. Comprehensive study of the more difficult characteristics of contemporary standard Russian in the areas of grammar, style, and vocabulary usage. Emphasis on developing fluency in oral and written expression.

401 Readings in the Social Sciences (3:3:0). Prerequisite: 15 credits of Russian or equivalent. Reading, translation, and discussion of Russian materials in fields of history, politics, geography, and sociology.

407 Russian Drama and Theater (3:3:0). Prerequisite: 60 credits or permission of instructor. Development of Russian theater including directing techniques in the Moscow Art Theater. Reading and discussion of major Russian plays of the 19th and 20th centuries. Course work in English; knowledge of Russian not required. May be taken toward fulfillment of the general requirement in literature for baccalaureate degrees.

410 Russian Poetry (3:3:0). Prerequisite: 15 credits of Russian or equivalent. Historical development of Russian poetry and representative works of the major poets. Reading is in Russian. Course work in English and Russian. May be taken toward fulfillment of the general requirement in literature for baccalaureate degrees.

470 Topics in (Post) Soviet Film (3:3:0). Prerequisite: 60 credits or permission of instructor. Russian, Soviet, and post-Soviet films selected by type, period, or director with emphasis varying from year to year. Required viewings, student discussion, and written critiques. May be re-
peated once with permission of the department or film studies advisor.

480, 481 Fourth-Year Russian (3:3:0). Prerequisite: RUSS 380, 381, or equivalent or permission of instructor. Advanced work in major grammatical and lexical topics of Russian. Application of theoretical principles in guided written and oral exercises.

490, 491 Independent Study (1-3:0:0),(1-3:0:0). Prerequisites: Russian studies major with 90 credits and permission of instructor. Research and analysis of a selected problem in language, literature, or culture in consultation with a member of the Russian studies faculty.

499 Seminar on Russian Literary and Critical Bibliography (3:3:0). Prerequisites: Russian studies major with 90 credits and permission of instructor. Comprehensive bibliographic survey of the major primary and secondary works of Russian literature and criticism.

School of Management (SOM)

School of Management

301 Business Models: A Learning by Writing Introduction (3:3:0). Prerequisites: "C" or better in ENGL 302, DESC 210, and ACCT 203. The fundamentals of business models are introduced and writing as a learning tool is emphasized. Interrelationships among accounting, finance, information systems, marketing, and operations will be the subject of several "learning by writing" deliverables.

401 International Business (3:3:0). (Requires 48 credits of course work.) Provides a multidisciplinary approach to the globalization of production and markets. Introduces globalization in the context of international institutions and cross-cultural values, theories of international trade and investment, the global financial system, and international business strategy, while simultaneously enabling students to absorb and sharpen global competencies.

498 Capstone Course: Advanced Business Models (3:3:0). Prerequisites: ACCT 301, DESC 301, FNAN 301, MGMT 301, and MKTG 301, and senior standing. This course is to be taken in the student's final semester. An advanced integrated exploration of business models and industry dynamics that uses live-case projects to assess the impact of technology on industry dynamics, competition, business models, organizational strategy, and firm performance. Students will look at strategic change in organizations from multiple perspectives integrating knowledge from their core coursework into a major presentation and paper. Students will receive coaching from area business leaders as they complete their presentations.

Social Work (SOCW)

New Century College

300 Introduction to Social Work (3:3:0). Introduces students to the historical roots of the social work profession and social welfare. The person-in-environment perspective is discussed as the framework for social work knowledge, values, and skills. This initial course in the social work curriculum is designed to introduce the student to the social work profession, professional values, ethics, fields of practice, and the settings in which social workers are employed. The profession's commitment to diverse and at-risk populations and social/economic justice is highlighted. Presentations by social work professionals in different fields of practice supplement classroom lecture, discussion, and small-group exercises. f,s,summer

301 Laboratory in Interpersonal Communication (3:3:0). Prerequisites: SOCI 101, PSYC 100, and sophomore standing; or permission of instructor. Emphasis on experiential learning of the biological, psychological, social, and cultural influences on the behavior of those who need and those who give help. Students examine their own behavioral and learning patterns, values, ethics, and attitudes to increase their ability to understand and help clients. Field placement of at least 60 hours required. f,s

323 Human Behavior in the Social Environment I (3:3:0). Prerequisites: SOCI 101, BIOL 104, and PSYC 100; or permission of instructor. Social systems approach unifying and integrating concepts and knowledge from biology, anthropology, sociology, and psychology about human behavior. Applications to professional practice, from the social work literature, and to the field experience. f

324 Human Behavior in the Social Environment II (3:3:0). Prerequisite: SOCW 323 with a minimum grade of C or permission of instructor. Examination of social systems theories as they pertain to the study of macro systems. Focus of study involves families, the social group, the formal organization, and the community. Student will apply theoretical concepts to contemporary social problems. s

351 Social Policy and Social Justice I (3:3:0). Prerequisites: SOCI 101 and GOVT 204; or permission of instructor. Introduction to social welfare policy, including its historical development, central concepts, institutional nature, and origins of social work as a profession. Analysis of service delivery systems and the role of the social work profession in bringing about social and economic change. f

352 Social Policy and Social Justice II (3:3:0). Prerequisite: SOCW 351 with a minimum grade of C or permission of instructor. Analysis of various social welfare policies and their development; examines how policies have emerged in response to social problems arising out of changing social, political, economic, and cultural influences. s

357 Methods of Social Work Intervention I (3:3:0). Open to majors only. Prerequisites: SOCI 101, SOCW 300 (or corequisite), and PSYC 100; or permission of instructor. Social work practice from a systems perspective. Particular emphasis on problem-solving activities with microsystems. The common core of knowledge, values, and skills essential to social work practice is analyzed to gain insight into social work functions and the role of the social worker as a change agent. f

358 Methods of Social Work Intervention II (3:3:0). Open to majors only. Prerequisite: 60 credits or permission of instructor. Continues a generic problem-solving model, focusing on group and macro intervention systems, settings, and skills. Emphasis on working with both treatment and task groups. Group processes, such as goal formulation, contract setting, composition, and termination necessary for effective worker intervention, are part of the knowledge base of the course. Field service of 40 hours required. s

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359 Junior Seminar (1:1:0). Corequisite: Must be taken simultaneously with SOCW 358. Provides students the opportunity to integrate theory, research, and practice in the area of group work. Time is allotted to process successes and obstacles, and to share with other students the issues, knowledge, and skills being learned in the junior-level practicum.

400 Legal and Ethical Issues in Human Services (3:3:0). Prerequisite: 60 credits or permission of instructor. Overview of ethical and legal issues related to human services professions. Topics include responsibility, competence, duty to warn, confidentiality, professional relationships, and research. Models of ethical decision making and critical thinking are emphasized.

410 Alcohol and Substance Abuse: Policies and Programs (3:3:0). Prerequisite: 60 credits or permission of instructor. Primary issues related to alcoholism and drug abuse including key concepts, theories, policies, and research regarding the use and abuse of alcohol and other drugs. Emphasis on the impact of the policies and programs on the well-being of ethnic minority and disadvantaged service populations. sum

423 Social Work with Adolescents (3:3:0). Prerequisite: 60 credits or permission of instructor. Major needs of adolescents and the implications for social work practice. Problems of family and peer group relationships, occupational choice, sexual and scholastic adjustment, and special problems of racial and cultural alienation, alcohol and drug abuse, and delinquency. Reviews various theoretical orientations and evidence from research. Analyzes both individual and group approaches to counseling and treatment.

425 Planning and Organizing for Community Change (3:3:0). Prerequisite: 60 credits or permission of instructor. Major needs of adolescents and the implications for social work practice. Problems of family and peer group relationships, occupational choice, sexual and scholastic adjustment, and special problems of racial and cultural alienation, alcohol and drug abuse, and delinquency. Reviews various theoretical orientations and evidence from research. Analyzes both individual and group approaches to counseling and treatment.

430 Social Work and the Law (3:3:0). Prerequisite: 60 credits or permission of instructor. Introduces students to the social worker's role in the legal system and familiarizes students with legal processes and their application to issues of interest to social workers and their clients, including child abuse, foster care, reproductive rights, juvenile justice, and legal rights of the poor/women/minorities.

435 Social Work with the Aged (3:3:0). Prerequisite: 60 credits or permission of instructor. Survey of the issues related to working with the aged population. A study of biological, psychological, and sociocultural aspects of aging, as well as the unique problems that are intricately involved with service delivery to aged persons. Students examine the forces that impinge on the aged person and explore critical issues related to extended life span, family changes, institutionalization, and the role of the aged persons in society. Students are challenged to increase their sensitivity and knowledge of aged citizens.

452 Senior Seminar I (2 credits). Open only to social work majors. Prerequisites: SOCW 300, 301, 323, 324, 351, 352, 357, 358, and 359 with a grade of C or better and recommendation of faculty. Concurrent with Senior Practicum I (SOCW 453), this seminar provides an integrative team experience designed to support the field experience and provide opportunities for students to demonstrate required competencies through special assignments.

453 Senior Practicum I (3 credits). Open only to social work majors. Prerequisites: SOCW 300, 301, 323, 324, 351, 352, 357, 358, and 359 with a grade of C or better and recommendation of faculty. Supervised learning experience (practicum) under the guidance of qualified faculty liaisons and professional staff designated and approved by the director of field education. Designed to facilitate practice with individuals, families, groups, and communities. Students spend two full days weekly in practicum sites. Requires concurrent seminar (SOCW 452) participation and faculty-agency visits.

454 Senior Seminar II (2 credits). Prerequisites: SOCW 452, 453, 471. Concurrent with Senior Practicum II (SOCW 456), this seminar is a continuation of the integrative team experience designed to support the field experience and provide opportunities for students to demonstrate required competencies through special assignments.

456 Senior Practicum II (3 credits). Prerequisites: SOCW 452, 453, 471. Continuation of the supervised learning experience (practicum) begun in SOCW 453. Students spend two full days weekly in practicum sites supervised by faculty liaisons and qualified professional staff designated and approved by the director of field education. Requires concurrent seminar participation (SOCW 454) and faculty-agency visits.

471 Research in Social Work (3:3:0). Prerequisites: SOC 313 or PSYC 300, six credits of social work courses; senior standing; or permission of instructor. Must be completed with a minimum grade of C. Principles and the theory underlying scientific inquiry. Emphasis on the use of research in social work practice, steps in conducting research, and research efforts in developing and evaluating social work knowledge and skills.

475 Selected Topics in Social Work Policy (3:3:0). Prerequisite: 60 credits or permission of instructor. In-depth study of special areas of social work that are of interest to students, faculty, and the social work community. Topics vary.

483 Selected Approaches to Social Work Intervention (3:3:0). Prerequisite: 60 credits or permission of instructor. Opportunity to examine critically personal use of different approaches to social work intervention currently employed in practice settings. Students have an opportunity to use the technical skills with clients that these approaches require. May be taken more than once for credit. Topics vary.

499 Independent Study in Social Work (1-3:0:0). Prerequisite: 60 credits and a research proposal approved by instructor before enrollment. Investigation of a research problem in the field of social work.

510 Interdisciplinary Seminar in Child and Family Welfare (3:3:0). Prerequisite: Upper-division undergraduate or graduate standing. Provides student with an in-depth understanding of the child and family welfare systems in the United States and other countries by examining factors that contribute to child and family dysfunction and by as-
### Social Work (SOCW) 477

- **511 Health Status of Vulnerable and At-Risk Women, Children, and Families (3:3:0).** Prerequisite: Upper-division undergraduate or graduate standing. Provides students with an in-depth understanding of the physical, social, and psychological factors that influence the health status, behaviors, and outcome of vulnerable populations in the United States and Latin American countries. Race, ethnicity, gender, and institutional arrangements are critical areas of focus in understanding the health trajectory of these groups.

- **598 Special Topics in Social Work (3:3:0).** Prerequisite: Upper-level undergraduate or graduate standing.

- **623 Human Behavior and Social Systems I (3:3:0).** Course takes an ecological approach to understanding the behavior of individuals, families, and groups within the context of their environments. Integrates and applies theories from psychology, sociology, biology, and anthropology to social work practice with smaller systems.

- **624 Human Behavior and Social Systems II (3:3:0).** Study of the behavior of larger systems including organizations, communities, and society. Applies theoretical concepts to an understanding of the physical environment, social institutions, social structure, culture, formal organizations, communities, and social movements.

- **651 Social Policies, Programs and Services I (3:3:0).** Study of the history of American social welfare policy and the role of the social work profession in responding to human need and promoting social justice. Explores contemporary social policies from across the human service system and examines their implementation by public, nonprofit, and for-profit agencies. Applies alternative policy analysis frameworks to the assessment of policy initiatives.

- **652 Social Policies, Programs, and Services II (3:3:0).** Examination of the policy-making process, including research, policy development, lobbying, and implementation. Explores the political process as a context for social change, and the impact of economic, cultural, social, demographic, political, historical, and ideological norms on policy outcomes. Emphasizes the social work role in addressing current social problems by influencing proposed policy responses.

- **657 Integrative Approaches to Social Work Intervention I (3:3:0).** Introduction to the role of social workers as change agents and the core knowledge, values and skills that guide social work practice with individuals, families, small groups, organizations, and communities. Presents and applies various theoretical frameworks, with emphasis on the initial steps in the problem-solving process.

- **658 Integrative Approaches to Social Work Intervention II (3:3:0).** Continuation of social work theory and practice with individuals, families, groups, organizations, and communities. Emphasizes intervention, evaluation, follow-up and termination, with attention to the incorporation of social work knowledge, values, and skills.

- **670 Writing for Professional Practice (3:3:0).** Study of various forms of written communication pertinent to social work practice. Examines the impact of audience, status, culture, and purpose on effective professional writing. Applies rhetorical theory to help students express themselves competently in the kinds of written formats needed for successful practice in diverse settings.

- **671 Research Methods for Social Workers (3:3:0).** Examination of the role of scientific inquiry in social work. Emphasis is on research design and implementation, including construction and use of measurement instruments, data collection, analysis, and interpretation, and application of computer technologies relevant to social work practice.

- **672 Foundation Field Practicum and Seminar I (3 credits).** Supervised social work learning experience in area human service agencies. Students complete two full days per week in a field practicum and attend a monthly seminar in which they share their learning, process their experiences, and integrate theory with practice.

- **673 Foundation Field Practicum and Seminar II (3 credits).** Continuation of the supervised social work learning experience begun in SOCW 672. Students spend two full days per week in a field practicum and attend a monthly seminar in which they share their learning, process their experiences, and integrate theory with practice.

- **675 Selected Topics in Social Work Management (3:3:0).** In-depth study of special topics relevant to social work supervision and administration in public, nonprofit, and for-profit human service agencies.

- **683 Selected Topics in Social Work and Social Change (3:3:0).** Critical examination of special topics related to understanding and improving community and/or societal conditions through policy practice, program development, and social action.

- **684 Children and Youth: Management and Social Change (3:3:0).** Explores the development and implementation of social welfare policies and services for children and youth, including child protection, foster care, adoption, juvenile justice, and education. Emphasis on improving conditions for children through the acquisition of advocacy skills including research, analysis, coalition building, testifying, lobbying, constituent organizing, political strategizing, and media relations.

- **685 Adults: Management and Social Change (3:3:0).** Examines the human service delivery system as it relates to mental health, substance abuse, disabilities, and employment. Focuses on development of supervisory and administrative skills necessary for agency management in these and other fields, including budgeting, personnel, marketing, and risk management.

- **686 Older Adults: Management and Social Change (3:3:0).** Examines issues facing older adults, including health and long-term care, from a program development perspective. Focuses on needs assessment, social planning, resource development, outreach, and program evaluation.

- **687 Family and Community: Management and Social Change (3:3:0).** Targets "community" as the locus for social change. Explores the changing dynamics of families and neighborhoods and their impact on agency services and effective social work intervention. Addresses networking, negotiation, and collaboration; interagency and interprofessional coordination; cultural competency in service delivery; and strategies for social and economic development.

- **688 Advanced Research in Social Work (4:3:1).** Emphasis on program evaluation research, including its purposes.
and uses, ethical considerations, pragmatic and political considerations; quantitative approaches; qualitative approaches; needs assessment; experimental methods; case studies; program monitoring; quality control and quality assurance; client satisfaction; and outcomes measures and indicators. Students will be involved in conducting program evaluation research, including the use of appropriate computer technology.

690 Concentration Field Practicum (6 credits). Supervised social work learning experience for four full days per week. Students are placed in area public, nonprofit, or for-profit venues reflecting their specific interests in agency supervision, organizational management, community change, electoral politics, and/or social policy.

691 Integrative Seminar (2 credits). Processing of field practicum experiences; analysis of successes and challenges; application of social work knowledge, values, and skills from across the curriculum. Culminates in professional presentations by students.

Sociology (SOCI)

Sociology and Anthropology

101 Introductory Sociology (3:3:0). Introduction to basic sociological concepts. Examines aspects of human behavior in a cultural framework including: individual and group interaction, social mobility and stratification, status and class, race and gender relations, urbanism, crime and criminology, and social change and reform.

120 Problems in the Global Society (3:3:0). Introduction to the examination and analysis of an important global issue. Consideration is given to the historical development of the problem and the theoretical analysis of its effect on different societies and cultures. The perception of the problem by different cultures and nations and the efforts of international institutions to address the issue are also investigated. Emphasis is on the interrelationship of social, political, economic, and cultural change in the global society. Course may be taken only once for credit.

300 Social Control (3:3:0). Prerequisite: SOCI 101 or permission of instructor. Examines how various social institutions function to organize and regulate society. Topics include family, education, ideology, law, media, work, governmental planning, and stratification. Course serves as a foundation of many specialized courses offered by the department, especially those that focus on control of crime and delinquency.

301 Criminology (3:3:0). Prerequisite: SOCI 101 or permission of instructor. Focuses on causes and meaning of crime, with emphasis on adults. Patterns of criminal behavior, including property crimes, violent crimes, organized crime, white-collar crime, and victimless crime. Critical assessment of criminal justice system as a response to crime.

302 Sociology of Delinquency (3:3:0). Prerequisite: SOCI 101 or permission of instructor. Theories of juvenile delinquency and societal reactions to delinquency. Gender differences in rates and types, historical overview emphasizing origins and development of juvenile justice system. Critical assessment of juvenile justice and its alternatives.

303 Sociological Research Methodology (4:3:2). Prerequisite: SOCI 313 or permission of instructor. Introduction to empirical design in sociological research. Historical development, research design, sampling, methods of gathering data, sociometric scales, analysis and interpretation of results, and research reporting.

304 Sociology of Work (3:3:0). Prerequisite: Three credits of sociology or permission of instructor. Meaning and structure of the world of work and its relationship to other spheres of life.

305 Sociology of Small Groups (3:3:0). Prerequisite: Six credits of sociology or permission of instructor. Characteristics, structure, and processes of small group dynamics; theories and models of group analysis, techniques of observation and research in small groups; research theory and application of small group knowledge to such natural groups as mutual aid self-help groups, families, juvenile delinquent gangs, and task groups in work sites.

307 Sociology of Collective Behavior (3:3:0). Prerequisite: Six credits of sociology including SOCI 101, or permission of instructor. Types of collective action, theories of social movements, and their roles in social change.

308 Sociology of Race Relations and Minorities (3:3:0). Prerequisite: Six credits of sociology including SOCI 101, or permission of instructor. History and changes in racial, ethnic, and minority relations in modern society, with particular emphasis on the African-American experience.

309 Marriage and the Family (3:3:0). Prerequisite: SOCI 101 or permission of instructor. Focuses on the family in history and family forms in contemporary societies. Looks at interaction within families and the relationship between society and families.

310 Sociology of Deviance (3:3:0). Prerequisite: Six credits of sociology or permission of instructor. Analysis of the macro- and microlevel deviance-producing processes, the meaning and control of deviance, and the major theoretical approaches to deviance.

311 Classical Sociological Theory (3:3:0). Prerequisite: Nine credits of sociology including SOCI 101, or permission of instructor. Sociological tradition is explored through readings and discussions of ideas drawn from the writings of selected sociological thinkers such as Comte, Marx, Weber, Durkheim, and others.

313 Statistics for the Behavioral Sciences (4:3:2). Prerequisite: SOCI 101 or permission of instructor. Fundamentals of applied statistics as used in behavioral science to include descriptive statistics, inferential statistics, correlation-regression, analysis of variance, factor analysis, nonparametric statistics, and practical experience with calculators in applying statistical analysis to actual problems of the behavioral sciences.

315 Sociology of Sex Roles (3:3:0). Prerequisite: Six credits or permission of instructor. Changing conceptions of sex roles, both female and male, in contemporary society. Using historical and comparative data, considers the differential socialization of males and females in relation to the changing social structure in which it takes place.

320 Advanced Problems in Global Society (3:3:0). Prerequisite: SOCI 120. Seminar in advanced examination of nation and state development within the new global order.
Explores the shifting debate among developmental sociologists in relation to actual strategies and practices of international organizations, first- and third-world governments, and grass roots movements. Students complete research projects on recent social change in such areas as global economic disparities, the gender gap, ecological destruction, food insecurity, refugees and migrants, and macrocredit and microcredit.

326 Military Sociology (3:3:0). Prerequisite: 60 credits or permission of instructor. The military from a sociological perspective. Topics include the role of the military in society, revolutions, civil-military relations, the military as a profession, and military culture.

332 Sociology of Urban Communities (3:3:0). Prerequisite: Six credits of sociology including SOCI 101, or permission of instructor. The urban community: historical development, demography, and ecology of metropolitan areas; urbanism as a way of life; the emergence of suburbia; and the future of cities.

340 Power in Society: Introduction to Political Sociology (3:3:0). Prerequisite: Six credits of any social science including SOCI 101, or permission of instructor. Analysis of how political power is related to other aspects of social life, in terms of such sociological approaches as class conflict, social consensus, elite analysis, and protest and revolution.

352 Modern Social Problems (3:3:0). Prerequisite: SOCI 101 or permission of instructor. Sociological analysis of the problems of modern society, including those related to stratification, urbanism, family and kinship, cultural change, and deviant behavior.

373 The Community (3:3:0). Prerequisite: 6 credits of sociology including SOCI 101, or permission of instructor. Examination of small to moderately sized communities ranging through the village, rural community, small town, and city subcommunity. The latter category includes city localities, ethnic villages, and suburban communities.

377 Art and Society (3:3:0). Prerequisite: SOCI 101, three credits of ARTH, or permission of instructor. Introduces the many ways in which art reflects social tendencies, comments on social problems, and contributes to discussions about a wide range of social issues. Students attend theatrical performances and visit exhibition spaces on campus, and learn to analyze what they experience through both aesthetic and sociological approaches. Contemporary issues, such as debates about artistic freedom and public morality, the commercialization of art, and the relationship between cultural and social hierarchies, also are explored.

382 Education in Contemporary Society (3:3:0). Prerequisite: Six credits of sociology including SOCI 101, or permission of instructor. Study of education as a social institution and its function as a socialization agency for social stability and social change. Emphasizes influences of social class elements on educational process and social organization of the U.S. public school system.

383 Human Services in Society (3:3:0). Prerequisite: SOCI 101 or permission of instructor. Analysis of human services emphasizing government-sponsored, nonprofit organizations, and informal voluntary services, and their interrelationships with health care and welfare systems.

Comparative analysis of services in other societies. Observation in service agencies.

385 Sociology of Religion (3:3:0). Prerequisite: Three credits of sociology or permission of instructor. Personal and institutional dimensions of religious life in relation to major sociological concepts such as role, status, norms, and social aggregates. Student selects an aspect of religion for in-depth study.

390 Sociology of Health, Illness, and Disability (3:3:0). Prerequisite: Six credits of sociology including SOCI 101, or permission of instructor. Examination of social context of health, illness, and disability, the relationships of health care professionals and patients, and the structure and delivery of health care in different medical systems.

399 Independent Study (1-3:0:0). Open to sociology majors only. Prerequisites: Six credits of sociology including SOCI 101 and approval of a written proposal. Individual study of a sociological topic of interest to the student.

401 Social Stratification: The Study of Inequality (3:3:0). Prerequisite: 12 credits of sociology including SOCI 101, or permission of instructor. Structure of social inequality from a stratification framework. Social class systems are analyzed through economic, political, and prestige structures. Includes the study of social mobility and differential life stages and opportunities.

402 Sociology of Punishment and Corrections (3:3:0). Prerequisite: Six credits of sociology including SOCI 101, or permission of instructor. Theories explaining forms of punishment systems, punishment and corrections as products of historical, cultural, and political changes, differences by race and gender in punishment and corrections. Problems of social control and violence in prisons, alternative rehabilitation, and community prevention strategies.

405 Analysis of Social Data (4:3:3). Prerequisite: 60 credits, SOCI 313, or permission of instructor. Overview of the management and analysis of empirical social science data, including file construction, scaling and measurement, data transformation, and treatment of missing data. Manipulation, management, and analysis of data sets using computers are emphasized.

410 Social Surveys and Attitude and Opinion Measurements (3:3:0). Prerequisites: SOCI 303 and 313 or equivalents, or permission of instructor. Survey of research methods and techniques used in collecting, measuring, and analyzing social data, attitudes, and opinions with special emphasis on using computer software, the Internet, and other information technologies for social research. Ethical issues for social research, computing, and information technology are highlighted.

412 Contemporary Sociological Theory (3:3:0). Prerequisite: 12 credits of sociology including SOCI 101 and 311, or permission of instructor. Contemporary sociological theorists such as Parsons, Merton, Mills, Berger, and Goudner are analyzed in terms of their relationship to major schools of contemporary sociological theory.

413 Seminar in Social Issues (3:3:0). Prerequisites: 90 credits and 12 credits of sociology. Opportunity to apply to contemporary relevant issues the theoretical perspectives and methodological skills previously learned.
414 Sociology of Language (3:3:0). Prerequisite: 60 credits and 3 credits of sociology, or permission of instructor. Interaction of language and social structure. Focus on language as revealing culturally specific rules of interpretation; the sex, class, race, and setting of specific uniformities in producing talk; and language as it constrains the individual.

416 Internship in Sociology (3:0:0). Prerequisite: 21 credits of sociology including Research Methods, or permission of instructor. Intended to promote learning in the application of sociological knowledge and build skills in different work settings. Students will work in an approved setting as applied sociologists. Minimum of 40 credits of work for each credit hour is required.

421 Field Work in Social Change (3:3:0). Prerequisite: Six credits of sociology or permission of instructor. In-depth investigation of planned social change through field work internship with a change organization of student's choice. Groups may be involved in influencing peace, environment, civil rights, consumer protection, poverty, or other public issues. Topics include ideologies, targets, organizational structures, opposition, and strategies of change.

441 The Sociology of Aging (3:3:0). Prerequisite: Six credits of sociology or permission of instructor. Aging from a sociological perspective. Topics covered include demographic trends and the aging population in America, the social construction of life stages and the creation of "old age," cultural labeling, and human resistance.

450/550 The Holocaust: The Construction of Social History through Survivor Testimonies (3:3:0). Prerequisite for 450: 60 credits or permission of instructor. Prerequisite for 550: Undergraduate senior status in sociology or graduate status. Examines the Holocaust, the destruction of European Jewry, through testimonies of survivors and the narratives of historians. Topics include the historical and cultural circumstances that encouraged German antisemitism; the rise of Nazism; the ghettoization of the Jews in Poland; Jewish life in the ghettos; European Jews under Nazi occupation; Jewish resistance; Christian rescuers; the invasion of Russia and mobile killing units; life in hiding and passing, forced labor camps, and concentration camps; the United States' and the world's responses; and reflections on the Holocaust today. Eyewitness testimony, memory, narrative, and literature are also considered.

471 Prevention and Deterrence of Crime (3:3:0). Prerequisite: 60 credits, in-service status, or permission of instructor. Theoretical and practical strategies for crime prevention and deterrence. Social, environmental, and mechanical developments. Police, courts, and correctional elements of law enforcement in terms of current effectiveness and future potential for crime prevention.

475/575 Women and the Law (3:3:0). Prerequisite for 475: 60 credits or permission of instructor. Prerequisite for 575: Undergraduate senior status in sociology or graduate standing. Analyzes the changing position of women in law from both a legal and a sociological perspective. Focuses on how the law defines and regulates women's rights in a variety of areas such as employment, marriage and divorce, reproduction and control of one's body, and violence against women. Explores the social and economic consequences of various legal doctrines and compares laws and policies in the United States with those in other countries.

480, 481 Honors Seminar in Sociology I, Honors Seminar in Sociology II (3:0:0). Prerequisite: Admission to the sociology honors program and permission of instructor. Linked, sequential courses, normally given by the same instructor. SOCI 480 involves the application of theoretical and methodological knowledge to the analysis of a social issue that serves as the course's central theme. SOCI 481 culminates in the preparation and presentation of a substantive research paper.

482 Honors Internship in Sociology (3:0:0). Prerequisites: Admission to the Sociology Honors Program and permission of instructor. Designed as a research internship that is intended to provide students with hands-on experience in sociology and the opportunity to do research within approved work settings. In addition to 120 hours of field work (for three credits), students meet at the discretion of the instructor to plan their research and share their ongoing field work experiences.

492 Complex and Alternative Organizations (3:3:0). Theories and analysis of types of organizations from informal voluntary associations to large complex ones. Non-profit organizations and alternatives to bureaucracies, such as feminist collectives, cooperatives, self-help groups, and social movement organizations are explored. Students do field work in organizations applying theories and concepts to their observations.

499 Independent Research in Sociology (1-4:0:0). Prerequisite: 18 credits of sociology including SOCI 311, 313, and 412; a 3.000 GPA in sociology; and a research proposal approved by instructor and department chair before enrollment. Investigation of a sociological problem according to individual interest with emphasis on research.

503 Sociology of Law (3:3:0). Prerequisite: Undergraduate senior status in sociology, graduate standing, or permission of instructor. Classical and contemporary sociological theories applied to law and legal institutions. Social relations between the law and the community, special group interests, social change, and social deviance. Case studies. Consideration of the legal profession.

505 Sociology of Sex and Gender (3:3:0). Prerequisite: Undergraduate senior status in sociology, graduate standing, or permission of instructor. Advanced study of sex roles in contemporary society. Using historical and comparative data, course examines perceived, prescribed, and actual sex differentiation in social, political, and economic roles.

515 Applying Sociology (3:3:0). Prerequisite: Undergraduate senior status in sociology or graduate standing. Overview of the ways sociologists have applied their theoretical and methodological skills and understanding in sociological practice in nonacademic settings.

516 Internship in Sociology (1-6:1-6:0). Prerequisites: 21 credits of sociology including research methods, or permission of instructor. Intended to provide learning experience in the application of sociological knowledge and skills in different work settings. Students work in an approved setting as applied sociologists. Minimum of 40 credits of work for each credit hour is required.

523 Racial and Ethnic Relations: American and Selected Global Perspectives (3:3:0). Prerequisite: Undergraduate senior status in sociology, graduate standing, or permission of instructor. Demographic purview of racial and
525 Current Research in Sex and Gender (3:3:0). Prerequisite: Undergraduate senior status in sociology, graduate standing, or permission of instructor. Advanced study of the current social science research and research methodology used in the study of sex and gender.

530 Methods and Logic of Social Inquiry (3:3:0). Prerequisite: Undergraduate senior status in sociology or graduate status and undergraduate statistics and research methodology or permission of instructor. Emphasizes the gathering, interpretation, and evaluation of scientific evidence. Course develops critical-thinking skills by using a set of rules and logical criteria for the evaluation of social science research. Course covers the logic of scientific inquiry, including various data collection methods, such as observational research and experiments, types of variables, causality, and how to distinguish between good and bad research in the published literature.

531 Statistical Reasoning (3:3:0). Prerequisite: Graduate standing and undergraduate statistics and research methodology or permission of instructor. Intermediate treatment of the statistical methods used in the analysis of social data. Topics include sampling, inference, hypothesis testing, analysis of variance, linear regression, and correlation. Introduction to the logic of multivariate analysis is included.

590 Gender, Race, and the Natural World (3:3:0). Prerequisites: Undergraduate seniors, graduate standing, or permission of instructor. Advanced study of the links among gender, race, and nature using a social-psychological framework, original sources, and seminar discussion format. A critical analysis of the ideologies that underpin the interlocking narratives of gender, race, and nature and an examination of the role of science in production of those ideologies.

599/NURS 611 Issues in Sociology (3:3:0). Prerequisite: Undergraduate senior status in sociology or graduate status. Contemporary topics in sociology including issues in sociological theory, crime and delinquency, advanced research methods, social and cultural change, urban sociology, medical sociology, sociology of aging, and rural sociology. Course may be taken only once for credit.

607 Criminology (3:3:0). Prerequisite: Graduate standing or permission of instructor. Crime and crime causation. Topics include social basis of law, administration of justice, and control and prevention of crime.

608 Juvenile Delinquency (3:3:0). Prerequisite: Graduate standing or permission of instructor. Sociology of adolescent behavior. Sociological factors that determine which behaviors and social categories of adolescents are likely to be labeled and treated as delinquent.

609 Sociology of Punishment and Corrections (3:3:0). Prerequisite: Graduate standing or permission of instructor. Understanding the development of the modern penal system as interpreted by various perspectives, including Durkheim, Marx, Weber, Foucault, Elias, and Garland. Exploration of recent trends and problems, including social control and violence in prisons, race and gender disparities in punishment, and alternative rehabilitation and prevention strategies.

611 Classical Sociological Theory (3:3:0). Prerequisite: Graduate standing or permission of instructor. In-depth examination of major issues in classical (pre-1930) sociological theory. Durkheim, Marx, Weber, Mead, and others are analyzed, and the social and intellectual context of their theories is emphasized.

612 Contemporary Sociological Theory (3:3:0). Prerequisite: Graduate standing or permission of instructor. Schools in contemporary sociological theory such as structural-functionalism, conflict, exchange, symbolic interactionism, ethnomethodology, humanist sociology, and critical theory are examined. Contemporary theorists are analyzed in relation to the schools.

614 Sociology of Culture (3:3:0). Prerequisite: Graduate standing or permission of instructor. Analysis of 20th-century debates in American culture, and cultural politics, with emphasis on art and popular culture, the news media, and competing notions of "the public." In-depth readings in cultural sociology cover a variety of theoretical and methodological approaches.

615 Internship in Sociology (1-6:0:0). Prerequisite: Graduate standing. Intended to provide learning experiences in the application of sociological knowledge and skills in different work settings. Students work in an approved setting as applied sociologists. A minimum of 40 hours of work are required for each credit.

619 Conflict and Conflict Management: Perspectives from Sociology (3:3:0). Prerequisite: Graduate standing in sociology or conflict analysis and resolution, or permission of instructor. Deals with the sociology of conflict. Such major sociological theories of conflict as those of Marx, Weber, Simmel, Dahrendorf, Coser, and Collins are presented. The role that sociological conflict theory plays in undergirding conflict management practices is stressed.

630 Analytic Techniques of Social Research (3:3:0). Prerequisite: Graduate standing and undergraduate statistics and research methodology, or permission of instructor. Focus on general linear model and multiple regression analysis in nonexperimental data. Range of topics will include logic of causal analysis, multicollinearity, influential observations, categorical independent and dependent variables, violation of assumptions, missing data, structural equation and measurement models, and discrete multivariate analysis.

631 Survey Research (3:3:0). Prerequisite: SOCI 530, SOCI 531, or permission of instructor. Introduction to the theory, method, and practice of survey research design and analysis. Students complete a survey research project.

632 Evaluation Research for Social Programs (3:3:0). Prerequisite: SOCI 530, SOCI 531, or permission of instructor. Study of methodological issues related to the evaluation of social programs. Conceptual and research design issues are explored in relation to social programs, particularly the delivery of social services. Includes the examination of methods used to assess the need for the programs, impact of delivery systems, and the efficiency and effectiveness of social programs.

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635 Environment and Society. (3:3:0) Prerequisite: Graduate standing. Overview of human ecology and environmental sociology, emphasizing selected topics. Focuses on theory, since theory makes it possible to generalize from understandings derived in an analysis of a particular problem and apply them to other problems.

640 Social Theory and Social Policy (3:3:0). Prerequisite: Graduate standing or permission of instructor. Major theories of social organization and social change as a means of understanding social policy development. Concentration is on social policies in American society.

650 Issues in the Sociology of Health, Illness, and Disability (3:3:0). Prerequisite: Graduate standing or permission of instructor. Social context of disease and medical care, the position of the professions in the medical care structure, the delivery of medical care, and the physician-patient relationship under different systems of practice.

651 (551) Health Care Systems (3:3:0). Prerequisite: Graduate standing or permission of instructor. Changing health care systems are rapidly affecting patient providers and health and quality of life of the society. Analysis and theories of change in health care systems and their impacts on society and various stakeholders. For-profit and non-profit organizations and their impacts are examined. Comparative cross-cultural analysis of health care systems.

660/860 Historical and Comparative Sociology (3:3:0). Prerequisites: Graduate standing or permission of instructor. Seminar in the theory and methods of historical and comparative sociology, primarily for students with a background in sociological theory and methods. Examination of the basic approaches and research data of history and sociology, a survey of the development of the field, and an analysis of exemplary studies.

686 Sociology of Aging (3:3:0). Prerequisite: Graduate standing or permission of instructor. Analysis of sociological issues in aging. Issues include class and cultural factors, problems of work, retirement, attachment and loss, and ageism. Different theories of aging are examined.

692 Complex and Alternative Organizations (3:3:0). Prerequisite: Graduate standing or permission of instructor. Classical and contemporary theories and analysis governing formal organizations, their development, characteristics and relationships to society are examined. Alternative conceptualizations to bureaucracy considered such as learning organizations, self-help groups, feminist collectives, cooperatives, and social movement organizations. Nonprofit, governmental, and business organizations are dissected.

696, 697 Independent Study (3:0:0), (3:0:0). Prerequisite: Graduate standing or permission of instructor. Theoretical and research literature chosen by student and instructor.

799 Thesis (1-6:0:0). Graded S/NC.

800 Studies for the Doctor of Philosophy in Education (variable credit). Prerequisite: Admission to the Ph.D. in Education program to study in sociology. Program of studies designed by student's discipline director and approved by student's doctoral committee, which brings the student to participate in the current research of the discipline director and results in a paper reporting the original contributions of the student. Enrollment may be repeated.

Sociology and Anthropology (SOAN)

Sociology and Anthropology

190 Classical Texts in Society, Nature, and Culture (3:3:0). Seminar course that explores the conceptual foundations of social science through readings and discussions of seminal texts by such major figures as Aristotle, Galileo, Hobbes, Kant, Hegel, and Darwin.

670 Special Topics in Sociology and Anthropology (4-8:0-8:0-8). Prerequisites: Graduate standing or permission of instructor. Provides a cross-disciplinary pedagogical format within the Department of Sociology and Anthropology. Covers a variety of pedagogical formats, such as combining ethnographic field techniques taught in anthropology with sociological-based urban issues, or providing archaeological laboratory analyses with a grounding in statistical techniques continue to be proposed by department faculty.

Software Engineering (SWE)

Information and Software Engineering

432 Design and Implementation of Software for the Web (3:3:0). Prerequisites: Math 125, INFS 311 or CS 450, and CS 421. This course teaches students how to develop software for web applications. The concepts of client-server computing, theories of usable graphical user interfaces, and models for web-based information retrieval and processing are covered. Goals are to understand how to design usable software interfaces and implement them on the web, learn how to build software that accepts information from users across the web and returns data to the user, and understand how to interact with database engines to store and retrieve information. Specific topics that are included are HTML, CGI programming, Java, AppleScript, and Java servlets.

619 Software Construction (3:3:0). Prerequisites: SWE foundation courses or equivalent. An in-depth study of software construction using a modern, object-oriented language with support for graphical user interfaces and complex data structures. Specifications, design patterns, and abstraction techniques, including procedural, data, iteration, type, and polymorphic. Information hiding, classes, objects, and inheritance. Exception handling, event-based systems, and concurrency.

620 Software Requirements Analysis and Specification (3:3:0). Prerequisites: SWE foundation courses or equivalent. An in-depth study of methods, tools, notations, and
validation techniques for the analysis, specification, prototyping, and maintenance of software requirements. In-depth study of object-oriented requirements modeling, including use case modeling, static modeling and dynamic modeling using the Unified Modeling Language (UML) notation. Students participate in a group project on software requirements and specification using a modern method.

621 Software Design (3:3:0). Prerequisites: SWE 619, with 620 recommended, or permission of instructor. Concepts and methods for the architectural design of large-scale software systems. Fundamental design concepts and design notations are introduced. Several design methods are presented and compared. In-depth study of object-oriented analysis and design modeling using the Unified Modeling Language (UML) notation. Students participate in a group project on object-oriented software design.

623 Formal Methods and Models in Software Engineering (3:3:0). Prerequisites: SWE 619 or permission of instructor. Formal mechanisms for specifying, validating, and verifying software systems. Program verification through Hoare's method and Dijkstra's weakest preconditions. Formal specification via algebraic specifications and abstract model specifications, including initial specification and refinement towards implementation. Integration of formal methods with existing programming languages, and the application of formal methods to requirements analysis, testing, safety analysis, and object-oriented approaches. Formal methods using the Object Constraint Language (OCL).

625 Software Project Management (3:3:0). Prerequisites: SWE foundation courses or equivalent. Lifecycle and process models; process metrics, planning for a software project, mechanisms for monitoring and controlling schedule, budget, quality, and productivity, and leadership, motivation, and team building.

626 Software Project Laboratory (3:3:6). Prerequisites: SWE 619, 620, 621 and 623, or permission of instructor. Students are involved in requirements analysis, design, implementation, and management of a software development project. Students work in teams to develop or modify a software product, applying sound principles of software engineering. Both industrial and academic standards are used to assess the quality of the work products.

630 Software Engineering Economics (3:3:0). Prerequisite: SWE 625. Covers quantitative models of the software lifecycle, cost-effectiveness analysis in software engineering, multiple-goal decision analysis, uncertainty and risk analysis, software cost estimation, software engineering metrics, and quantitative lifecycle management techniques.

631/CS 631 Object-Oriented Design Patterns (3:3:0). See CS 631.

632 User Interface Design and Development (3:3:0). Prerequisite: SWE 619, or CS 540 and 571, or permission of instructor. Principles of user interface design, development, and programming. Includes user psychology and cognitive science, menu system design, command language design, icon and window design, graphical user interfaces and web-based user interfaces.

637 Software Testing and Quality Assurance (3:3:0). Prerequisite: SWE 619 or permission of instructor. Concepts and techniques for testing software and assuring its quality. Topics cover software testing at the unit, module, subsystem, and system levels; automatic and manual techniques for generating and validating test data; the testing process; static vs. dynamic analysis; functional testing; inspections; and reliability assessment.


642 Software Engineering for the World Wide Web (3:3:0). Prerequisites: SWE 619, or CS 540 and 571, or permission of instructor. Detailed study of the engineering methods and technologies for building highly interactive web sites for e-commerce and other web-based applications. Engineering principles for building web sites that exhibit high reliability, usability, security, availability, scalability, and maintainability are presented. Methods such as client-server programming, component-based software development, middleware, and reusable components are taught.

699 Special Topics in Software Engineering (3:3:0). Prerequisite: Permission of instructor. Special topics not occurring in the regular SWE sequence. May be repeated for credit when semester topic is different.


707/CS 707 Distributed Software Systems (3:3:0). Prerequisite: CS 706 or permission of instructor. Issues in the design and implementation of distributed applications. Topics covered include distributed programming using sockets as well as higher-level technologies such as remote procedure calls and distributed object middleware technologies including Java RMI, CORBA, and DCOM.

720 Advanced Software Requirements (3:3:0). Prerequisites: SWE 620 and 621. The course gives state of the art and state of the practice in software requirements engineering. In-depth coverage of selected methods, tools, notations, or validation techniques for the analysis and specification of software requirements. The course work includes a project investigating or applying approaches to requirements engineering.

721 Reusable Software Architectures (3:3:0). Prerequisites: SWE 620 and 621. This course investigates the software concepts that promote reuse of software architectures. The influence of object technology on software design and reuse is studied. Domain Modeling methods, which model the application domain as a software product family from which target systems can be configured, are investigated. The course also covers reusable software patterns including architecture patterns and design patterns, software components, and object-oriented frameworks.

735/CS 735 Concurrency (3:3:0). See CS 735.

763 Software Engineering Experimentation (3:3:0). Prerequisite: SWE 621 or permission of instructor. A detailed study of the scientific process, particularly using the experimental method. The course examines how empirical studies are carried out in software engineering. The distinction between analytical techniques and empirical techniques is reviewed. Other topics include experimentation required in software engineering, kinds of problems that can be solved using experimentation, methods used to control variables and eliminate bias in experimentation, and analysis and presentation of empirical data for decision making.
Spanish (SPAN)

Modern and Classical Languages

101 Elementary Spanish I (3:3:1). For students with no knowledge of Spanish. Introduction to Spanish, including elements of grammar, vocabulary, oral skills, listening comprehension, and reading. Lab work required.

102 Elementary Spanish II (3:3:1). Prerequisite: SPAN 101, appropriate placement score, or permission of department. Continuation of SPAN 101. Lab work required.

105 Review of Elementary Spanish (3:3:1). Prerequisite: Appropriate placement score or permission of department. Review of elements of Spanish for students who have studied Spanish previously. May not be taken for credit in combination with SPAN 102 or 109. Lab work required.

109 Intensive Elementary Spanish (6:6:2). Equivalent to SPAN 101 and 102 taught in a single semester. Recommended for students who desire an intensive introduction to Spanish. May not be taken for credit in combination with SPAN 101, 102, or 105. Lab work required.

201 Intermediate Spanish I (3:3:1). Prerequisite: SPAN 102, 105, 109, appropriate placement score, or permission of department. Further development of skills in listening, speaking, reading, and writing. SPAN 201 and 202 must be taken in sequence. Lab work required.

202 Intermediate Spanish II (3:3:1). Prerequisite: SPAN 201, appropriate placement score, or permission of department. Application of skills to reading, composition, and discussion. Lab work required.

209 Intensive Intermediate Spanish (6:6:2). Prerequisite: SPAN 102, 105, 109, appropriate placement score, or permission of department. Equivalent to SPAN 201 and 202 taught in a single semester. May not be taken for credit in combination with SPAN 201 or 202. Lab work required.

301 Grammar and Syntax (3:3:0). Prerequisite: SPAN 202, 209, appropriate placement score, or permission of instructor. In-depth review of Spanish grammar and syntax. Extensive practice in controlled and free writing with emphasis on fundamental difficulties and points of interference that exist between English and Spanish.

302 Reading and Writing Skills Development (6:6:0). Prerequisite: SPAN 202 or 209, appropriate placement score, or permission of the instructor. Development of ability to write on topics of current interest. Readings provide examples of each topic and the necessary vocabulary for compositions. Introduces reading strategies and provides practice in the reading of different kinds of texts.

321 Introduction to Spanish Culture (3:3:0). Prerequisite: ENGL 101 or equivalent, or permission of instructor. Designed for nonmajors. History, culture, economic and social development, and scientific and artistic achievements that have contributed to the formation of modern Spain. Course work in English. Credit may be earned in either SPAN 321 or 461, but not in both.

322 Introduction to Latin American Culture (3:3:0). Prerequisite: ENGL 101 or equivalent, or permission of instructor. Designed for nonmajors. History, culture, economic and social development, and scientific and artistic achievements that have contributed to the formation of modern Latin America. Course work in English. Credit may be earned in either SPAN 322 or 466, but not in both.

323 Field Study in Hispanic Culture (1-3:6:0). Prerequisite: 60 credits or permission of instructor. Study tour to an area of the Spanish-speaking world. Students must attend a series of lectures before the tour and must consult with the designated faculty member on a research project on a topic in Hispanic culture resulting in a paper or report.

324 Study Abroad in Spanish (3:3:0). Prerequisite: SPAN 202, 209 or equivalent, or permission of instructor. Study at an academic institution in a Spanish-speaking country including classroom studies with professors from the host country and field experiences.

325 Major Hispanic Writers (3:3:0). Prerequisite: ENGL 101 or equivalent, or permission of instructor. Designed for nonmajors. Study of the works of major Hispanic writers in translation. Writers studied vary. Course work in English. May be taken toward fulfillment of the general requirement in literature for baccalaureate degrees. May be repeated for credit with permission of department.

329 Special Topics in Spanish and Latin American Literature (3:3:0). Prerequisite: ENGL 101 or permission of instructor. Designed for nonmajors. Course work in English. May be taken toward fulfillment of the humanities requirement in literature for baccalaureate degrees. May be repeated once for credit.

351 Oral Proficiency in Spanish (3:3:0). Prerequisite: SPAN 202, 209, appropriate placement score, or permission of instructor. Development of oral expression on topics of current interest and everyday situations, including written assignments. Not open to native speakers.

390 Introduction to Hispanic Literary Analysis (3:3:0). Prerequisite: SPAN 302 or permission of instructor. Required course that prepares students for the study of Hispanic literatures. Introduces basic terminology of literary analysis and provides practice in the examination of texts in the major genres: poetry, narrative, and drama.

400 Spanish for the Professions (3:3:0). Prerequisites: SPAN 302, or permission of instructor. Advanced study of the language needed for use in a specific profession, such as translation, business, social service, or health professions. May be repeated for credit with change of topic.
425, 426 Independent Study (1-3:0:0), (1-3:0:0). Prerequisites: Spanish major with 90 credits and permission of instructor. Research and analysis of a selected problem in literature or linguistics in consultation with a department member. Maximum of six credits of independent study may be applied to fulfillment of major requirements.

451 Advanced Oral Spanish (3:3:0). Prerequisites: 9 credits of SPAN at 300 level or above or permission of instructor. Development of vocabulary and strengthening of conversational skills through class discussions and oral and written reports based on contemporary themes. Not open to native speakers.

452 Advanced Written Spanish (3:3:0). Prerequisites: 9 credits of SPAN at 300 level or above or permission of instructor. Development of skills required in writing Spanish. Guided and original compositions. Grammatical structures reviewed and supplemented with individual corrections.

461 Spanish Civilization and Culture (3:3:0). Prerequisite: SPAN 452 or permission of instructor. Survey of Spanish culture and civilization from the non-Roman era to the 20th century.

466 Latin American Civilization and Culture (3:3:0). Prerequisite: SPAN 452 or permission of instructor. Introduction to the study of Latin American civilization and culture from the pre-Columbian era to the 20th century.

480, 481 Special Topics in Spanish (3:3:0), (3:3:0). Prerequisites: SPAN 452 or permission of instructor. Study of a selected theme in Hispanic literature, culture, or linguistics. May be repeated for credit with change of topic.

483, 484 The Literature of Spain I, II (3:3:0). Prerequisites: SPAN 390 and 452 or permission of instructor; SPAN 483. Examines the main periods, trends, genres, and most representative works of the Spanish peninsular literature from its beginnings to the end of the Golden Age. SPAN 484 studies Spanish literature from 1700 to the present.

488 The Literature of Spanish America (3:3:0). Prerequisites: SPAN 390 and 452, or permission of instructor. Survey of the literature of Spanish America. Study of texts that are representative of the colonial, romantic, modernista, avant garde, and contemporary periods.

490 Internship in Spanish (1-6:0:0). Prerequisites: 9 credits in Spanish at the 300 level, or permission of instructor. Qualified students work with area schools, social service programs, government agencies, interest groups, museums, or corporations. Specific arrangements must be made with, and approved by, a member of the Spanish faculty during the semester prior to enrollment.

497, 498 Senior Honors Tutorial (3:0:0), (3:0:0). Prerequisites: Spanish major with 90 credits, a cumulative GPA of 3.000, and GPA of 3.000 in the major field. Students meeting these requirements are admitted to candidacy on submission of a letter of application to the department Honors Committee in the second half of the junior year. A faculty recommendation and an interview by the Honors Committee are also required. First semester involves weekly meetings with a faculty member to discuss readings from a comprehensive list prepared by the Spanish faculty. In the second semester, independent research and completion of an honors essay under the supervision of a member of the Spanish faculty are required.

500 History of the Spanish Language (3:3:0). Scientific study of the evolution of the Spanish language from its origin in Vulgar Latin to its present forms.

501 Applied Spanish Grammar (3:3:0). Analysis of Spanish grammar as a basis for teaching language skills. Terminology and methodology for the teaching of syntax are stressed.

502 Hispanic Sociolinguistics (3:3:0). Introduction to sociolinguistics with emphasis on bilingualism and language contact in the Spanish-speaking world including the United States.


520 Studies in Medieval Spanish Literature (3:3:0). Study of a major work or a literary genre of this period.

525 Studies in Renaissance Literature (3:3:0). Study of a literary movement or selected authors of the Spanish Renaissance.


540 Studies in 20th-Century Literature (3:3:0). Study of a writer, genre, theme, or movement of this period.

545 Studies in Hispanic Literature (3:3:0). Study of major writers in a particular generation or movement.

551 Special Topics in Spanish (3:3:0). Special studies in Spanish or Latin American language, literature, or culture. Specific topics are announced in advance. May be repeated for credit with permission of department.


565 Studies in Spanish American Drama (3:3:0). Study of playwrights who have made a major contribution to the development of the genre.

576 Advanced Translation (3:3:0). Prerequisite: Graduate standing or permission of instructor. Advanced work in translation of selected texts from diverse fields. Comparative terminology, sight translation, and precise writing. Emphasis on the function and technique of documentation in translation. Translation from Spanish to English and from English to Spanish.

580 Contemporary Hispanic Institutions (3:3:0). Study of 20th-century cultural, social, and political institutions in Spain and Spanish America with emphasis on language and terminology used to describe their functions, regulations, and conditions.

635 Seminar in Don Quixote (3:3:0). Study of Don Quixote and the major critical approaches to the work.

650 Seminar in 20th-Century Drama (3:3:0). Study of major dramatists in the generation of 1898 and in the contemporary theater.

655 Seminar in 20th-Century Prose (3:3:0). Study of a major writer, theme, or movement in the novel or the essay.

675 Seminar in Literature and Art (3:3:0). Comparative analysis of a literary theme or style in relation to other media (e.g., painting, architecture, film) for an integral understanding of the arts.

680 Seminar in Literature and Society (3:3:0). Study of a literary topic, a genre, or selected authors in relation to a given economic, social, or political system in Spain or Latin America.

685 Seminar in Literature and Ideas (3:3:0). Study of major ideological-philosophical themes and their artistic expression in literature.

798 Directed Reading and Research (3:0:0). Prerequisite: Open only to degree students who have completed at least 18 credits. Reading and research on a specific project under the direction of a department member. Oral or written report required.

799 Thesis (1-6:0:0). Students who take SPAN 798 and then elect the thesis option receive three credits for SPAN 799 on completion of the thesis. Students who do not take SPAN 798 receive six credits for SPAN 799 on completion of the thesis. Graded S/NC.

800 Studies for the Doctor of Philosophy in Education (variable credit). Prerequisite: Admission to the Ph.D. in Education program in Spanish Studies. Designed by student's discipline director and approved by student's doctoral committee that prepare the student to do research and writing in the current area of interest in the discipline. Enrollment may be repeated.

See also FRLN course listings.

Special Education (EDSE)

Graduate School of Education

500 In-Service Educational Development (1-6:0:0). See EDUC 500.

510/EDIT 510 Introduction to Assistive Technology (3:3:0). See EDIT 510.

517 Computer Applications for Special Populations (3:3:0). Prerequisite: Graduate standing or permission of instructor. Presents a lecture/laboratory course for teachers of special populations (e.g., children with disabilities, bilingual children) in applications of computer technology for instructional programs and computer skills. Students learn to use computer technology designed for special populations.


524/EDIT 524 Assistive Technology for Individuals with Learning Disabilities (2:2:0). See EDIT 524.


526/EDIT 526 Assistive Technology and the Internet (2:2:0). See EDIT 526.

527 Adapted Sports, Recreation, and Leisure (1:1:0). Introduces tools for adapting sports, recreation, and leisure activities to promote the benefits of active participation, relaxation, health, and wellbeing for individuals with differing abilities. Students participate in simulations, research, and design. Knowledge and awareness components of this course may be delivered via distance education.

528 Low-Tech Assistive Technology Solutions (1:1:0). Focuses on functional applications of low-technology solutions within the areas of self-care; mobility and transfer; communication; stability and support; sports, recreation, and leisure; and academic and work environments. The course includes exploration and opportunities to design and create low-tech devices for children and adults. Knowledge and awareness components of this course may be delivered via distance education.

530 Policy Perspectives Affecting Diverse Young Learners and Their Families (3:3:0). Provides students with an understanding of both historical and current trends and issues involving legislation and policy in early childhood education, bilingual education, early childhood special education, and multicultural education. Focuses on the historical role of social advocacy, the development of advocacy skills, and collaboration and consultation with other professionals and staff in the field of early childhood education.

531 Transition and Community-Based Instruction (3:3:0). Addresses issues in transition for youth with severe disabilities. Covers self-determination, development and implementation of a transition plan, post-secondary opportunities including education/community-based instruction, and vocational environments. This course is equivalent to EDSE 544 for students in the severe disabilities program.

532 Positive Behavior Supports (3:3:0). Designed for professionals working with individuals with severe disabilities. Focuses on concepts and skills needed to design, implement, and evaluate behavior support programs derived from functional assessment. Covers effective teaching strategies; addresses relevant replacement skills; facilitates generalization and maintenance of skills; and incorporates individually designed crisis intervention procedures. This course is equivalent to EDSE 620 for students in the severe disabilities program.

533 Curriculum and Assessment in Severe Disabilities (3:3:0). Addresses best practices in curriculum and assessment for individuals with severe disabilities. Covers the design of assessment/evaluation techniques and procedures for the severe needs population, including adaptations and accommodations. Covers IEP formulation and implementation with linkage to assessment. This course is equivalent to EDSE 649 for students in the severe disabilities program.

534 Communication and Severe Disabilities (3:3:0). Introduces professionals to augmentative/alternative communication (AAC) for individuals with severe speech/language impairments. Addresses the knowledge and skills needed to assess the potential AAC user, make team decisions, develop and implement instruction, and evaluate the effects of instruction aimed at motivating, building, and expand-
ing communication, choice-making, and social interaction. This course is equivalent to EDSE 622 for students in the severe disabilities program.

540 Characteristics of Students with Emotional Disturbance and Learning Disabilities (3:3:0). Presents theories of deviance and specific conditions in emotional disturbance and learning disabilities. Studies the impact of the manifestations of these learning and behavioral differences on academic and social/emotional performances. Diversity within student populations is addressed throughout the course. Field experiences in public schools may be required.

544 Adaptive Methods and Transition for Secondary Education (3:3:0). Provides an overview of career, transition, and vocational planning programs for students with special needs. Special consideration is given to legislative requirements, training and placement options, adapting curriculum content, scheduling, and personal relationships. Field experience in public schools may be required.

547 Medical and Developmental Risk Factors for Children with Disabilities (3:3:0). Examines the nature and causes of disabling and/or special health conditions. Examines screening and evaluation techniques, characteristics, and educational implications.

551 Classroom Management: Theory and Practice (3:3:0). Focuses on identifying, recording, evaluating, and changing social and academic behaviors of diverse student populations. Explores theories of classroom management and presents various approaches to instructional, behavioral, and environmental management. Addresses the development of Individualized Education Programs and their impact on management issues. Field experience in public schools may be required.


556 Language Acquisition and Communication for Diverse Infants and Toddlers (3:3:0). Provides students with an understanding of early language development in terms of each of the five major components of language. Discusses speech, language, and communication, particularly in terms of their interrelatedness with cognitive and sociocultural development. Explores the importance of adult-child interaction and the impact of bilingualism, cultural diversity, cognitive ability, and language disorders.

557 Language Development and Emergent Literacy for Diverse Learners, Ages 3-5 (3:3:0). Provides students with an understanding of first and second language. Explores the impact of disability and second language acquisition, and covers the interrelationship of speaking, listening, reading, and writing. Students also gain an understanding of the diversity of oral and written communication styles in families, communities, and cultures.

592 Special Topics in Education (3:3:0). See EDUC 597.

600 Workshop in Education (1-6:0:0). See EDUC 600.

610 Designing Adaptive Environments (2:2:0). Provides an overview of environmental adaptations for people with disabilities to increase their access to community, workplace, and school activities. The course covers legal issues within the ADA for adapting environments, and addresses programmatic and physical access issues. Knowledge and awareness components of this course may be delivered via distance education.

615 Early Intervention for Infants and Toddlers with Disabilities (3:3:0). Explores current public policy initiatives for coordinating services for infants and toddlers. Discusses models of services delivery and approaches to family-centered service.

620 Managing Severely Challenging Behaviors and Applied Behavior Analysis (3:3:0). Prerequisites: Graduate standing and permission of advisor. Focuses on applying behavior analysis principles and social learning theory to increase learning by students with special needs. Emphasizes single subject research designs.

621 Advanced Applied Behavior Analysis I (3:3:0). This course focuses on the basic content of applied behavior analysis and teaches course participants to implement behavioral procedures and to develop behavioral programs for clients with fundamental behavioral needs.

622 Augmentative Communication (3:3:0). Prerequisites: Graduate standing, EDSE 552 (can be taken concurrently), and permission of advisor. Focuses on alternative language and communication techniques for children with severe language and speech impairments.

623 Advanced Applied Behavior Analysis II (3:3:0). Prerequisite: EDSE 621. This course further expands on the basic content of applied behavior analysis and teaches course participants to implement behavioral procedures and to develop behavioral programs for clients with fundamental behavioral needs.

624 Seminar in Applications of Applied Behavior Analysis I (3:3:0). Prerequisites: EDSE 621 and 623. This seminar expands students' capability to deal with more complex behavioral situations and enables them to relate to more sophisticated professional issues and environments.

625 Seminar in Applications of Applied Behavior Analysis II (3:3:0). Prerequisites: EDSE 621, 623, and 624. This seminar further expands students' capability to deal with more complex behavioral situations and enables them to relate to more sophisticated professional issues and environments.

648 Introduction to Psycho-Educational Assessment (3:3:0). Prerequisite: EDUC 340. Introduces basic statistical procedures and test characteristics. Appropriate terminology and practices related to formal and informal assessment are applied throughout the course. Students practice administering, scoring, and interpreting tests, including the impact of multicultural diversity on assessment.

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649 Advanced Clinical Psycho-Educational Assessment in Special Education (3:3:0). Prerequisite: EDSE 648 is required for ED/LD students. Focuses on advanced issues in administering, scoring, and interpreting education evaluation instruments with an emphasis on writing reports and developing the Individualized Education Program. Considers using assessment results for instructional and placement decisions.

655 Curriculum Methods: Elementary ED/LD (3:3:0). Applies research on teaching effectiveness, teaching accountability, and instructional approaches with specific attention to reading, language arts, social skills, and cooperative learning. Field experience in public schools may be required.

656 Assessment of Diverse Young Learners, Ages 3–5 (3:3:0). Provides students with an understanding of the forms, functions, methods, and roles of assessment for planning and implementing effective early childhood programs for children ages 3 to 5 from diverse cultures and with varied learning needs. Students learn to use both qualitative and quantitative approaches to evaluation and assessment. They also learn about technological adaptations and gain an understanding of appropriate strategies for conducting, reporting, and decision making related to specific functions of assessment. The course also covers assessment strategies necessary for second language learners and adaptations for children with disabilities.

659 Curriculum and Methods: Early Childhood Special Education (3:3:0). Prerequisite: Permission of advisor. Emphasizes planning, organizing, implementing, and evaluating programs for young children with special needs.


662 Consultation and Collaboration (3:3:0). Prerequisite: Teaching licensure or enrollment in a graduate degree program in education. Provides professionals in special education, regular education, and related fields with the knowledge and communications skills necessary to provide collaborative consultation and technical assistance to other educators and service providers.

663 Seminar in Special Education (3:3:0). Provides advanced course work for selected populations in special education. Covers population characteristics, current best practices for programming, evaluation, and planning. Students participate in research, development of presentations, writing, and discussion of selected topics. May be repeated for credit.

665 Collaboration with Families of Children with Special Needs (3:3:0). Focuses on strategies for developing culturally appropriate family-professional partnerships to benefit children with special needs. Explores theories and research that support a family-centered approach. Includes a focus on family/professional rights and responsibilities in the special education process.

669 Interdisciplinary Approach for Children with Sensory and Motor Disabilities (3:3:0). Emphasizes positioning, handling, and adaptive strategies. Focuses on understanding the roles of related disciplines in collaborative planning and service delivery.

671 Special Topics in the Education of Exceptional Children (1:1:0). This is a variable topics course. No more than three credits may be applied to the M.Ed. degree.

671-A Special Topics in the Education of Exceptional Children: Creative Methods of Solving Problems (1:1:0). Teaches systematic creative methods of problem solving processes, both cognitively and experientially.

782 Comprehensive Topics in Special Education: Trends and Issues (3:3:0). Prerequisite: Majority of course work. Focuses on current trends and issues, as well as legislation and litigation concerning individuals with disabilities. Students take a series of exams addressing major trends and issues in special education.

790 Internship in Special Education (1-6:3:0). Prerequisite: Permission of advisor. Provides supervised internships that apply university course work to instruction of children and their families in school and community settings. Students enroll in two separate internships appropriate to the area of study for a total of six credits. Applications for field internships are due as follows: Fall—February 15; Spring—September 15; and Summer–March 1.

794 Special Topics (3:3:0). Provides advanced study of selected topics in education for students preparing for doctoral studies or who have been admitted to the Ph.D. program in education.

797 Advanced Topics in Education (3:3:0). See EDUC 797.

841 Intervention Research in Special Education (3:3:0). Prerequisite: Admission to the Ph.D. in Education program or permission of instructor. Provides advanced graduate students with opportunities for in-depth study, analysis, and discussion of original intervention research in special education. Emphasizes analyzing research methodology, coding original intervention research, analyzing results, synthesizing findings, formulating future research questions relevant to individuals with disabilities, and gaining an understanding of the submission process for conferences and publications.

842 Application of Research Methodology in Special Education (3:3:0). Prerequisite: Admission to the Ph.D. in Education program or permission of instructor. Provides knowledge and skills in the application of research methodology in special education. Topics include methods for conducting survey research, experimental/quasi-experimental research, research involving correlation and regression, and qualitative research. Emphasizes application to specific issues in special education research.

843 Leadership in Special Education Administration (3:3:0). Prerequisite: Admission to the Ph.D. in Education program or permission of instructor. Examines leadership issues and applies them to the administration of special education programs. Explores current challenges in the delivery of services for exceptional children through case studies and projects.

844 Current Issues in Special Education (3:3:0). Prerequisite: Admission to the Ph.D. in Education program or permission of instructor. Helps students develop an understanding of the role of convergent research evidence in addressing current issues in special education practice and...
policy. Familiarizes students with current issues in special education and the group experimental, single subject, and qualitative research designs used to address these current issues. Students evaluate research studies both in terms of their methodological strengths and weaknesses and their part in providing convergent bodies of evidence that can be used for defining practice and policy.

**Sport Management (SPMT)**

Graduate School of Education

201 Introduction to Sport Management (3:3:0). Open to non-majors. Introduces students to the sport management profession. The primary focus is on the sport industry, including professional sport entertainment, amateur sport entertainment, for-profit sport participation, nonprofit sport participation, sporting goods, and sport services.

241 Practicum (3:3:0) Provides paid or voluntary experience in a sport industry setting. Work sites are chosen by students after approval of faculty supervisors.

302 Sport and Ethics (3:3:0). Investigates moral issues in sport and judgments about right and wrong behavior among athletes, coaches, spectators, and other support personnel.


320 Psychology of Sport (3:3:0). Covers psychological theories of personality, motivation, and anxiety explored in the sport environment. Examines social-psychological research on audience effects, team cohesion, leadership, and fan behavior.

412 Sport Marketing and Finance (3:3:0). Investigates the principles and processes involved in sport marketing and finance. Focuses on such topics as research and development, sport promotion, sport sponsorship, advertising, merchandising, and distribution of sporting goods.

480 Special Topics in Sport Management (3:3:0). See course description in the Schedule of Classes. Announced in advance.

490 Internship (12). Prerequisites: 90 hours (pass/fail): HEAL 205, 323, and 350; PHED 200 and 304; PRLS 317, 405, and 410. Provides paid or voluntary work experience in sport industry settings. Requires a minimum period of 10–12 weeks of full-time employment. Applies course work, theories, and research to work settings. Work sites are chosen by students after the approval of faculty supervisors. Includes meetings and assignments prior to as well as during the internship.

**Statistics (STAT)**

Applied and Engineering Statistics

250/IT 250 Introductory Statistics I (3:3:0). Prerequisite: High school algebra. Elementary introduction to statistics. Topics include descriptive statistics, probability, estimation and hypothesis testing for means and proportions, correlation, and regression. Students use statistical software for assignments. F,S,Summer

344 Probability and Statistics for Engineers and Scientists I (3:3:0). Prerequisite: MATH 213. Introduction to probability and statistics with applications to computer science, engineering, operations research, and information technology. Basic concepts of probability, random variables and expectation, Poisson process, bivariate distributions, sums of independent random variables, correlation and least squares estimation, central limit theorem, sampling distributions, maximum likelihood and unbiased estimators, confidence interval construction, and hypothesis testing. F,Summer

346 Probability for Engineers (3:3:0). Prerequisite: Math 213. Introduction to probability with applications to electrical and computer engineering, operations research, information technology, and economics. Basic concepts of probability, conditional probability, random variables and moments, specific probability distributions, multivariate distributions, moment generating functions, limit theorems, and sampling distributions. F

350 Introductory Statistics II (3:3:0). Prerequisite: STAT 250. Emphasis on applications. Topics include analysis of variance, multiple regression, and nonparametric inference. A statistical computer package is used for data analysis. Spring

354 Probability and Statistics for Engineers and Scientists II (3:3:0). Prerequisite: STAT 344. Continuation of STAT 344. Multivariate probability distributions, variable transformations, regression, analysis of variance, contingency tables, and nonparametric methods. Applications to quality control, acceptance sampling, and reliability. Spring

362/IT 362 Introduction to Computer Statistical Packages (3:3:0). Prerequisite: STAT 250/IT 250 or equivalent. Use of computer packages in the statistical analysis of data. Topics include data entry, checking, and manipulation, as well as the use of computer statistical packages for regression and analysis of variance. Fall

455 Experimental Design (3:3:0). Prerequisite: STAT 350 or 354, and STAT 362 or 301. Principles of analysis of variance and experimental design. Topics include computation and interpretation of analysis of variance; multiple comparisons; orthogonal contrasts; design of experiments including factorial, hierarchical, and split plot designs; principles of blocking and confounding in 2**n experiments; estimation of variance components. Optional topics may include analysis of covariance, partial hierarchical designs, or incomplete block designs. Computer statistical packages are used to perform computations. Spring

457 Applied Nonparametric Statistics (3:3:0). Prerequisites: STAT 350 or 354, or equivalent. Introduction to nonparametric methods with applications to the decision and information sciences and operations analysis. Topics covered are testing and estimation for one- and two-sample problems, independent and paired samples, location and dispersion problems, one- and two-way layouts, tests for independence, regression, and discussion of efficiency. Fall

463 Introduction to Exploratory Data Analysis (3:3:0). Prerequisite: STAT 350 or 354, or equivalent. Introduction to modern exploratory data analysis techniques. Topics include graphical techniques, such as box plots, parallel coordinate plots, and other graphical devices, re-expression and transformation of data, order statistics, influence and leverage, and dimensionality reduction methods such as projection pursuit. Fall

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474 Introduction to Survey Sampling (3:3:0). Prerequisite: STAT 350 or 354, and STAT 362 or 501. Introduction to the design and analysis of sample surveys. Sample designs covered include simple random sampling; systematic sampling; stratified, cluster, and multistage sampling. Analytical methods include sample size determination, ratio and regression estimation, imputation for missing data, and nonsampling error adjustment. Practical problems encountered in conducting a survey are discussed. Methods are applied to case studies of actual surveys. Class project may be required. Course is recommended for students of decision, information, social sciences, and mathematics. f

498 Independent Study in Statistics (1-3:0:0). Prerequisite: 60 undergraduate credits; must be arranged with instructor and approved by the department chair before registering. Directed self-study of special topics of current interest in statistics. May be repeated for a maximum of six credits if topics are substantially different.

499 Special Topics in Statistics (3:3:0). Prerequisites: 60 undergraduate credits and permission of instructor; specific prerequisites vary with the nature of the topic. Topics of special interest to undergraduates. May be repeated for a maximum of six credits if the topics are substantially different.

501 SAS Language and Basic Procedures (1:1:0). Prerequisites: A course in statistics and experience with Microsoft Windows. Introduction to the SAS Data Step and Base SAS Procedures. Preparation for graduate students in the use of SAS for other graduate courses offered by the Applied and Engineering Statistics Department. Topics include observation and variable structures, data interfaces, formats, functions, and procedures for summarizing and displaying data. f,su.

502 Introduction to SAS/GRAPH (1:1:0). Prerequisite: STAT 501. Introduction to SAS/GRAPH. Continued preparation beyond STAT 501 for graduate students in the use of SAS for other graduate courses offered by the Applied and Engineering Statistics Department. Topics include an overview of SAS/GRAPH and SAS/GRAPH procedures, SAS/GRAPH output options and in-depth coverage of the OPTIONS, GDEVICE, GCHART, GPLOT and GSLIDE procedures. f,su.

503 SAS Macro Language (1:1:0). Prerequisite: STAT 501. Introduction to SAS Macro Language. Continued preparation beyond STAT 501 for graduate students in the use of SAS for other graduate courses offered by the Applied and Engineering Statistics Department. Topics include an overview of macro language processing, macro variables, defining and calling macro variables, macro quoting, macro facility error messages, and examples of efficient code using macros. f,su.

510 Statistical Foundations for Technical Decision Making (3:3:0). Prerequisite: MATH 108 or equivalent, or permission of instructor. Use of statistical methods as scientific tools in the analysis of practical problems. Topics include descriptive statistics, probability theory, distributions, sampling, inference, estimation and hypothesis testing; linear regression and correlation; and the analysis of variance. Credits are not applicable toward the M.S. in Operations Research and Management Science or in Statistical Science. Can be used to satisfy the requirements for the certificate in Federal Statistics. Cannot be used to satisfy the requirements of the M.S. in Statistical Science. s

530 Mathematical Methods for Statistics and Engineering (3:3:0). Prerequisite: MATH 113. Calculus, linear algebra, and probability results required for the pursuit of an advanced degree in statistics or a related field. Cannot be used to satisfy the requirements of the M.S. in Statistical Science. Designed for students who have not completed the MATH 113-114-213 sequence or need a refresher course. f

544 Applied Probability (3:3:0). Prerequisite: STAT 344 or equivalent, or permission of instructor. Course in probability with applications in computer science, engineering, operations research, and statistics. Random variables and expectation, conditional expectation, random vectors, special distributions, limit theorems, and simulation are covered. f,s

554 Applied Statistics (3:3:0). Prerequisite: STAT 344 or equivalent, or permission of instructor. Application of basic statistical techniques. Focus is on the problem (data analysis) rather than on the theory. Topics include one and two sample tests and confidence intervals for means and medians, descriptive statistics, goodness-of-fit tests, one- and two-way ANOVA, simultaneous inference, testing variances, regression analysis, and categorical data analysis. Normal theory is introduced first with discussion of what happens when assumptions break down. Alternative robust and nonparametric techniques are presented. f,s

574 Survey Sampling I (3:3:0). Prerequisite: STAT 354 or 554; corequisite: STAT 362 or 501. Design and implementation of sample surveys. Covers components of a survey; probability sampling designs to include simple random, systematic, Bernoulli, proportional to size, stratified, cluster and two-stage sampling; and ratio and regression estimators. Practical problems encountered in conducting a survey are discussed. Methods are applied to case studies of actual surveys. Class project is required. f

634 Case Studies in Data Analysis (3:3:0). Prerequisite: STAT 554 and 501 or permission of instructor. Examination of a wide variety of case studies illustrating data-driven model building and statistical analysis. With each case study, various methods of data management, data presentation, statistical analysis, and report writing are compared. as

652 Statistical Inference (3:3:0). Prerequisite: STAT 544 or ECE 528 or equivalent. Fundamental principles of estimation and hypothesis testing. Topics include limiting distributions and stochastic convergence, sufficient statistics, exponential families, statistical decision theory and optimality for point estimation, Bayesian methods, maximum likelihood, asymptotic results, interval estimation, optimal tests of statistical hypotheses, and likelihood ratio tests. s

655 Analysis of Variance (3:3:0). Prerequisite: STAT 554 and 501 or permission of instructor. Single and multifactor analysis of variance, planning sample sizes, introduction to the design of experiments, random block and Latin square designs, and analysis of covariance. as

656 Regression Analysis (3:3:0). Prerequisites: STAT 554, 501 or permission of instructor and matrix algebra. Simple and multiple linear regression, polynomial regression, general linear models, subset selection, step-wise regression, and model selection. Also covered are multicollinearity, diagnostics, and model building. Both the theory and practice of regression analysis are covered. f

657 Nonparametric Statistics (3:3:0). Prerequisite: STAT 554 or 652 or equivalent. Distribution-free procedures for
making inferences about one or more samples. Tests for lack of independence, for association or trend, and for monotone alternatives are included. Measures of association in bivariate samples and multiple classifications are discussed. Both theory and applications are covered. Students are introduced to appropriate statistical software.

658 Time Series Analysis and Forecasting (3:3:0). Prerequisite: STAT 652 or 554 or equivalent. Modeling stationary and nonstationary processes, autoregressive, moving average and mixed model processes, hidden periodicity models, properties of models, autocovariance functions, autocorrelation functions, partial autocorrelation functions, spectral density functions, identification of models, estimation of model parameters, and forecasting techniques.

662 Multivariate Statistical Methods (3:3:0). Prerequisite: STAT 554 or equivalent and STAT 501 or permission of instructor. Standard techniques of applied multivariate analysis. Topics include review of matrices, T-square tests, principle components, multiple regression and general linear models, analysis of variance and covariance, multivariate ANOVA, canonical correlation, discriminant analysis, classification, factor analysis, clustering, and multidimensional scaling. Computer implementation via a statistical package is an integral part of the course.

663/CSI 773 Statistical Graphics and Data Exploration (3:3:0). Prerequisite: A 300-level course in statistics; STAT 554 strongly recommended. Exploratory data analysis provides a reliable alternative to classical statistical techniques that are designed to be the best possible when stringent assumptions apply. Topics covered include graphical techniques such as scatter plots, box plots, parallel coordinate plots and other graphical devices, re-expression and transformation of data, influence and leverage, and dimensionality reduction methods such as projection pursuit.

664/SYST 664 Bayesian Inference and Decision Analysis (3:3:0). Prerequisite: STAT 544 or 554 or equivalent, or permission of instructor. Fundamentals of Bayesian decision theory and its application in statistical inference and decision analysis. Topics include prior distributions and Bayes theorem, proper scoring rules, conjugate priors, approximate posterior distributions, multivariate utility theory, influence diagrams and Bayesian networks, measuring utilities, and probability distributions.

665 Categorical Data Analysis (3:3:0). Prerequisite: STAT 554 or equivalent and STAT 501. Analysis of cross-classified categorical data in two and higher dimensions. Familiarity with the basic test for two-way contingency tables and elementary regression and analysis of variance as presented in STAT 554 is presumed. Topics include measures of association, logistic regression, linear response models, loglinear models, repeated measurements data, and analysis of incomplete tables. A computer statistical package is used extensively for data analysis.

673 Statistical Methods for Longitudinal Data Analysis (3:3:0). Prerequisite: STAT 674 or permission of instructor. Principles of the design and analysis of longitudinal studies. Topics include retrospective and prospective studies, repeated periodic and continuous surveys, rotating of panel surveys, management of a longitudinal database, estimation of the level and change of population means, and proportions and totals over time. Techniques include the classical minimum variance unbiased estimators, time series analysis, and model-based multivariate analysis. Case studies such as the Current Population Survey and the National Crime Survey are presented.

674 Survey Sampling II (3:3:0). Prerequisites: STAT 501, 554 and 574. Continuation of STAT 574. Regression estimators for complex sampling designs, domain estimation, two-phase sampling, weighting adjustments for nonresponse, imputation, nonresponse models, measurement error models, introduction to variance estimation. Applications to case studies of actual surveys are made.

677/OR 677/SYST 677 Statistical Process Control (3:3:0). Prerequisite: STAT 554, 610, or equivalent. See OR 677.

678/OR 675 Reliability Analysis (3:3:0). Prerequisite: STAT 554 or equivalent. Introduction to component and system reliability, their relationship, and problems of inference. Topics include component lifetime distributions and hazard functions, parameter estimation and hypothesis testing, life testing, accelerated life testing, system structural functions, and system maintainability.

682/OR 682/ MATH 685/CSI 700 Computational Methods in Engineering and Statistics (3:3:0). Prerequisites: MATH 203 and 213 or equivalent, or permission of instructor. Numerical methods have been developed to solve mathematical problems that lack explicit closed-form solutions or have solutions that are not amenable to computer calculations. Examples include solving differential equations or computing probabilities. Discusses numerical methods for such problems as regression, analysis of variance, nonlinear equations, differential and difference equations, and nonlinear optimization. Applications in statistics and engineering are emphasized.

700 Multivariate Statistics and Data Analysis I (4:3:1). Prerequisites: STAT 510 or equivalent. Coverage of regression (simple, multiple, multivariate), two-sample tests of means, analysis of variance (ANOVA, ANCOVA, MANOVA, MANCOVA, factorial designs, repeated measures), and factor analysis exploratory and confirmatory), with an emphasis on applications in the health and biological sciences. Students learn how to intelligently apply multivariate statistical methods to data, to carry out the necessary computations using statistical software, and to correctly interpret the results and make accurate statements about their findings. Cannot be used to satisfy the requirements of the M.S. in Statistical Science degree.

701 Multivariate Statistics and Data Analysis II (3:3:0). Prerequisites: STAT 700, HSCI 800 or equivalent. Coverage of discriminate analysis, canonical correlation analysis, structural analysis (LISREL and path analysis), confirmatory factor analysis, and other selected topics (e.g., principal component analysis, cluster analysis, multidimensional scaling, classification trees, etc., depending upon the interests of the class), with an emphasis on applications in the health and biological sciences. Students learn how to intelligently apply multivariate statistical methods to data, to carry out the necessary computations using statistical software, and to correctly interpret the results and make accurate statements about their findings. Cannot be used to satisfy the requirements of the M.S. in Statistical Science degree.

751/CSI 771 Computational Statistics (3:3:0). Prerequisites: STAT 544, 554, and 652. Study of the basic com-

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putational-intensive statistical methods and related methods that would not be feasible without modern computational resources. Covers nonparametric density estimation including kernel methods, orthogonal series methods and multivariate methods, recursive methods, cross-validation, nonparametric regression, penalized smoothing splines, the jackknife and bootstrapping, computational aspects of exploratory methods including the grand tour, projection pursuit, alternating conditional expectations, and inverse regression methods.

779 Topics in Survey Design and Analysis (1-3:1-3:0). Prerequisite: STAT 674 or permission of instructor. Specialized advanced topics in survey sampling building on the foundations in STAT 574 and 674. Topics offered will vary according to the interest and availability of instructors. They include, but are not limited to, administrative records in the analysis of data, adaptive sampling, calibration estimators, capture-recapture models, data security, establishment surveys, model-based inference, measurement error models, non-response models, imputation, multivariate analysis of survey data, record linkage, small area estimation, spatial sampling, survey errors and costs, telephone survey methods, variance estimation, web-based survey methods. Topics may be offered in the form of modules from one to three credits, with a one-credit module being offered over a period of five weeks. Up to three modules may be offered in a single semester for a total of one to three credits. Students may earn up to six credits in this course under different topics.

781/SYST 781/INFS 781 Data Mining and Knowledge Discovery (3:3:0). Prerequisite: STAT 663/CSI 773 or STAT 554 or CS 580 or STAT 664/SYST 664 or CS 650 or INFS 614 or 623 or permission of instructor. Concerned with statistical and computational methods and systems for deriving user-oriented knowledge from large databases and other information sources, and applying this knowledge to support decision making. Information sources can be in numerical, textual, visual, or multimedia forms. Covers theoretical and practical aspects of current methods and selected systems for data mining, knowledge discovery, and knowledge management, including those for text mining, multimedia mining and web mining. Content may vary from semester to semester.

789 Advanced Topics in Statistics (1-6:1-6:0). Prerequisite: Permission of instructor. Topics in statistics not covered in the regular statistics sequence. May be repeated for credit.

798 Master’s Essay (3:0:0). Prerequisites: Nine graduate credits and permission of instructor. Project chosen and completed under the guidance of a graduate faculty member, that results in an acceptable technical report.

799 Master’s Thesis (1-6:0:0). Prerequisites: Nine graduate credits and permission of instructor. Project chosen and completed under the guidance of a graduate faculty member, that results in an acceptable technical report and oral defense.

Study of the Americas (STAM)

Study of the Americas

410 Senior Seminar in the Study of the Americas (3:3:0). Prerequisite: Minors in the study of the Americas with 15 credits. Capstone course in which students investigate a specialized topic (chosen by the professor) from the perspective of their individualized concentration in the major. Each student successfully completes a research project that results in a seminar paper of 25 to 30 pages.

490 Internship in the Study of the Americas (3-12:0:0). Prerequisite: Permission of the program director. Nonpaying, work-study positions in organizations concerned with the Americas. Internships are available with organizations such as government agencies, nongovernment agencies, public interest groups, labor unions, political parties, political activist groups, publications, religious groups, and businesses. Three credits are the usual load, but an internship semester is also possible. Opportunities and requirements for an internship can be discussed with the director of the program. Specific arrangements must be made with and approved by the faculty advisor and the program director. Placement depends on availability of positions, and preference is given to majors in the study of the Americas.

499 Independent Research in the Study of the Americas (1-6:0:0). Prerequisites: Majors in the study of the Americas with 75 credits, and permission of instructor and program director. Intensive investigation of a particular question or problem related to the study of the Americas. Project is proposed by an individual student and carried out in consultation with a member of the center faculty.

690 Internship (2-6:0:0). Prerequisite: Permission of program director. Internships are nonpaying, work-study positions established by the STAM program with employers involved in interdisciplinary STAM issues. Qualified students are placed with area schools, interest groups, agencies, museums, parks, or corporations. Placement depends on availability of positions.

Systems Engineering (SYST)

Systems Engineering

101 Understanding Systems Engineering (3:3:0). This course introduces students to the profession of systems engineering and the curriculum for a B.S. in Systems Engineering at George Mason University. The students will be introduced to large and small systems and asked to understand these systems through the provision of some hands-on experiences. Key concepts will include the understanding of the requirements for a system and the translation of system-level requirements to component-level requirements. Several different kinds of example systems will be presented and discussed, specifically, what objectives of the system are, the system’s major components, how the system works, and what some of the major design issues are. Each student will give a similar presentation on a system of the student’s choice. Students working in groups will design, develop and test a system, and give an oral presentation to the class on the system they developed. The students will be responsible for writing several short papers on the curriculum and the presentations that they have heard.

201 Discrete Dynamic Systems Modeling (3:3:0). Prerequisite: MATH 114. An introduction to the modeling of dynamic systems with examples from many fields in engineering, science, and social sciences: mechanical, computer, biological, economic, urban, and social systems. Linear and nonlinear systems and linearization of such systems. A dis-
crete time system formulation is used to study the properties and behavior of such systems.


203 Systems Modeling Laboratory (1:0:3). Corequisite: SYST 202. Introduction to computer modeling using an engineering modeling environment such as MATLAB. Solution to systems of linear equations, numerical integration and differentiation, interpolation and curve fitting, solution of ordinary differential equations. Simulation and numerical solution of continuous dynamic systems. Discretization of continuous time systems. Use of built-in functions and construction of macros. Graphical presentation of results.

301 Systems Design (3:3:0). Prerequisite: Junior standing; corequisite: SYST 201. Systems engineering design and integration process, the development of functional, physical, and operational architectures. Emphasis is on requirements engineering, functional modeling for design, and formulation and analysis of physical design alternatives. Methods and software tools for systems engineering design are introduced.

302 Systems Methods (3:3:0). Corequisites: CS 112, STAT 344, and SYST 202. Prerequisites: MATH 114. Analysis methods of systems engineering design and management. Decision analysis, economic models and evaluation, optimization in design and operations, probability and statistical methods, queuing theory and analysis, management control techniques, reliability and maintainability analysis, and economic and life-cycle cost analysis. Laboratory exercise with different software programs is included.


371 Systems Engineering Management (3:3:0). Prerequisite: SYST 301; corequisite: SYST 302. Study of the basics of systems engineering management. This includes engineering economics, planning, organizing, staffing, monitoring, and controlling the process of designing, developing, and producing a system that will meet a stated need in an effective and efficient manner. Management tools, processes, and procedures will be discussed, including various engineering documentation templates, managerial processes, and dealing with personnel issues.

410 Modern Telecommunications (3:3:0). Prerequisites: A grade of B or better in CS 211, STAT 344, and SYST 202. A comprehensive overview of telecommunications, including current status and future directions. Topics include a review of the evolution of telecommunications; voice and data services; basics of signals and noise; digital transmission; network architecture and protocols; local area, metropolitan, and wide area networks and narrow band ISDN; asynchronous transfer mode and broadband ISDN; satellite systems, optical communications, cellular radio, personal communication systems, and multimedia services. Examples of real life networks are provided to illustrate the basic concepts and gain further insight.

417 Optimization Methods in Systems Engineering (3:3:0). Prerequisite: SYST 202. An introduction to optimization for systems engineers and others wishing to gain, through a single course, a foundation in linear programming, nonlinear programming, integer programming, dynamic programming, discrete time optimal control, continuous time optimal control, and artificial intelligence techniques for solving optimization problems. Examples drawn primarily from systems engineering, including telecommunications, water resources, transportation, capital budgeting and project management. Emphasis on the geometric motivation and interpretation of key theoretical results and on efficient numerical algorithms.

419 Engineering of Large-Scale Systems (3:3:0). Prerequisite: SYST 417 or OR 441, and MATH 213 or permission of instructor. Formulation and solution of large-scale static and dynamic models of complex systems. Techniques of relaxation and decomposition. Exploitation of special structure. Parallelism. Test and evaluation. Applications to manufacturing, transportation, water resources, and defense.

420 Network Analysis (3:3:0). Prerequisite: SYST 417 or OR 441 and MATH 213. Network nomenclature. Elementary graph theory. Linear and nonlinear network models: multicommodity flow, mathematical games and equilibria on networks, network design and control; dynamic network models; applications to transportation, telecommunications, data communications, and water resource systems.


422 Data Communication and Networks (3:3:0). Prerequisite: A grade of B or better in SYST 410. Introduction to the concepts and design issues in data communication systems. Emphasis on impact of communications technology on information systems.

430 Integration of Hardware and Software (3:3:0). Prerequisite: A grade of B or better in SYST 422. Introduction to hardware and software components of computer systems. Study of hardware and software interchangeability. Understanding and analysis of factors that impact the effectiveness and efficiency of hardware and software integration. Topics include engineering fundamentals for computer design, hardware and software components, tradeoff between hardware and software, analysis of data representations and addressing, impact of the operation design and flow control design on the performance of computer systems, global control, operating system, memory management, input/output characteristics, bus systems, and efficiency analysis. Macro-engineering of computer systems. Study of practical examples in the area of hardware and software design and development in the information technology industry.
442 Decision Support Systems Design (3:3:0). Prerequisite: SYST 301. Studies the design of computerized systems to support individual or organizational decisions. The course teaches a systems engineering approach to decision support system (DSS) development. A DSS is the end product of a development process, and it is this process that is key to successfully integrating a DSS into an organization. Evaluation of DSS. The course emphasizes that a DSS is the end product of the design process, and it is this process that is key to successful integration of a DSS into an organization. A systems engineering approach to DSS design is taken, in which the implications of the research on human information processing for development of a DSS is considered.

451 Knowledge-Based Systems Design and Engineering (3:3:0). Prerequisites: CS 211 and 60 credits. Introduction to the design of expert systems. Fundamentals of expert systems development, including knowledge acquisition and representation, inference, system components, and system design. Introduction to knowledge engineering tools and programming of case study examples using an expert system shell.

470 Human Factors Engineering (3:3:0). Prerequisites: SYST 301, STAT 344. Human information processing, inferential analysis, biases and heuristics in human information processing, support systems to aid in human information processing, human-system interaction, and software systems engineering considerations.

472 Introduction to Systems Integration (3:3:0). Prerequisite: SYST 301. Examination and application of systems integration methodology and methods as a part of systems engineering and as a companion to systems architecting: system integration engineering. Approaches to systems assessment, as a basis for effective systems integration, are considered and applied. The format for the conduct of the course includes a balance of seminars and lectures with competitive small-team system integration tasks that include regular peer reviews and collaboration.

473 Decision and Risk Analysis (3:3:0). Prerequisite: STAT 344. Study analytic techniques for rational decision making that address uncertainty, conflicting objectives, and risk attitudes. The course covers modeling uncertainty; rational decision-making principles; representing decision problems with value trees, decision trees, and influence diagrams; solving value hierarchies, decision trees and influence diagrams; defining and calculating the value of information, incorporating risk attitudes into the analysis; and conducting sensitivity analyses.

489 Senior Seminar (3:3:0). Corequisite: SYST 490. This course is designed to introduce the students to several important topics in systems engineering, provide additional experience to the students in writing and giving presentations, and obtain feedback on the curriculum for the B.S. in Systems Engineering. Several lectures will be devoted to ethics in systems engineering. Writing and making presentations for systems engineering will also be covered early in the semester. Students will attend technical lectures and write a paper on material covered in the lectures. Students will also be required to write a long paper on new technology. The instructor and guest lecturers will present material that is not part of the required course load to expand the horizons of the students. Examples of "hot" topics are "knowledge-based" design, enterprise-wide reengineering, electronic commerce, and optimization by "natural analogs" (simulated annealing, neural networks, genetic algorithms). In addition, students will work in teams to critique and redesign the curriculum in Systems Engineering. Each group will deliver a written product and provide at least one briefing to the class. The best critique and redesign will be presented to the faculty.

490 Senior Design Project I (3:2:1). Prerequisites: SYST 333, 371; corequisites: SYST 417, 470. The first part of a capstone course in the systems engineering program. Students apply the knowledge they have gained in systems engineering methods to a group project. During the first semester of the senior design course, students perform concept definition and requirements analysis. A plan for carrying out the project is developed, culminating in a proposal presented to faculty at the end of the semester.

491 Industrial Project (1:3:0:3:9). Prerequisite: 75 credit hours, SYST 302; must be arranged with an instructor and approved by the department faculty chair before registering. Semester-long work experience in systems engineering in an industrial or governmental organization. The work is supervised jointly by a systems engineer from the sponsoring organization and a faculty member of the department. The project and the arrangements for supervision must be approved by the student's faculty advisor. Periodic reports, a written final report, and a presentation are required.

495 Senior Design Project II (3:1:2). Prerequisite: SYST 490. The second part of the capstone course in the systems engineering program. The design project plans formulated in SYST 490 are reviewed and modified. Additional instruction on documentation and project management is given. The design project is completed, and a formal report is prepared, presented, and evaluated.

498 Independent Study in Systems Engineering (13:0:0). Prerequisites: 60 credits and GPA of at least 3.00; must be arranged with an instructor and approved by the department chair before registering. Directed self-study of special topics of current interest in systems engineering. May be repeated for a maximum of 6 credits if the topics are substantially different.

499 Special Topics in Systems Engineering (3:3:0). Prerequisite: 60 credits; specific prerequisites vary with topic. Topics of special interest to undergraduates. May be repeated for a maximum of 6 credits if the topics are substantially different.

500/CSI 600 Quantitative Foundations for Systems Engineering (3:3:0). Prerequisite: Math 213, 214. This course provides the quantitative foundations necessary for core courses in the Systems Engineering and Operations Research master's program and the certificate program in C'1. Topics include vectors and matrices, differential and difference equations; linear systems; Fourier, Laplace and Z-transforms, and probability theory. Engineering applications of the topics will be emphasized. Students will receive graduate credit for this course which will, when used on a plan of study, extend the minimum credit hour requirements for the degree.

510 Systems Definition and Cost Modeling (3:3:0). Prerequisite: Graduate standing. Comprehensive examination of the methods and processes for the identification and representation of system requirements. Investigation of the systems acquisition life cycle with emphasis on require-
ments definition, including functional problem analysis. Examination of the systems engineering definition phase including requirements, problem analysis, definition, and functional economics. Specification of functional and non-functional requirements, and associated requirements prototyping. Functional economic analysis, including the use of prevailing cost estimation models and planning and control of common operating environments. Lecture and group project including creation of requirements and use of cost estimation model.


513 Total Systems Engineering, Reengineering and Enterprise Integration (3:3:0). Prerequisites: SYST 510 or SYST 520. Principles of strategic quality, including TQM. Quality standards including ISO9000 and 14000. Organizational leadership, cultures, and process maturity, reengineering. Quality, organization learning and reengineering approaches to enable information integration and management and environment and framework integration in the systems engineering of knowledge intensive systems. Emphasis is placed on the role of integrated product and process design teams, standard and commercial off-the-shelf products in enterprise integration. Architecture driven system characteristics are studied, as is transition management of legacy systems.

520 System Design and Integration (3:3:0). Prerequisite: Graduate standing. System design and integration methods are studied and practiced, including both structured analysis and object-oriented based techniques. The course includes the development process of functional, physical, and operational architectures for the allocation and derivation of component-level requirements for the purpose of specification production; examination of interfaces and development of interface architectures. Life cycle of systems is addressed; generation and analysis of life cycle requirements. Software tools are introduced and used for portions of the systems engineering cycle. Students are expected to develop a system design for a system of their choice using both the structured analysis and object-oriented techniques presented in class, and they will make presentations on these designs.

521/OR 643 Network Analysis (3:3:0). Prerequisites: MATH 213 and MATH 203 or equivalent; OR 441 or OR 541. Network nomenclature. Elementary graph theory. Linear and nonlinear network models: multi-commodity flow, mathematical games and equilibria on networks, network design and control. Dynamic network models. Applications to transportation, telecommunications, data communications, and water resource systems.

530 System Management and Evaluation (3:3:0). Prerequisite: Graduate standing. Provides the necessary techniques for evaluating the cost and operational effectiveness of system designs and systems management strategies.

Performance measurement, work breakdown structures, cost estimating, and quality management are discussed. Configuration management, standards, and case studies of systems from different application areas are discussed.

542 Decision Support Systems Engineering (3:3:0). Prerequisite: SYST 301 or graduate standing. Studies the design of computerized systems to support individual or organizational decisions. The course teaches a systems engineering approach to decision support system (DSS) development. A DSS is the end product of a development process, and it is this process that is key to successfully integrating a DSS into an organization. Any DSS is built on a theory (usually implicit) of what makes for successful decision support in the given context. Empirical evaluation of the specific DSS and the underlying theory should be carried on throughout the development process. The course examines some prevailing theories of decision support, considers the issues involved in obtaining empirical validation for a theory, and discusses what, if any, empirical support exists for the theories considered. Students design a decision support system for a semester project.

555 Introduction to Intelligent Systems Engineering (3:3:0). Prerequisite: SYST 451 or SYST 520. Introductory course to Intelligent Systems Engineering for students planning to study systems engineering. This course covers the principles and interrelationships among basic methods in the field, including symbolic and sub-symbolic reasoning, imprecise and approximate reasoning (e.g., fuzzy logic), and neural networks, and emphasizes engineering analysis and system design and implementation. Basic intelligent system principles as well as various engineering applications are covered. This course includes hands-on experience and the design of an experimental intelligent system with state-of-the-art tools.

563 Research Methods in Systems Engineering and Information Technology (3:3:0). Prerequisite: STAT 344 and 354 or equivalent. Provides the foundation for one of the most important activities in systems engineering: information gathering to support drawing conclusions and making decisions about design options and process improvements. The course begins by developing an understanding of the scientific process, the use of empirical evidence to support and refute scientific hypotheses, and the use of scientific information in decision-making. The course covers different sources of scientific evidence: designed experiments, quasi-experiments, field studies, surveys, and case studies. The process of formulating testable hypotheses is discussed. Methods of measurement are discussed, including approaches to measuring soft, hard-to-quantify factors. Presentation of results is discussed. Students do a project involving empirical research.

571 Systems Engineering Management (3:3:0). Prerequisite: SYST 471 or SYST 530. This course is a study of more advanced topics in systems engineering management. This is a seminar style course, and students are expected to read a number of selections from the current literature as well as make presentations and produce papers on engineering management topics. A number of issues in systems engineering management, such as multiproject management, quality programs, and the impacts of process change on the organization will be examined. The course focuses strongly on the practical impacts of various
496 Systems Engineering (SYST)

system engineering management techniques and practices on projects, organizations, and personnel.


573 Decision and Risk Analysis (3:3:0). Prerequisite: STAT 344 or equivalent. Study of analytic techniques for rational decision making that address uncertainty, conflicting objectives, and risk attitudes. This course covers modeling uncertainty; rational decision-making principles; representing decision problems with value trees, decision trees, and influence diagrams; solving value hierarchies, decision trees, and influence diagrams; defining and calculating the value of information; incorporating risk attitudes into the analysis; and conducting sensitivity analysis. (Offered concurrently with SYST 473. Students may not receive credit for both SYST 473 and SYST 573.)

595/ECE 595 Discrete Event Systems (3:3:0). Prerequisite: SYST 500 or equivalent. Introduction to the modeling and analysis of discrete event dynamical systems. Elements of discrete mathematics including sets and multisets, lattices, relations, and graph theory. Systems and models. Untimed and timed models of discrete event systems. Condition/event nets; place/transition nets and their properties. Concurrent and asynchronous processes. Colored Petri nets and the modeling of systems. Simulation and performance analysis. Applications from several domains: Command and control, air traffic control, flexible manufacturing systems, robotics, decision making organizations, and decision support systems.

611 System Methodology and Modeling (3:3:0). Prerequisite: SYST 500 or equivalent. This course provides a broad, yet rigorous, introduction to methodologies for Systems Engineering. Emphasis is on systems modeling and performance. Topics include system model and behavior analysis, linear and nonlinear systems, discretization and linearization, optimization, dynamic programming and optimal control. These methodologies address system performance issues and assist in the evaluation of alternative system designs. Resource allocation for planning and control is also introduced.

621 Systems Architecture for Large-Scale Systems (3:3:0). Prerequisite: SYST 510 or equivalent. Introduction to system architecture for the technical description of large-scale systems. An intensive study of the relationships between the different types of architecture representations and the methodologies used to obtain them. Systems engineering approaches for transitioning from functional descriptions to structure and architectural descriptions. Analysis of existing architectures and design of new architectures. The role of modeling, prototyping, and simulation in architecture development. Executable models of system architectures and performance evaluation. The role of the systems architect, the systems architecting process, and systems management of architecture and design activities. System interoperability, integration, and interfaces. A case study of a large-scale system conceptual architecture will be used to demonstrate application of systems architecture principles.

659 Topics in Systems Engineering (3:3:0). Prerequisite: Permission of instructor. Topics not covered in the department’s regular systems engineering offerings. Course content may vary each semester depending on instructor and the perception of students’ needs. Course may be repeated once for credit.

664/STAT 664 Bayesian Inference and Decision Theory (3:3:0). Prerequisite: STAT 544 or STAT 534 or equivalent. This course introduces students to decision theory and its relationship to Bayesian statistical inference. Students will learn the commonalities and differences between the Bayesian and frequentist approaches to statistical inference, how to approach a statistics problem from the Bayesian perspective, and how to combine data with informed expert judgment in a sound way to derive useful and policy relevant conclusions. Students will learn the necessary theory to develop a firm understanding of when and how to apply Bayesian and frequentist methods, and will also learn practical procedures for inference, hypothesis testing, and developing statistical models for phenomena. Specifically, students will learn the fundamentals of the Bayesian theory of inference, including probability as a representation for degrees of belief, the likelihood principle, the use of Bayes Rule to revise beliefs based on evidence, conjugate prior distributions for common statistical models, and methods for approximating the posterior distribution. Graphical models are introduced for constructing complex probability and decision models from modular components.

671/OR 671 Judgment and Choice Processing and Decision Making (3:3:0). Prerequisite: STAT 510. Intuitive nature of human judgment and decision making, and some methods currently being used for improving individual and group decision. The nature of judgment emphasizing limitations on human information processing abilities. The use of decision-analytic techniques to improve decision making.

672/ECE 651/CS 685: Intelligent Systems for Robots (3:3:0). Prerequisite: SYST 611 or ECE 650 or CS 580 or SYST 555. Review of recent developments in the area of intelligent autonomous systems. Study of the applications of artificial intelligence, control theory, operations research, decision science, computer vision, and machine learning to robotics. Correspondences between various fields are also studied. Topics include analysis and design of methods, algorithms and architectures for planning, navigation, sensory data understanding, visual inspection, spatial reasoning, motion control, learning, self-organization, and adaptation to the environment.

677/OR 677/STAT 677 Statistical Process Control (3:3:0). Prerequisite: STAT 510, STAT 534, or STAT 544 or equivalent. Introduction to the concepts of quality control and reliability. Acceptance sampling, control charts.
and economic design of quality control systems are discussed, as are system reliability, fault-free analysis, life testing, repairable systems, and the role of reliability, quality control, and maintainability in life-cycle costing. The role of MIL and ANSI standards in reliability and quality programs is also considered.

680/ECE 670/0R 683 Principles of Command, Control, Communications, and Intelligence (C3I) (3:3:0). Prerequisites: ECE 528 or OR 542 or equivalent. Fundamentals of C3I are developed from a descriptive, theoretical, and quantitative perspective. Topics include C2 process; quantitative models for combat, sensing, data fusion; individual and team decision making; organizational theory; tools for modeling C2 systems; and evaluations of C2 systems.

683 Modeling, Simulation, and Gaming (3:3:0). Prerequisites: MATH 213, SYST 500 or equivalent and graduate standing. Develops methods for designing combat models and games. Existing combat models are critical to the C3I process. Exercises and games are used to demonstrate the value of properly developed C3I modules in a combat simulation.


685 Estimation and Tracking: Principles and Techniques (3:3:0). Prerequisite: ECE 528 or OR 542 or STAT 544 or equivalent. Principles and estimation techniques for static and dynamic systems, linear and nonlinear, discrete and continuous time. Estimation for kinematic models, track initiation, bearing-only tracking, tracking maneuvering targets with adaptive filtering, MM (Multiple Model) and interactive MM algorithms. Tracking single target in clutter, nearest neighbor algorithm, tracking and data association, Multiple hypothesis tracking. Tracking performance evaluation.

691/EEP 601 Introduction to Enterprise Engineering: Engineering and Policy (4:3:1). Prerequisite: INFS 614, or equivalent. This course provides an overview of Extended Enterprise Integration. Lectures focus on the SAP architecture and the R/3 standard software solution. Laboratory requires students to complete an end-to-end implementation project with the Great Plains Software midrange ERP solution, Dynamics C/S+. For modeling, students must demonstrate complete proficiency in the Architecture of Information Systems (ARIS) methodology, and the supporting ARIS Toolset.

692/EEP 602 Decision Support for Enterprise Integration (3:3:0). Prerequisite: SYST 542 and SYST 691. Lectures focus on the use of "business intelligence" to enhance competitive advantage; developing an information driven set of controls to improve profitability; and emphasizing the creation of a balanced business with aligned corporate direction and strategic intent. Solutions provided within ERP systems are examined.

693/EEP 603 Supply Chain Integration and Management (Business-to-Business Electronic Commerce) (3:3:0). Prerequisite: SYST 691. Lectures focus on two issues: Supply chain integration from an information technology perspective, and supply chain management from a decision support perspective. The motivation for the course is the merging of enterprise computing with operations research, primarily through customer/supply chain management systems. Topics include ERP/web integration, advanced planning, and customer relationship management.

694/EEP 604 E-Commerce Architectures (Business-to-Consumer Electronic Commerce) (3:3:0). Prerequisite: SYST 691. Introduction to the network and system architectures that support high volume business to consumer web sites and portals. Course provides insight into the structure of the modern web enabled storefront. Critical business and technology issues include Storage Area Networks (SANs), server clustering, load balancing techniques at the server and network level, fault tolerance, and recovery of database and application servers.

695/EEP 605 Economics of Electronic Commerce (3:3:0). Prerequisite: SYST 691. Focuses on gaining competitive advantage through electronic commerce implementation; the identification and growing of new market opportunities, as well as the electronic enabling of existing business relationships; business-to-consumer relationships, as well as the economics of strategic procurement, ERP hosting, customer relationship management, catalog hosting, portal operations, and supplier management.

696/EEP 606 Customer Relationship Management (3:3:0). Prerequisite: SYST 691. Focuses on the “front office” and its integration with the “back office.” The modern world of e-commerce extends intra-enterprise integration as implemented in Enterprise Resource Planning (ERP) systems to include external constituents, such as customers, partners, and suppliers. This course is focused on modern system support for the demand chain and the value creation process that results from integrating the front office systems (e.g., CRM) with the back office systems (ERP).

697/EEP 607 Critical Information Technology Infrastructures (3:3:0). Prerequisite: SYST 694. Design and implementation of high-speed network and application services in support of modern Enterprise Resource Planning (ERP) systems. Critical technologies include high-speed data communication, switched vs. routed data flow, workflow engines, business rule and web application servers, and load balancing technologies. A large-scale web-enabled ERP system architecture will be examined in detail.

698 Independent Study and Research (3:3:0). Prerequisites: Graduate standing, completion of at least two core courses, permission of instructor. Study of a selected area in systems engineering or C3I under the supervision of a faculty member. A written report is required.

760 Special Topics in Command, Control, Communications, and Intelligence Systems Engineering (3:3:0). Prerequisite: SYST 680. Special topics in the C3I area, with different content in different terms. Representative areas include quantitative evaluation of C3 systems, applications of artificial intelligence in C3 systems, and military communications systems.

781/INFS 781/STAT 781: Data Mining and Knowledge Discovery (3:3:0). Prerequisites: SYST/STAT 644 or CS 650 or INFS 623 or equivalent. This course is concerned with methods and systems for deriving user-oriented knowledge from large databases and other information sources, and applying this knowledge to support decision making. Information sources can be in numerical, textual, visual, or...
multimedia forms. The course covers theoretical and practical aspects of current methods and selected systems for data mining, knowledge discovery, and knowledge management, including those for text mining, multimedia mining, and web mining.

798 Research Project (3:0:0). Prerequisite: 21 graduate credits. Research project chosen and completed under the guidance of a graduate faculty member, resulting in an acceptable technical report.

799 Master's Thesis (1:6:0:0). Prerequisites: 21 graduate credits and permission of instructor. Research project chosen and completed under the guidance of a graduate faculty member, which results in a technical report acceptable to a three-member faculty committee, and an oral defense.

Technology Management (TECM)

School of Management

610 Communications and Leadership (2:2:0). Prerequisite: Admission to the technology management program. Focuses on developing skills in vivid, succinct, and memorable professional communications with emphasis on communicating effectively with peer decision makers. Participants create formal and informal presentations and written executive summaries and proposals. The roles of the CIO and the IT manager are explored.

615 Decision Making Using Accounting and Financial Information (3:3:0). Prerequisite: Admission to the technology management program. Focuses on valuation of information technology companies, projects, and product lines. Value chain analysis and activity based management are explored as the basis for effective financial management. Skills and knowledge in the use of coexisting strategic, financial, and information plans are developed.

620 Economics of Technology Management (2:2:0). Prerequisite: Admission to the technology management program. Economic environments of IT industry, demand models, resource organization and substitutability, measures of efficiency and productivity are illuminated. The course includes information economics as it relates to IT companies.

635 Metrics and Statistics for Quality and Project Management (2:2:0). Prerequisite: Admission to the technology management program. Explores current metrics and metric development for quality, intangible assets, and project management as required within IT companies. Applies statistical tools of best use with these metrics.

640 Management of Consulting and Technical Professionals (3:3:0). Prerequisite: Admission to the Technology Management Program. Leadership, motivation, career development, performance evaluation, and team design, composition and facilitation in professional service environments. Helps participants understand both themselves and those they manage.

660 Negotiation, Conflict Resolution and Group Decision Making (2:2:0). Prerequisite: Admission to the technology management program. Techniques for making group decisions and resolving internal team conflicts, as well as negotiating effectively with outside parties. Applications include technology assessments, outsourcing decisions, project bidding, and contract negotiations.

700 Business Engineering and Change Management (2:2:0). Prerequisite: Admission to the Technology Management Program. Change management, the visualization, planning, and implementation of transitions throughout the organization or business unit, is fast becoming a key source of competitive advantage. The course will provide the theory and practice of change management and strategic planning including organizational development and organizational transformation.

702 Interpersonal Dynamics and Teamwork (3:3:0). Prerequisite: Admission to the Technology Management Program. Development of behavioral skills integral to effective teamwork and interpersonal relationships in work environments. Techniques for making group decisions and resolving internal team conflicts, as well as negotiating effectively with outside parties are covered.

703 Technology Assessment, Evaluation, and Investment (3:3:0). Prerequisite: Admission to the Technology Management Program. This course prepares the student to be an educated consumer of information technology to maximize the strategic advantage of IT to an organization. Information technologies, architectures, and products are categorized and analyzed with a view to develop and maintain the most favorable IT asset portfolio to successfully carry out business goals and strategies. Techniques for making technology assessments, outsourcing decisions, project bidding, and contract negotiations.

704 Planning and Control of Projects (3:3:0). Prerequisite: Admission to the Technology Management Program. Focuses on project scheduling, time-cost tradeoffs, budgeting, cost control, and project monitoring. Special emphasis on cost-management aspects of technology projects in intensive industries. Software and case studies will be used.

720 Analysis of IT Industries (2:2:0). Prerequisite: Admission to the technology management program. Develops knowledge of the status of the IT industry and its companies and segments. Students analyze IT companies using Porter's Five Forces Model, examine industry segments, and create an electronic database with their findings and analysis.

735 Technology Management Capstone Project (2:2:0). Prerequisite: Admission to the technology management program. Teams undertake a strategic evaluation and plan for IT-driven business initiatives. Team presentation of results include 1) an analysis of competitive forces and the value chain, 2) recommendations, including changes in goals and organizational design, 3) a plan of action integrating marketing, human resource development, organizational design, finance, and information technology, and 4) an implementation plan using theories of communication and change management, to include the business case and a business plan.

740 Management of Client Relationships (3:3:0). Prerequisite: Admission to the technology management program. Proposal development, bidding, legal issues of contracts and agreements, formation of commercial partnerships, and new business development. Methods and practices for conducting client needs assessment and managing deviations of scope. Application of the principles of marketing information systems and technology to internal and external customers.

745 Business Functions & Operations: Client Industries (2:2:0). Prerequisite: Admission to the technology management program.
ment program. Explores best practices in the IT industry. Students analyze practices in terms of gaining competitive advantage in an industry where the scarcity economic model for products no longer applies. Course work focuses on leading an organization with the IT function.

750 Global IT Management (3:3:0). Prerequisite: Admission to the technology management program. Students spend a week in an international residency. Dealing with technological changes across international markets and amidst global developments, virtual organizations, and project management across cultures are emphasized. Corporate site visits are combined with presentations by professors from universities outside the United States and presentations by relevant practitioners.

Telecommunications (TELE)

Communication

350 Structure of the Telecommunications Industry (3:3:0). Prerequisite: 60 credits or permission of instructor. Study of the evolution and operation of telecommunications systems from wireline telegraphy to wireless voice, video, and data services. Topics include communication coding systems, analog and digital modulation schemes, twisted pair telephony, broadband coaxial cable, and high-power direct-to-home digital satellite.

450 Telecommunications Senior Seminar (3:3:0). Prerequisite: 90 credit hours or permission of instructor. Students explore the complex interrelationships that affect modern telecommunications and how major mergers, acquisitions, regulatory decisions, congressional initiatives, or engineering breakthroughs can each profoundly affect the telecommunications industry at any given time. Serves as the capstone seminar in the telecommunications minor.

730 Telecommunications Management (3:3:0). Prerequisite: Graduate standing. Surveys the strategic and organizational issues in the field of telecommunications management. Focus is on strategic management and oriented toward the executive management level of telecommunications firms.

750 Coordinating Seminar (3:3:0). Prerequisite: Open only to students in the M.A. or M.S. in Telecommunications programs with at least 18 credits of course work. Topics include specific telecommunications problems in management, law, engineering, education, and communication. Focuses on the ways a problem in one area can create or solve a problem in other areas.

764 Telecommunications Internship (3:6:1:2:0). Prerequisites: Graduate standing and permission of the M.A in Telecommunications program director. Students work in an approved professional-level telecommunications position, meeting regularly with their agency and university internship supervisors. A paper and a journal are required, as well as a minimum of 60 hours work for each credit hour of enrollment. Normally, students enroll in internships at the end of the program of study.

798 Directed Readings and Research (3:3:0). Prerequisites: Graduate standing in Telecommunications, 15 hours of graduate credit completed, and permission of department. Specialized course designed for students who have a desire to explore a telecommunications topic in greater depth than through the current course work provided in the curriculum. A written report is required; an oral or written examination may be required.

799 Thesis (1-6:0:0). Prerequisites: Degree candidacy in the M.A. in Telecommunications, completion of 24 credits of graduate course work, and approval of a thesis proposal by the faculty advisor and telecommunications director. Individualized section form required. Original research related to the student's concentration in telecommunications. Research must result in a document meeting university standards. Graded S/NC.

Telecommunications (TCOM)

School of Information Technology and Engineering

500/ECE 540 Modern Telecommunications (3:3:0). Prerequisite: Graduate standing. A comprehensive overview of telecommunications, including current status and future directions. Topics include a review of the evolution of telecommunications; voice and data services; basics of signals and noise, digital transmission, network architecture and protocols; local area, metropolitan and wide area networks and narrow band ISDN, asynchronous transfer mode and broadband ISDN; and satellite systems, optical communications, cellular radio, personal communication systems, and multimedia services. Examples of real-life networks are provided to illustrate the basic concepts and gain further insight.

501 Data Communications and Local Area Networks (1.5:1.5:0). Prerequisite: Graduate standing. Network concepts; Open Systems Interconnection (OSI) reference model and layering; data coding; analog/digital communications review; Physical layer and data link control; switching and multiplexing; commercial digital link standards; Data Link Layer Control (DLC) functions. DLC protocols; flow control; error control; link management; common link protocols. Local Area Networks (LANs); basics, definitions, media access control; LAN performance; LAN standards, rings and buses; bridging and frame relay.

502 Wide Area Networks and Internet (1.5:1.5:0). Prerequisite: Graduate standing. OSI reference model review; packet network layer functions; connection-oriented and connectionless packet switching; X.25 and X.75 standards; SONET and Packet-over-SONET; circuit-switched networks and control signaling; congestion control and traffic management; virtual private networks; introduction to network management; routing methods; internetworking; introduction to Internet Protocol concepts; OSI transport layer client-server model; domain name systems; and telnet.

503 Fiber Optic Communications (1.5:1.5:0). Prerequisite: TCOM 500. Introduction and overview of optical fiber communications systems. Course covers basic elements of fiber optic networks: semiconductor light sources (light emitting diodes and laser diodes), fiber optic waveguides, network system design issues, link budget analysis, and component requirements. Additional topics may include wavelength-division multiplexed and Time-Division Multiplexed networks and optical switching systems.

504 Asynchronous Transfer Mode Networks (1.5:1.5:0). Prerequisites: TCOM 500, 501, 502, or equivalent. Asynchronous Transfer Mode (ATM) concept, protocols, services, and applications. The emphasis is on the standards
500 Telecommunications (TCOM)

and technology of ATM for local and wide area networks. Relation to broadband ISDN; ATM switching, multiplexing and transport; user-network and network-network interface aspects; ATM Adaptation layer; Access switching; ATM Wide Area Network switches; design and practice of networks based on ATM technology.

505 Networked Multicomputer Systems (1.5:1.5:0). Prerequisites: TCOM 500, 501, or equivalent. Introduction to the systems engineering of a networked multicomputer system. Study of distributed multicomputer architectures, architecture of a network operating system, and key system components. The focus of this course is on the development of a thin-client/server system, requirements analysis of a client/server web computing, system planning and implementation. The course includes a study of example multicomputer systems and a discussion of future directions.

506 Personal Communication Systems (PCS) (1.5:1.5:0). Prerequisites: TCOM 500, 501, 551, and 552 or equivalent. An introduction to Personal Communication Systems (PCS). The course guides the students through several topics of this emerging area, describing the multiple technical layers of the PCS systems. It begins with data-link level and network layer protocols, including their implementation. This is followed by mobile station operation and base station operation, and description of how voice and data services work. In the final part, the vital issues of user authentication, privacy and data or voice encryption are discussed.

507 Introduction to Satellite Communications (1.5:1.5:0). Prerequisite: TCOM 500 and 551 or equivalent. An introduction to modern satellite communication systems. Topics include satellite channel characterization, channel impairment and transmission degradation, link budget calculation, modulation, coding, multiple access, demand assignment, synchronization, switching, onboard processing, and transponder design.

508 Advanced Satellite Communications (1.5:1.5:0). Prerequisites: TCOM 500, 507. An in-depth study of contemporary satellite communication system design and analysis. Topics include mobile satellite communications, VSAT, DBS, traffic capacity, access control, orbital analysis, LEO constellations, payload design, link analysis, interoperability and intersatellite links, cellular applications.

509 Internet Protocols (1.5:1.5:0). Prerequisites: TCOM 501 and 502. The Internet Protocol (IP) Suite: principles, protocols, and architecture; Internetworking; Internet addressing; IP, routing protocols (RIP, OSPF, BGP); Internet Control Message Protocol; Internet Group Management Protocol; User Datagram Protocol; Transmission Control Protocol; Client-Server Model, Domain Name System, Socket Interface; Internet applications (TELNET, FTP, SNMP, HTTP, etc.); Internet security; Internet multicasting; quality-of-service in the Internet (RSVP, DiffServ, MPLS); Mobile IP; Next Generation Internet (IPv6).

510 Client-Server Architectures and Applications (1.5:1.5:0). Prerequisite: TCOM 500. Fundamentals of application engineering for client/server (C/S) Internet environments. Review of C/S application architectures and system perspective on C/S middleware. Study of web-based middleware, distributed data managers and SQL middleware, distributed transaction processing middleware, and C/S object technology.

513 Optical Communications Networks (1.5:1.5:0). Prerequisite: TCOM 503. Introduction and overview of current developments in Optical Communication Networks. Course emphasis will be on the underlying technologies that make the all-optical networks possible. Specific topics include components needed for Wavelength Division Multiplexed Systems and Dense Wavelength Division Multiplexed Systems; tunable wavelength lasers, wavelength add/drop multiplexer, space division switching, and wavelength-routing networks; optical LAN, MAN, and WAN concepts; passive and active wavelength filters, switches and routers; free-space optical networks.

516 Global Positioning System (GPS) (1.5:1.5:0). Prerequisite: TCOM 551. Background in long range navigation developments; early global systems; space based systems; GPS and GLONASS systems; system architecture; spacecraft and earth station characteristics; design concepts of the CA and P GPS signal modes; frequencies, modulation, and other design aspects; clock issues; range and accuracy calculations and limitations; advanced concepts.

519 Voice over IP (1.5:1.5:0). Prerequisite: TCOM 501, 502, 509. Concept of transporting Voice over a Packet Switched Network; typical VoIP network scenarios (campus, multi-site private network, calling nationwide and international); communications protocols for VoIP (RTP, RTCP, RFC 1889, H.323, etc.); conferencing and security issues; quality issues (delay, Mean Opinion scores); VoIP network design.

520 Economics of Telecommunications (3:3:0). Prerequisite: Graduate standing; TCOM 500. Management of telecommunications networks; economic concepts in a changing climate of telecommunications ownership, deregulation, and privatization; resource allocation fundamentals based on internal rate-of-return, net present value, opportunity costs, etc.; valuation of potential acquisitions in a broad telecommunications market; financial modeling techniques.

521 Systems Engineering for Telecommunications Management (3:3:0). Prerequisite: TCOM 500. Advanced software principles, techniques and processes for designing and implementing complex communication systems. The planning and implementation of communications systems from strategic planning through requirements, the initial analysis, the general feasibility study, structured analysis, detailed analysis, logical design, and implementation. Current system documentation through use of classical and structured tools and techniques for describing flows, data flows, data structures, file designs, input and output designs, and program specifications. The student gains practical experience through a project.

540 Telecommunications Network Optimization: Routing, Flow Management, and Capacity Modeling (1.5:1.5:0). Prerequisite: TCOM 500. Provides the student with state-of-the-art knowledge and techniques so he is able to apply operations research knowledge to optimal dimensioning, design and use of telecommunication networks. This subject includes review of traffic models in telecommunication networks including models for particular streams and multiplexing, as well as multi-rate and multi-hour models. Theory, algorithms and computational aspects of linear, network, and integer programming; formulation of telecommunication problems as optimization models, and review of solution strategies. Topics include maximum
flow, shortest paths, minimum cost flows; data structure for trees and graphs; applications, modeling, theory and algorithms for optimal location of service facilities (concentrators, multiplexers, etc.) in telecommunication networks.

541 Network Design and Pricing (1.5:1.5:0). Prerequisite: TCOM 500. Capacity planning, capital budgeting and reliability modeling for determining optimal design. Economic models of pricing alternative telecommunications systems, project selection evaluation, and mechanisms for determining the reliability of complex networks. This course concentrates on the modeling and evaluation. Software tools are provided and tested throughout the course.

542 Stochastic Models in Telecommunications. (1.5:1.5:0). Prerequisite: TCOM 500. Review of teletraffic theory: Erlang’s loss formula, equivalent random method, delay and delay-loss systems, etc.; complex simulation modeling and statistical analysis of outputs. Parameter estimation, evaluation of quality, etc.

545 Reliability and Maintainability of Networks (3:3:0). Prerequisite: TCOM 500. Stochastic modeling of network reliability, simulation modeling, modeling replacement strategies. An introduction to concepts of quality control, sampling for acceptance, and economic design of quality control systems are discussed, as is system reliability. Faulty tree analysis, life testing, repairable systems and the role of reliability, quality, and maintainability in life-cycle costing.

546 Financial Models of Telecommunications Systems (3:3:0). Prerequisite: TCOM 500. Telecommunication properties and systems. Broadcast, cable, and common carrier capitalization. Pricing, acquisition criteria, and forecasting techniques. Economic analysis of regulations and policies affecting telecommunications. Compares policy objectives with the actual effects of policies, emphasizing economic principles. Determining appropriate discount and hurdle rates, life cycle costing, evaluating technology horizons, and depreciation concerns will be discussed. Studies the economic analysis of regulations and policies affecting the mass media. Compares policy objectives with the actual effects of policies, emphasizing economic principles. Uses economic and sociological theories to analyze the impacts of information technologies on economic organizations, markets, competitive strategies, and communication policy design.

548 Security and Privacy Issues in Telecommunications. Prerequisite: Graduate standing. An introduction to secure data and voice communications. Topics include cryptography, cipher systems, practical security schemes, confidentiality, authentication, integrity, access control, non-repudiation, and their integration across a telecommunications network. The course reviews threats and vulnerabilities in distributed systems.

551 Digital Communication Systems (3:3:0). Prerequisite: TCOM 500. Digital transmission of data, voice, and video. The course covers the following topics: signal digitization; modulation and demodulation; error correction coding; multiple access methods; multiplexing; synchronization; channel equalization; frequency spreading; encryption; transmission codes; digital transmission using bandwidth compression techniques; elements of information theory; development of link budget evaluation (system noise temperature, Nyquist filter concepts, antenna gain, filter bandwidth, etc.).

552 Introduction to Mobile Communications Systems (3:3:0). Prerequisites: TCOM 500 and 531. An introduction to mobile communication system design and analysis. Topics include the mobile communication channel, access and mobility control, mobile network architectures, connection to the fixed network, and signaling protocols for mobile communication systems. Examples of mobile communication systems including the panEuropean GSM system, the North American DAMPS system, and Personal Communication Systems.

553 Carrier Telecommunications (1.5:1.5:0). Prerequisite: TCOM 500. Sampled signals, delta modulation; adaptive delta modulation; pulse amplitude modulation; pulse code modulation. Sampling theorem; quantization; quantization noise; aliasing; time division multiplexing; North America/Japan T carriers; European Ecarriers. Introduction to digital communications: data codes; baseband line codes; noise and its effects; modulation and demodulation methods Amplitude shift keying; frequency shift keying; phase shift keying; differential phase shift keying; multi-level signaling; hybrid signaling; comparative performance.


556 Applied Cryptography (1.5:1.5:0). Prerequisites: TCOM 500 and 548. A broad overview of cryptographic algorithms and mechanisms and their application in today’s communication networks. Discussion of modern cryptographic techniques such as public key cryptography, digital signatures, secret sharing, key management, key escrow, public key certificates, and public key infrastructure. Use of cryptography on the Internet including secure electronic mail, secure WWW, and electronic commerce. Comparison and analysis of software implementations of cryptographic algorithms.

590 Selected Topics in Telecommunications (1.5,3.0). Prerequisite: permission of instructor; specific prerequisites vary with the subject of the topic. Selected topics from recent developments and applications in various engineering disciplines within specialty modules 1, 2, and 3 of the TCOM program. The course is designed to help the professional engineering community keep abreast of current developments. The 1.5 credit course lasts for one-half semester (approximately seven weeks) while the 3.0 credit course lasts for the full semester.

591 Selected Topics in Telecommunications (1.5,3.0). Prerequisite: permission of instructor; specific prerequisites vary with the subject of the topic. Selected topics from recent developments and applications in various engineering disciplines within specialty modules 4 and 5 of the TCOM program. The course is designed to help the professional engineering community keep abreast of current developments. The 1.5 credit course lasts for one-
half semester (approximately seven weeks) while the 3.0 credit course lasts for the full semester.

598 Independent Study in Telecommunications (1.5,3.0: 1.5,3.0:0). Prerequisite: Graduate standing; approval of program director. Directed self-study of special topics in telecommunications that relate to specialty modules 1, 2, and 3. Topics must be arranged with an instructor and approved by the program director before registering. The course may be taken for either 1.5 credits or 3.0 credits in the fall and spring semesters. NOTE: No more than a total of 6 credits may be taken from a combination of TCOM 598, TCOM 599, TCOM 696, and TCOM 697 courses for credit within the TCOM program.

599 Independent Study in Telecommunications (1.5,3.0: 1.5,3.0:0). Prerequisites: Graduate standing; approval of program director. Directed self-study of special topics in telecommunications that relate to specialty modules 4 and 5. Topics must be arranged with an instructor and approved by the program director before registering. The course may be taken for either 1.5 credits or 3.0 credits in the fall and spring semesters. NOTE: No more than a total of 6 credits may be taken from a combination of TCOM 598, TCOM 599, TCOM 696, and TCOM 697 courses for credit within the TCOM program.

690 Advanced Topics in Telecommunications (3:3:0). Prerequisite: permission from instructor; specific prerequisites vary with the subject of the topic. Advanced topics from recent developments and applications in various engineering disciplines within specialty modules 1, 2, and 3 of the TCOM program. The advanced topics are chosen in such a way that they do not duplicate existing TCOM courses. Active participation of the students is encouraged in the form of writing and presenting papers in various research areas of the advanced topic. The course is designed to enhance the professional engineering community's understanding of breakthrough developments in specific areas.

691 Advanced Topics in Telecommunications (3:3:0). Prerequisite: permission from instructor; specific prerequisites vary with the subject of the topic. Advanced topics from recent developments and applications in various engineering disciplines within specialty modules 4 and 5 of the TCOM program. The advanced topics are chosen in such a way that they do not duplicate existing TCOM courses. Active participation of the students is encouraged in the form of writing and presenting papers in various research areas of the advanced topic. The course is designed to enhance the professional engineering community's understanding of breakthrough developments in specific areas.

696 Independent Reading and Research (1.5,3.0: 1.5,3.0:0). Prerequisites: Graduate standing; approval of program director. Study of a selected area within specialty modules 1, 2, or 3 under the supervision of a faculty member. A written report is required. NOTE: No more than a total of 6 credits may be taken from a combination of TCOM 598, TCOM 599, TCOM 696, and TCOM 697 courses for credit within the TCOM program.

697 Independent Reading and Research (1.5,3.0: 1.5,3.0:0). Prerequisites: Graduate standing; approval of program director. Study of a selected area within specialty modules 4 or 5 under the supervision of a faculty member. A written report is required. NOTE: No more than a total of 6 credits may be taken from a combination of TCOM 598, TCOM 599, TCOM 696, and TCOM 697 courses for credit within the TCOM program.

698 Telecommunications Projects Course (3:3:0). Prerequisite: Graduate standing. This course is intended to be taken towards the end of the degree program within any of the modules 1, 2, or 3. The primary activity in the course is completing a major applied project, preferably within a group of two to three people. A secondary goal is consolidating students' training before graduation so that, in some cases, it may act as a capstone course. Students and outside telecommunication industry managers will be asked to present ideas for projects and, through the grouping of the students, new skills and approaches may be learned from others within the group. Some class time will be used for discussion of the projects, either to monitor their progress, or as a way of exploring alternative approaches. The class will also have a series of readings and class-time discussion of current trends, difficulties, and new opportunities for the particular industry most relevant to the module the project is in. The course concludes with presentations of the projects results to the department faculty.

699 Telecommunications Project Course (3:3:0). Prerequisite: Graduate standing. Designed to be the capstone of the degree program under the specialty modules 4 or 5. It is intended that it be taken toward the end of the degree program. The primary activity in the course is the completion of a major applied project, preferably as a two- to three-person group. A secondary goal is the consolidation of student's training before graduation. Students as well as outside telecommunication industry managers are asked to present ideas for projects. From these ideas, group projects are selected. Some of the classroom time is used for discussion of the projects, either to monitor their progress, or as a way of exploring alternative approaches. The class has a series of readings and class-time discussion of current trends, difficulties, and new opportunities for the industry. At the end of the semester, the course presents the results of the projects to the department faculty.

Theater (THR)

College of Visual and Performing Arts

101 Theatrical Medium (3:3:0). Designed to introduce the student to the medium of theatrical performance, its role in contemporary society, and an investigation of the components of production from conception through performance to ensuing criticism. Delivered in a lecture/demonstration format by a team of theater professionals. Students are required to attend theatrical performances on and off-campus and submit a written report on each.

150, 151 Drama, Stage, and Society I and II (3:3:0), (3:3:0). First semester covers the development of Western drama and theater from its beginnings through Shakespeare. Second semester brings the study up to the present day. Readings in dramatic literature and the history of the theater are considered in their social context.

190 Special Topics (1-3:1-3:0). Rotating topic. Introductory seminar in areas of special interest in the field. May be repeated for a maximum of 12 credits.

195 Theater as the Life of the Mind (3:3:0). This foundational interdisciplinary course traces four themes from classic theater through the television, plays and movies we are
currently creating in the United States. We will develop interpretive perspectives from a range of disciplines and relate the works of art to current events, ideologies, and worldviews. We will develop a glossary of core concepts such as rhetoric, poetry, history, philosophy, signifying structure, politics, and social thought. The course will be strong in content, centered on intellectual and artistic substance, including the history of and main issues of the subject matter. The course is intended to introduce a wide range of students to a liberal arts approach to learning, with a focus on theater, film, and television. The course aims to help make the works of art to current events, ideologies, and worldviews.

200 Play Production Practicum (1:0:0). Academic credit is awarded to Theater B.A. candidates for satisfactory participation in departmental or Theater of the First Amendment productions. One credit is awarded for each assignment up to a total of 4 credits, which fulfills the major requirement. See departmental listing for more information. May be repeated for up to a total of 4 credits.

201 Stage Management (1:1:0). Theory and technique of stage management for theater. Special emphasis on problem-solving skills.

202 Literary Management (1:1:0). Principles of literary management and dramaturgy for the regional/resident theater. Directed primarily toward the development of new work.

203 Production/Company Management (1:1:0). Techniques of production and company management applied to university and professional theater productions.

210 Acting I (3:3:0). This course will introduce students to contemporary acting techniques through individual and/or group exercises, incorporating tools such as observation, sense and emotion memory, improvisation, given circumstances, and actions and objectives. The instructor will use lecture, scene selection, and discussion to familiarize students with the history and development of acting theory, selected examples of its various cultural contexts, and the basic types of stage configurations. Students will be expected to develop an appreciation of the theater and its basic elements through attendance of live performances (on- and/or off-campus), in-class critical evaluation, and oral and written reflection.

215 Stage Make-Up (3:3:0). The theory and practice of stage and television make-up covering character analysis, facial anatomy, application of make-up and period styles.

230 Introduction to Technical Theater (3:3:0). This course will introduce students to the theory, practice, and historical context of the physical production component of theater. Students will study current trends in technical theater and see how they developed from earlier technology. This will be accomplished through lecture and hands-on experience.

231 Introduction to Technical Theater II (3:3:0). A continuation of the work begun in THR 230, stressing the contributions of costumes, sound, and props to theatrical production. Intensive work in drafting for the theater. Participation in Theater Division productions is required.

235 Fundamentals of Costume Construction (3:3:0). Basic flat pattern development, theatrical sewing techniques, and organization of the costume construction process. Includes lab study and practical experience in garment construction and related costume crafts as used in theater costume design.

240 Directing I (3:3:0). Introduction to text analysis, rehearsal procedure, staging techniques, and the development of a production idea. Students direct exercises and short scenes along with preparing written production notes.

300 Voice and Speech Fundamentals (3:3:0). Prerequisite: THR 210 or permission of instructor. Basic techniques in breathing, vocal production, and articulation for the actor.

301 Voice and Speech for the Performer (3:3:0). Prerequisite: THR 300 or permission of instructor. Integration of text and performance problems with voice and speech fundamentals begun in THR 300. Advanced work in vocal production and character-specific sounds.

303 Movement for the Actor I (3:3:0). Development of the physical side of the actor's instrument emphasizing free and responsive expression of impulse and intention.

304 Movement for the Actor II (3:3:0). Advanced work in the techniques established in THR 303.

310 Acting II (3:3:0). Prerequisite: THR 210 or permission of instructor; must be concurrently enrolled in THR 200. Extends the principles begun in THR 210 through scene study, audition technique, and work in analysis, characterization, and relationships.

314 Lighting Stagecraft (3:3:0). Prerequisites: THR 230, or permission of instructor; must be concurrently enrolled in THR 200. Practical and theoretical instruction on how to be a theatrical electrician. Includes ideas on workplace safety, basic electrical procedures of the theater, theatrical electrical production, integrating with other theater professionals, and professionalism.

320 Beginning Modern Acting (3:3:0). Prerequisites: THR 210 and 310 or permission of instructor. Builds on students' existing skills in observation, sense memory, relaxation and improvisation. Students learn a variety of methods for scene preparation to apply to their own acting process.

321 Acting Shakespeare (3:3:0). Prerequisites: THR 210 and 310 or permission of instructor. Develops the student's understanding of the challenges of performing Shakespeare by building upon the body of acting skills and knowledge already acquired. The course focuses on how structure of language in the plays reflects, reveals, and expresses the emotional life of the character. Students use detailed script analysis, expansion of vocal range, and use of actions and objectives to achieve the experience of transforming Shakespeare's language into powerful theatrical expressions.

322 Alexander Technique/Stage Combat (3:3:0). Offered during the Beginning Modern Acting time block but open to all theater majors.

330 Seminar in Technical Theater (3:3:0). Prerequisite: THR 230 or permission of instructor. Rotating topic. Offered periodically, the course addresses a selected topic in design or technical theater on an advanced level. May be repeated for a total of 24 credits.

333 Stage Design (3:3:0). Prerequisite: THR 230 or permission of instructor. Fundamentals of creating, developing, and communicating the design idea through sketches.
plans, rendering, and/or models. Analysis of text from the designer's perspective.

334 Lighting Design (3:3:0). Prerequisite: THR 230 or permission of instructor. Study of lighting design as an art that defines space and reveals form. Introduction to the tools, equipment, and process of lighting design. Analysis of the text from the designer's perspective.

335 Costume Design (3:3:0). Prerequisite: THR 230 or permission of instructor. Project-oriented class emphasizing the process of designing and building. Costume design is studied in relation to historical periods and the artistic demands of the script. Includes lecture/lab in fundamentals of costume design for the stage.

336 Advanced Theater Technology (3:3:0). Prerequisite: THR 230 or permission of instructor. Continuation of work begun in THR 230, stressing the contributions of costumes, sound, and props to theatrical production. Intensive work in drafting for the theater. Participation in Theater Division productions required.

340 Directing II (3:3:0). Prerequisite: THR 240 or permission of instructor. With techniques developed in THR 240, students analyze and stage extended scenes and/or one-act plays. Emphasis on the collaborative process and production organization.

343 Costume Draping and Drafting (3:3:0). Prerequisite: THR 235 or permission of instructor. Pattern development through draping and drafting. Laboratory study and practical experience in the construction of stage costumes.

345 Puppetry: History and Technique (3:3:0). In the context of a comprehensive and intensive exploration of world puppetry, this course experiments with building and performance styles. Emphasis on hand and rod puppets, shadow work, toy theater, and bunraku-style figures. Students develop, build, and present original work.


351 Dramatic Theory and Criticism (3:3:0). Chronological study of the development of dramatic theory and criticism from Plato and Aristotle through modern movements. Students read plays, theoretical works, and critical responses, and write original criticism of performances and/or texts.

352 Dramatic Literature Seminar (3:3:0). Rotating topic, period, or genre. Intensive study of a particular topic, period, or genre in dramatic literature. Topics may include 20th-century American women playwrights, Ibsen, tragedy and comedy, 17th-century drama in England, France, and Spain. May be repeated for a total of nine credits provided the specific course content is different.

355 Moral Vision in American Theater (3:3:0). Prerequisite: THR 101, Theater major, or permission of instructor. Goal is to examine the vision of American society created and presented in contemporary American theater. The subject is defined as "moral" vision because the focus is on how we perceive ourselves in relation to other persons and to standards of value in society. Perspectives include sociology, theory of culture, practical theater craft, and literary criticism. Features plays by a wide range of American playwrights.

359 World Stages (3:3:0). In this seminar, students will be introduced to a variety of theatrical traditions and performance theories from around the world, with a special emphasis on those not covered in introductory Western drama survey courses, 150 and 151. Students will read and discuss dramatic texts, performance theory, and video clips in an effort to understand a variety of theatrical traditions within their cultural and historical contexts. Students will be encouraged, whenever possible, to attend live local theater, and contribute their experiences to the discussion as appropriate. Requirements include two team presentations (taking turns as writer and presenter), one midterm paper and one solo presentation with accompanying paper.

380 Playwriting I (3:3:0). Students are exposed to the principles of dramatic writing, including character, plot, dramatic structure, dialogue, exposition, setting, and creating theatrical images using examples from plays, screenplays, and the students' own work.

381 Playwriting II (3:3:0). Prerequisite: THR 380 or permission of instructor. Intensive continuation of the work begun in THR 380.

420 Advanced Modern Acting (3:3:0). Prerequisite: THR 210 and 310 or permission of instructor. This course in advanced scene study will build on students' skills in previous acting courses. Students will be assigned an actor's approach, a midterm sonnet presentation and a final scene.

421 One-Person Show (3:3:0). Prerequisite: THR 210 and 310 or permission of instructor. Students will work with designated faculty on the successful writing, rehearsal and performance of an original thirty-minute one-person show.

423 Audition Techniques: Stage and Camera (3:3:0). Prerequisite: THR 310 or equivalent or permission of instructor. Professional directors, coaches, and casting directors offer their perspective on what makes an effective and honest audition. Students prepare a repertoire of pieces for stage and camera auditions.

424 Contemporary Women Playwrights (3:3:0). Prerequisite: Junior standing, or permission of instructor. This course is an exploration of identity/culture, sexuality/gender, work, relationships and power through the eyes of women dramatists and performance artists. Students will analyze texts and issues through readings, video, and live performances.

425 Verse Speaking (3:3:0). Prerequisite: THR 210 and 310 or permission of instructor. Students will explore verse literature and the mechanics of verse structure through the reading, discussion and recitation of major verse plays of Western drama from the Middle Ages through the twentieth century. Class instruction will focus on the study of various verse forms, paying particular attention to vocal cues within verse structure, the meaning of rhythm and the practice of vocal techniques used in speaking texts in class. Students will also prepare weekly presentations of the playwrights and historical backgrounds of the plays and their periods.

440 Advanced Studies in Directing/Dramaturgy (3:3:0). Prerequisite: THR 340 or permission of instructor. Course in the collaborative development of production ideas by director/dramaturgy teams. Students conceive ideas and present work in the classical and contemporary repertoire, supported by full dramaturgical apparatus.
480 Advanced Playwriting (3:3:0). Prerequisite: THR 381 or permission of instructor. Advanced playwriting workshop in which students explore their own voice in terms of theatrical writing.

490 Special Topics in Drama (1-6:1-6:0). Rotating topic. Advanced seminar in topics of special interest in the field. Topics include dramatic writing or other media and feminism in the contemporary theater. May be repeated for a total of 24 credits provided the specific course content is different.

491 Major's Seminar on the Profession (3:3:0). Prerequisite: Junior theater major. Designed to acquaint upper-division majors with the realities of living and working in the theater. Features guest speakers from the profession and intensive development of students' portfolio materials specific to the demands of their field.

494 Field Experience (1-6:0:0). Off-campus experience with a professional theater to provide the student with an opportunity to apply classroom training, knowledge, skills, and theory to a professional situation. May be repeated for a total of 12 credits.

495 Senior Synthesis Project (3:3:0). Prerequisite: Junior standing or above. This course will require that a student design an advanced-level project, with the supervision of a faculty advisor, that represents the culmination of his or her studies in the theater major. (This may reflect his or her work in one or more specialized areas, such as acting, directing, playwriting, dramaturgy, design, puppetry, or technical production.) The synthesis project must include an intellectual component as well as a public presentation with the student discussing his or her work with a faculty panel. Students are encouraged to incorporate work in one or more disciplines and collaborate with each other. Each project will be assessed on the student's demonstrated ability to communicate effectively in both oral and written forms.

497 Independent Study (1-6:0:0). Prerequisite: Open only to theater majors with 90 credits and by special permission of the department chair. Individual research and creative project in close consultation with instructor. Selection from projects in performance, directing, technical theater and design, playwriting, or theater history and criticism. May be repeated for a total of 24 credits, provided the suffix citing specific course content is different.

571 Advanced Playwriting Workshop (3:3:0). Prerequisite: Undergraduate degree or equivalent or permission of instructor. Advanced playwriting workshop in which students explore their own voice in terms of theatrical writing.

599 Independent Study (1-6:1-6:0). Prerequisite: Undergraduate degree or equivalent, or permission of instructor. Independent reading, performance, and/or research on a specific project under the direction of a selected faculty member. May include attendance in a parallel undergraduate course. May be repeated for a total of 6 credits.

Tourism and Events Management (TOUR) Graduate School of Education

200 Introduction to Travel and Tourism (3:3:0). Open to non-majors. Provides an introduction to travel and tourism from local to international levels. Gives an overview of the scale, scope, and organization of the industry, with emphasis on the development of natural, cultural, heritage, and recreational resources of tourism. Identifies issues related to the economic, technological, legal, and political aspects of tourism.

241 Practicum (3:3:0). Prerequisite: TOUR 200 majors only. Provides practical experience in the travel and tourism environment through selective fieldwork, job placement, and/or seminar/conference attendance.

312 Ecotourism (3:3:0). Prerequisite: TOUR 200 or permission of instructor. Analyzes tourism that is nature-based and entails a learning component while striving for environmental and sociocultural sustainability within the context of financial viability. Considers markets, role of protected areas, impacts, business aspects, external environments, organizations and policies, and research trends and needs.

320 Events Management (3:3:0). Prerequisite: TOUR 200 or permission of instructor. Explores the principles and practices of managing medium- and large-scale events, including festivals, conventions, concerts, shows, sporting events, and ceremonies. Emphasizes organization, site preparation, communications, personnel, and security, as well as evaluation and innovation.

330 Resort Management (3:3:0). Prerequisite: TOUR 200 or permission of instructor. Surveys effective practices in the management of resort recreation enterprises. Includes examination of basic resort operations, including front desk, food and beverage, amenities, and housekeeping. Covers management of a variety of resort types, such as ski resorts, beach resorts, dude ranches, business retreats, adventure camps, health spas, and golf resorts.

340 Sustainable Tourism (3:3:0). Prerequisite: TOUR 200 or permission of instructor. Considers the characteristics of environmentally, economically and socioculturally sustainable tourism and assesses the possibilities and limitations for its implementation within a variety of destination and product settings. Emphasizes conventional "mass" tourism as well as small-scale "alternative" tourism.

352 Heritage and Cultural Tourism (3:3:0). Prerequisite: TOUR 200 or permission of instructor. Analyzes historical and cultural attractions, including museums, canals, monuments, pilgrimage sites, military sites, and cultural/heritage landscapes. Covers presentation and interpretation, African-American and Native American heritage, management and operational considerations, and marketing.

412 Tourism Marketing and Finance (3:3:0). Prerequisites: TOUR 200 and PRLS 411 or permission of instructor. Provides understanding and tools for marketing and management of financial resources in entrepreneurial tourism enterprises. Includes market planning, business planning, feasibility assessment, investment analysis, basic accounting, and operational control.

420 Tourism Planning/Policy (3:3:0). Prerequisite: at least 9 hours of TOUR credits. Examines the principles of planning and policy that apply to integrated and sustainable tourism development at the international, national, state, regional, local, and site scale. Government, industry, and community perspectives are taken into consideration.

430 Tourism on Public Lands (3:3:0). Prerequisite: at least 9 hours of TOUR credits. Covers the evolution, status, and management of tourism on federal, state, and municipal lands, including USDA Forest Service, Bureau of Land Manage-
ment, National Park Service, and State Forest jurisdictions. Emphasizes supply and demand, multiple-use issues, policy and management, funding, tourism impacts, jurisdictional coordination, and the role of adjacent private lands.

440 MICE Tourism (3:3:0). Prerequisite: at least 9 hours of TOUR credits. Analyzes meetings, incentives, conventions, and exhibitions with respect to business environment and structure, industry suppliers, site and facility selection, human resource management, legal and financial issues, marketing and promotion, and event organization.

470 Senior Seminar (1:1:0). Prerequisite: Only TOUR majors in senior year. This capstone educational experience focuses on current issues in tourism and event management and career development strategies.

490 Internship (12:0:0). Prerequisite: Only TOUR majors with 90 hours completed, of which at least 12 hours are TOUR credits (including TOUR 241). This supervised professional experience provides a continuous and structured opportunity to apply principles and skills developed in the classroom to the solution of practical problems in the tourism and events management industry. Provides a paid or voluntary full-time work experience in an approved tourism or event management setting for a minimum of 10–12 weeks. Includes meetings and assignments before and during the internship.

University/Interdisciplinary Studies (UNIV) Student Academic Affairs

190 Freshman Seminar (3:3:0). Prerequisite: Freshman standing; enrollment is by minimum 3.300 cumulative high school GPA and by invitation. Broad interdisciplinary subjects taught by Robinson Professors. Topics vary. Courses may be repeated for up to 12 credits.

301 Great Ideas in Science (3:3:0). A nontechnical introduction to the ideas that have shaped the growth of science from the building of Stonehenge to the modern theories of the Big Bang. The idea behind each major advance is treated in its historical context, with special attention to its importance in mankind's understanding of the nature of the universe. Examples are taken from the physical, geological, and biological sciences. The course is intended for nonscience majors and uses little mathematics.

University Transition (UNIV) Student Academic Affairs

100 University: Freshman Transition (1:1:0). Assists freshmen with their transition to college life. Helps students adjust academically, develop decision-making skills, and learn about the services and opportunities for involvement at George Mason. Although all classes have a core body of knowledge, each class specializes in a particular aspect of college life. Team development at Hemlock Overlook is a component of every section.

200 University: Sophomore Transition (2:2:0). Topics course focusing on the transition issues for students at second semester freshman standing or higher. Section topics each semester include Careers/Major Decisions, Relationships, Involvement: Focus and Development, Conflict Management.

300 University: Junior Transition (1:1:0). A transition course for students at second semester sophomore standing or higher. This course has two tracks. The first track assists new transfer students with their first semester academic and transition issues. The second track focuses on career readiness for internships and research assistantships in the student's academic interest.

400 University: Senior Transition (2:2:0). A transition course for students at second semester junior standing or higher. The emphasis of this course is placed on development for the professional workplace, skills for graduate school preparation, and readiness for life responsibilities. Course covers skill preparation for the world of work, development of field of study expertise, resume/portfolio development, professional ethics, money management, career/alumni support networks, and final year motivation.

Urban and Suburban Studies (USST) Public and International Affairs

301 Urban Growth in a Shrinking World (3:3:0). Examines the process of urbanization historically and comparatively. For major world regions, attention is given to both the political economy of urbanization and its impact on social and economic relations. Concludes with an examination of the growing globalization of the world economy and its implications for urban life and the urban political economy of the future.

390 Special Topics in Urban and Suburban Studies (3:3:0). Subject varies according to specialization of instructor.

401 Seminar: The Future of Metropolitan America (3:3:0). Prerequisite: 12 credits of USST-approved courses, including USST 301. Course examines trends in the development of the American metropolis, including the impact of information economy and technological developments on metropolitan form and life, continuing outward growth and increasing decentralization of metropolitan areas, changing functional organization of urban space, and continued social segregation in metropolitan areas. Students analyze contemporary predictions about the future of metropolitan life in America and explore how alternative public policies can shape that future. Students work on research projects on metropolitan life and form in Northern Virginia and other parts of the Washington metropolitan area.

490 Internship (3:0:0). Prerequisite: Open only to students with 12 credits of USST; see USST coordinator. Internships are approved work-study programs that focus on urban and suburban issues with an approved agency or firm. Placement depends on the student's qualifications and the availability of positions. Students work with an on-site supervisor and the coordinator of Urban and Suburban Studies.

Women's Studies (WMST) Women's Studies Program

100 Representation of Women (3:3:0). Explores representations of women in advertising, television, film, photographs, cartoons, performance arts, literature, religious texts, and news media from various worldwide sources. Through
interdisciplinary study students will evaluate the powerful effects these representations have on the political, economic, and social lives of women throughout the world.

200 Introduction to Women's Studies (3:3:0). Interdisciplinary introduction to the field of women's studies, encompassing key concepts in the field, history of women's movements and women's studies in America, cross-cultural constructions of gender, and a thematic emphasis on the diversity of women's experience across class, race, and cultural lines.

300 Current Issues in Women's Studies (3:3:0). Study of selected topics central to contemporary women's studies. Topics vary but include subjects such as women and violence, women and international development, women's myth and ritual, the history and politics of sexuality, psychoanalysis, and religion.

301 Sociology of Sex Roles (3:3:0). Prerequisite: 60 credits or permission of instructor. Changing conceptions of sex roles, both female and male, in contemporary society. Using historical and comparative data, course considers the differential socialization of males and females in relation to the changing social structure in which it takes place.

302 Cultural Constructions of Sexualities (3:3:0). Prerequisite: Six credits of 200-level English courses. Introductory survey of cultural, literary, and theoretical constructions of sexuality that seeks to complicate traditionally fixed categories of identity. Examination of various representatives of human sexuality, with particular attention to its intersections with gender, race, ethnicity, nationality, and class.

303 Psychology of Women (3:3:0). Prerequisites: PSYC 100 and BIOL 103, 104, or permission of instructor. Behavior and attitudes of women, influence of sex chromosomes and sex hormones on behavior, influence of culture on sex role differentiation, and theories of sex role development.

304 Women and Media (3:3:0). Prerequisite: COMM 302 or permission of instructor. Introduction to the concepts of the power and influence of the mass media. Allows students to see themselves as products of media influence and gives them a sense of women's roles as media professionals, as well as consumers.

305 Women and Literature (3:3:0). Prerequisite: Six credits of 200-level English courses. An exploration of the experience of women as both authors and subjects in imaginative literature. May be repeated once for credit when subtitle is different, with permission of department.

306 Topics in Communication and Gender (3:3:0). Prerequisite: 60 credits. Exploration of selected topics involving gender and communication. Topics covered may include women in media, women as rhetors, male/female communication, and communication and sex roles. Specific interests are examined in a seminar setting. Course may be repeated with approval of department.

330 Feminist Theory across the Disciplines (3:3:0). Prerequisite: WMST 200 or permission of instructor. Examination of feminist critique and transformation of the theories, methods, and methodologies of the sciences and humanities.

400 Internship in Women's Studies (1-3:3:0). Prerequisite: Completion of 60 credits, including WMST 200, or permission of instructor. Community- or campus-based service or experiential learning related to women's or gender issues. Independent course in which students develop, in consultation with a faculty member, individual contracts defining the learning and competencies they plan to gain from the experience. May be repeated for credit, up to six credits, but only three credits of WMST 400 or 401 may be applied toward the women's studies interdisciplinary minor.

401 Experiential Learning in Women's Studies (1-3:3:0). Prerequisite: Concurrent enrollment in a women's studies course. Community- or campus-based service or experiential learning as it relates to a specific WMST course, taken at the same time. Students develop, in consultation with the faculty member, individual contracts defining the learning and competencies they plan to gain from the experience. May be repeated for credit up to a total of six credits, but only three credits of WMST 400 or 401 may be applied toward the women's studies interdisciplinary minor.

490 Independent Study in Women's Studies (1-3:3:0). Prerequisite: Nine WMST credits including WMST 200, or permission of instructor. Reading or research on a specific topic related to women and/or gender issues, under the direction of a faculty member. May involve a combination of reading assignments, tutorials, papers, presentations, or off-campus activities. May be repeated for credit up to a total of six credits, but only three credits may be applied toward the women's studies interdisciplinary minor.

630 Feminist Theories across the Disciplines (3:3:0). This multidisciplinary course examines the central issues of feminist theory and explores the various strategies of feminist theorists. Analyzes the ways in which feminist theories have challenged established disciplinary boundaries and contested the traditional assumptions of the humanities, the social sciences, and the sciences.

640 Women and Global Issues (3:3:0). Prerequisites: Graduate standing. This multidisciplinary course explores the complex issues women face in different regions of the world. Addresses women's diverse and shared global concerns and provides students with the tools to analyze and understand women in a global context.

690 Directed Readings and Research in Women's Studies (3:3:3-6). Prerequisite: Graduate standing and permission of instructor. Advanced individualized study of gender through readings, discussion, research, and/or projects under the direction and supervision of a member of the women's studies faculty. May be repeated for total of nine credits.
Administration and Faculty

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Mel Chaskin, B.S., New York University; Clifton, Va.

Sidney O. Dewberry, B.S., George Washington University; Arlington, Va.

Edwin J. Feulner, Jr., B.S., Regis University; M.B.A., The Wharton School of the University of Pennsylvania; Ph.D., University of Edinburgh; Alexandria, Va.

Richard H. Fink, B.A., Rutgers University; M.A., University of California at Los Angeles; Ph.D., New York University; Centreville, Va.

Hope Hamilton (student alternate), B.A., Vassar College; student in School of Law, George Mason University; Arlington, Va.

James Hazel, B.A., Harvard University; J.D., George Mason University; Oakton, Va.

John F. Herrity, B.A., LL.B., LL.M., Georgetown University; Vienna, Va.

Manuel H. Johnson, B.S., Troy State University; M.S., Ph.D., Florida State University; McLean, Va.

Scott LaRose, B.S., Radford University; Reston, Va.

David Melia (student representative), B.A., George Mason University; graduate student School of Management, George Mason University; Fairfax, Va.

James C. Miller III, B.B.A., University of Georgia; Ph.D., University of Virginia; McLean, Va.

Leonard M. Pomata, B.S., Brooklyn Polytechnic; M.S., New York University; Great Falls, Va.

Gary Shapiro, B.A., State University of New York—Binghamton; J.D., Georgetown University Law Center, Vienna, Va.

Sudhakar Shenoy, B.Tech., Indian Institute of Technology; M.S., M.B.A., University of Connecticut; Great Falls, Va.

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Senior Vice President: Maurice W. Scherrens, J.D., Ed.D.
510 Administration and Faculty

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Vice President for Information Technology: Joy R. Hughes, Ph.D.
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Vice President for University Life: Karen E. Rosenblum, Ph.D.

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Director, Institute for Conflict Analysis and Resolution: Sara Cobb, Ph.D.
Dean, Graduate School of Education: Jeffrey Gorrell, Ph.D.
Dean, School of Information Technology and Engineering: Lloyd J. Griffiths, Ph.D.
Dean, School of Law: Mark F. Grady, J.D.
Dean, School of Management: Richard J. Klimoski, Ph.D.
Dean, College of Nursing and Health Science: Rita M. Carfy, D.N.Sc.
Dean, School of Public Policy: Kingsley Haynes, Ph.D.
Dean, College of Visual and Performing Arts: William F. Reeder, M.A.

Academic Affairs
Vice Provost for Academic Affairs: Linda A. Schwartzstein, J.D., LL.M., Ph.D.
Vice Provost for Research: Christopher T. Hill, Ph.D.
Associate Provost for Personnel and Budget: David W. Rossell, D.A.
Associate Provost for Educational Programs: Julie A. Christensen, Ph.D.
Associate Provost for General Education: Sheryl L. Beach, Ph.D.

Enrollment Services
Dean of Admissions and Enrollment Development: Andrew Flagel, M.A.
Director of Admissions: Eddie Kent Tallent, M.A.
Director of Graduate Admissions: Beverly Davis, M.A.
University Registrar: Susan H. Jones, M.S.
Director of Student Financial Aid: Jevita deFreitas, B.A.

University Libraries
University Librarian: John Zenelis, M.L.S., M.A.

University Life
Dean of Students: Girard Mulherin, S.T.L.
Associate Dean, University Life: and Director, University Career Services: Patricia Carretta, M.A.
Director, Disability Resource Center: Deborah Wayne, M.Ed.
Director, Student Academic Affairs and Advising: vacant
Director, Counseling Services: Ralph K. Roberts, Ph.D.
Director, Drug Education Services: vacant
Director, Early Identification Program: Hortensia Cadenas, M.A.
Director, English Language Institute: Kathryn Trump, M.A.

Medical Director, Health and Counseling Services: Wigida Abdalla, M.D.
Director, International Programs and Services: Julia Findlay, B.A.
Director, Diversity Programs and Services: Art King, M.Ed
Director, Student Health Services; Associate Dean, University Life: Mary Ann Braun
Director, Student Media: Michele Braithwaite, M.A.
Director, Student Activities: Mark Kidd, Ph.D.
Director, Women's Studies Research and Resource Center: Debra Bergoffen, Ph.D.
Director, Office of Continuing Professional Education/Herndon: Marianne D. Justus, M.A.

Faculty

Faculty Emeriti
Marjory Brown Azarowicz, B.A., M.A., Ph.D., Professor Emerita of Education
Barry Keith Beyer, B.A., M.A., Ph.D., Professor Emeritus of Education
Henry J. Bindel Jr., B.S., M.S., Ph.D., Professor Emeritus of Education
C. Alan Boneau, B.A., M.A. Ph.D., Professor Emeritus of Psychology
John Bonfadini, Ph.D., Associate Professor Emeritus of Education
Larry S. Bowen, A.B., M.S., Ph.D., Dean Emeritus of the Graduate School of Education
Stephen J. Brown, B.A., M.A., Ph.D., Professor Emeritus of English
James M. Buchanaan, B.S., M.A., Ph.D, Distinguished Professor Emeritus of Economics
Mary Kay Cabell, B.A., M.A., Ph.D., Associate Professor Emerita of Mathematics
Ernest Cassara, A.B., B.D., Ph.D., Professor Emeritus of History
Arthur H. Chickering, A.B., A.M.T., Ph.D., Professor Emeritus of Education
Jae W. Chung, B.C., M.C., M.A., Ph.D, Professor Emeritus of Economics
Evelyn Ellis Cohanlan, B.S., M.S., Ed.D, Professor Emerita of Nursing
John H. Cooper, B.A., M.A., D.P.E., Chair Emeritus of Health, Sport, and Leisure Studies
Anne Cordero, M.A., Ph.D, Associate Professor Emerita of Modern and Classical Languages
Lloyd Martin DeBoer, B.S., M.B.A., Ph.D., Dean Emeritus of the School of Business Administration
Edward Clark Dobson, B.M.E., M.S., Ph.D., Associate Professor Emeritus of Education
Stephen T. Early, B.A., M.A., Ph.D., Professor Emeritus of Government and Politics
Albert Wesley Edgemon, B.A.E., M.A., Ed.D, Professor Emeritus of Education
Michael G. Emsgen, B.S., A.R.C.S., Ph.D, Professor Emeritus of Biology
Edwin A. Fleishman, B.S., M.A., Ph.D, D.Sc. (Honorary), Professor Emeritus of Psychology
Arnald D. Gabriel, B.S., M.S., D.Mus. (Honorary), Professor Emeritus of Music
Helen S. Garson, B.A., M.A., Ph.D., Professor Emerita of English

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Martha M. Giles, B.M.Ed., M.M.Ed., D.M.Ed., Associate Professor Emerita of Music
Robert L. Gilstrap, B.S., M.Ed., Ed.D., Professor Emeritus of Education
Joseph B. Gittler, B.S., M.A., Ph.D., Professor Emeritus of Sociology
James Godfrey, Ph.D., Professor Emeritus of Accounting
Thomas Goodale, A.A.S., B.S., M.S., Ph.D., Professor Emeritus of Health, Fitness, and Recreation Resources
Vernon Gras, Ph.D., Professor Emeritus of English
Jayne Thompson Hart, B.A., M.S., Ph.D., Professor Emerita of Biology
James Louis Jackson, B.A., M.A., Ph.D., Professor Emeritus of English
Helen M. Jenkins, M.S.N., Ph.D., Professor Emerita of Nursing
George W. Johnson, B.A., M.A., Ph.D., President Emeritus, Professor Emeritus of English
Hazel Johnson-Brown, B.S., M.S., Ph.D., Professor Emerita of Nursing
Robert Emil Karlson, B.A., M.A., Ph.D., Associate Professor Emeritus of English
Irving Kayton, B.A., J.D., LL.M., J.S.D., Professor Emeritus of Law
Emelia-Louise Kilby, B.S., M.A., Ph.D., Professor Emerita of Health and Physical Education
Barbara Brant Knight, B.A., M.A., Ph.D., Associate Professor Emerita of Government and Politics
Robert Charles Krug, B.S., M.S., Ph.D., Professor Emeriti of Chemistry
Thelma Z. Lavine, A.B., A.M., Ph.D., Professor Emerita of Philosophy and American Culture
Catherine Malloy, B.S.N., M.P.H., Dr.P.H., Professor Emerita of Health, Fitness, and Recreation Resources
Henry G. Manne, B.A., J.D., J.S.P., LL.D., Dean Emeritus of the School of Law
Michael James McDermott Jr., A.B., Ph.L., Associate Professor Emeritus Philosophy and Religious Studies and Registrar Emeritus
William H. McFarlane, B.A., Ph.D., Professor Emeritus of Philosophy
Gustavo Mellander, AB., M.A., Ph.D., D.H.L., Dean Emeritus of the Graduate School of Education
Henry P. Meyer, B.A., M.A., Ph.D., Associate Professor Emeritus of French
Eugenie Vorburger Mieczarek, B.S., M.S., Ph.D., Professor Emerita of Physics
Mary S. Montebello, B.S., M.S., Ph.D., Professor Emerita of Education
Walter Jennings Moret Jr., A.B., B.D., Ph.D., Associate Professor Emeritus of Psychology
Josephine F. Pacheco, B.A., M.A., Ph.D., Professor Emerita of History
James D. Palmer, B.S., M.S.E.E., Ph.D., Professor Emeritus of Information Technology and Engineering
Anthony F. Palmieri, B.A., M.A., Ph.D., Associate Professor Emeritus of English
Samuel H. Phillips Jr., B.A., M.A., Ph.D., Professor Emeritus of Economics
Conrad D. Philos, A.B., J.D., Professor Emeritus of Law
Coleman Raphel, B.C.E., M.C.E., Ph.D., Dean Emeritus of the School of Business Administration

Mian M. Saeed, B.A., M.A., Ph.D., Professor Emeritus of History
Andrew P. Sage, Founding Dean Emeritus of the School of Information Technology and Engineering
David H. Schaefer, B.S., Associate Professor Emeritus of Electrical and Computer Engineering
Betty Jane Schuchman, B.S., M.S., Ed.D., Associate Professor Emerita of Education
Carol Joyce Sears, B.S., M.S., Ph.D., Associate Professor Emerita of Education
James G. Smith, B.M., M.M., D.M.A., Professor Emeritus of Music
Kitty Parker Smith, B.S.N., M.S.N., Associate Professor Emerita of Nursing and Health Science
William P. Snively, B.A., M.A., Ph.D., Professor Emeritus of Economics
John P. Soder, B.A., M.A., Ph.D., Associate Professor Emeritus of History
Melissa Stanley, B.S., M.A., Ph.D., Professor Emerita of Biology
Stephan R. Taub, A.B., Ph.D., Professor Emeritus of Biology
Hale Nuckolls Tongren, M.B.A., D.B.A., Professor Emeritus of Marketing
Zita Tyer, Ph.D., Professor Emeritus of Psychology
Dorothy J. Walker, B.S.N.E., M.S.N.E., Ph.D., J.D., Professor Emerita of Nursing
C. Robert Walter Jr., B.A., Ph.D., Professor Emeritus of Chemistry
John N. Warfield, A.B., B.S.E.E., M.S.E.E., Ph.D., Professor Emeritus of Public Policy
Louise White, Ph.D., Professor Emeritus, Public and International Affairs
William Scott Willis, B.A., M.A., Ph.D., Professor Emeritus of French
Norman A. Yance, B.S., B.D., Th.M., M.A.Phil., Ph.D., Associate Professor Emeritus of Philosophy and Religious Studies
George A. Zaphiriou, L.L.B., L.L.M., Professor Emeritus of Law

Instructional and Administrative Faculty 2002-2003

The faculty list reflects appointments as of the end of the fall 2001 semester.

Abdalla, Amr, Research and Evaluation Director, Center for the Advancement of Public Health, School of Public Policy, LL.B. 1977, Ain-Shams University, Cairo, Egypt; M.A. 1992, George Mason University.

Abdalla, Wagida, Medical Director, Student Health Services, M.D. 1972, Alexandria University, Egypt; Diplomate of the American Board of Pediatrics, 1982.

Abramowicz, Michael, Assistant Professor of Law, B.A. 1994, Amherst College; J.D. 1998, Yale Law School.

Ackerman, Helen J., Associate Professor, Vice President for University Relations. B.A. 1968, University of Western Australia; M.A. 1986, George Mason University.

Adamkewicz, Susan Laura, Associate Professor of Biology, A.B. 1962, Stanford University; Ph.D. 1968, University of Virginia.

## Administration and Faculty

<table>
<thead>
<tr>
<th>Name</th>
<th>Position/Institution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Addleson, Mark S.</td>
<td>Associate Professor, School of Public Policy; Director, New Professional Studies Program</td>
</tr>
<tr>
<td>Agee, Anne S.</td>
<td>Executive Director, DoIT; Deputy CIO of Information Technology Unit. Ph.D. 1989, Catholic University.</td>
</tr>
<tr>
<td>Ailes, Robert H.</td>
<td>Lecturer of Mathematical Sciences. B.S. 1957, United States Naval Academy; M.A. 1963, United States Naval Postgraduate School.</td>
</tr>
<tr>
<td>Aksyonov, Vassily P.</td>
<td>Robinson Professor of Russian Literature and Writing. M.D. 1956, Pavlov First Leningrad Medical Institute.</td>
</tr>
<tr>
<td>Akwule, Raymond U.</td>
<td>Associate Professor of Communication. B.A. 1977, M.A. 1979, University of Iowa; Ph.D. 1985, Howard University.</td>
</tr>
<tr>
<td>Albanese, Denise</td>
<td>Associate Professor of English. B.A. 1978, New York University; Ph.D. 1987, Stanford University.</td>
</tr>
<tr>
<td>Alemi, Farrokh</td>
<td>Associate Professor of Nursing. B.S. 1976, M.S. 1978, Ph.D. 1983, University of Wisconsin.</td>
</tr>
<tr>
<td>Allen, John Ashley</td>
<td>Associate Professor of Psychology. A.B. 1963, Duke University; M.S. 1969, Ph.D. 1971, North Carolina State University.</td>
</tr>
<tr>
<td>Allen, Melissa</td>
<td>Core Faculty Member, English Language Institute. B.A. 1975, M.A. 1979, San Francisco State University.</td>
</tr>
<tr>
<td>Amirah, Amal</td>
<td>Assistant Professor, English. B.A. 1983, Birzeit University, Palestine; M.A. 1987, Ph.D. 1997, Boston University.</td>
</tr>
<tr>
<td>Ammann, Paul E.</td>
<td>Associate Professor of Information and Software Engineering. A.B. 1983, Dartmouth College; M.S. 1985, Ph.D. 1988, University of Virginia.</td>
</tr>
<tr>
<td>Andersen, Torben J.</td>
<td>Visiting Assistant Professor of Management. M.S. 1979, University of Copenhagen; M.B.A. 1982, McGill University; Ph.D. 1998, University of North Carolina, Chapel Hill.</td>
</tr>
<tr>
<td>Andersen, Bonita</td>
<td>Director of Student Services, Office of Teacher Education. B.S. 1967, Bridgewater College; M.Ed. 1985, George Mason University.</td>
</tr>
<tr>
<td>Andersen, Daniel M.</td>
<td>Assistant Professor of Mathematics. B.A. 1989, St. Olaf College; Ph.D. 1993, Northwestern University.</td>
</tr>
<tr>
<td>Andersen, David</td>
<td>Associate Professor of Health, Fitness, and Recreation Resources; Director, Center for the Advancement of Public Health. B.S. 1971, Duke University; M.A. 1973, Ohio State University; Ph.D. 1983, Virginia Polytechnic Institute and State University.</td>
</tr>
<tr>
<td>Anderson, Mark Randolph</td>
<td>Instructor; Assistant Men's Basketball Coach. B.S. 1976, University of Missouri.</td>
</tr>
<tr>
<td>Andrykovitch, George Eugene</td>
<td>Associate Professor of Biology. B.S. 1962, M.S. 1965, University of Pittsburgh; Ph.D. 1968, University of Maryland., Juris. 1955, Oxford University; J.D. 1975, Stanford University.</td>
</tr>
<tr>
<td>Armor, David J.</td>
<td>Research Professor, School of Public Policy. A.B. 1961, University of California, Berkeley; Ph.D. 1966, Harvard University.</td>
</tr>
<tr>
<td>Ascoli, Giorgio A.</td>
<td>Associate Professor, Psychology. B.S. 1991, Scuola Normale Superiore, Italy; M.S. 1993, Pisa University, Italy; Ph.D. 1996, Scuola Normale Superiore.</td>
</tr>
<tr>
<td>Atanassova, Ivanka N.</td>
<td>Postdoctoral Teaching Fellow, History and Art History. M.A. 1975, University, Sofia, Bulgaria; Ph.D. 1979, Moscow Institute, International Relations, Russia.</td>
</tr>
<tr>
<td>Athale, Ravindra Anant</td>
<td>Associate Professor of Electrical and Computer Engineering. B.S. 1972, Bombay University; M.S. 1974, Indian Institute of Technology; Ph.D. 1980, University of California, San Diego.</td>
</tr>
<tr>
<td>Atherton, Martin</td>
<td>Assistant Professor of Nursing and Health Science. B.A. 1973, Michigan State University; M.P.H. 1979, Dr.P.H. 2000, University of Michigan.</td>
</tr>
<tr>
<td>Atkins, David C.</td>
<td>Assistant Director for Administration, Johnson Center and Student Union Operations. M.A. 1998, George Mason University.</td>
</tr>
<tr>
<td>Aufret, Jean-Pierre</td>
<td>Visiting Assistant Professor of Decision Sciences and Management Information Systems, B.S.</td>
</tr>
</tbody>
</table>

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1979, Duke University, M.B.A. 1982, Colgate Darden School of Business University of Virginia, Ph.D. 1999, American University


Ayat, Hossein, Adjunct Professor of Civil and Infrastructure Engineering. B.Sc. 1963, Tabriz University; M.Sc. 1966, Ph.D. 1972, Wayne State University.


Baghi, Hebatollah, Associate Professor of Nursing and Health Science. B.A. 1974, University of Isfahan; M.S. 1976, Ph.D. 1980, Iowa State University; Ph.D. 1988, Florida State University.


Baker, Ann C., Assistant Professor and Director, Program on Social and Organizational Learning. B.S. 1966, College of Charleston; M.A. 1975, University of Tennessee; Ph.D. 1995, Case Western Reserve University.

Bakhash, Shaul, Robinson Professor of History; B.A. 1959, M.A. 1968, Harvard University; Ph.D. 1972, Oxford University.

Balint, Peter John, Assistant Professor of Environmental Policy. B.A. 1971, Haverford College; M.A. 1972, University at Albany, State University of New York; M.S. 1998, Ph.D. 2000, University of Maryland.

Bannan-Ritland, Brenda, Assistant Professor of Education. B.S. 1986, Millersville University; M.S. 1991, Bloomsbury University; Ph.D. 1996, Pennsylvania State University.

Bavel, Domique, Assistant Professor of Physical Education Pedagogy. B.P.E. 1990, M.Sc. 1994, Ph.D. 1998, Laval University, Quebec, Canada.

Baraniecki, Anna, Associate Professor of Electrical and Computer Engineering. M.Sc. 1970, Warsaw Technical University, Poland; Ph.D. 1980, University of Windsor, Canada.

Barbara, Daniel, Associate Professor of Information and Software Engineering. B.S. 1975, Universidad Metropolitana, Caracas, Venezuela; M.S.E. 1981, Ph.D. 1985, Princeton University.

Barnea, Adrienne M., Assistant Professor; Counselor, Counseling Center. A.B. 1970, Drew University; Ed.M. 1972, Rutgers University; M.A. 1976, Ph.D. 1980, University of Maryland.

Barnhart, Melinda N., Assistant Director, Office of Sponsored Programs. B.A. 1973, Miami University; M. Ed. 1992, George Mason University.

Barocas, Ralph, Professor of Psychology. B.A. 1957, Hunter College; M.S. 1960, Ph.D. 1964, Pennsylvania State University.

Barreto, Ernest, Assistant Professor, Physics. B.S. 1990, University; Chicago; M.S. 1995, Ph.D. 1996, University, Maryland.

Bartholomew, Cheryl G., Associate Professor of Women's Studies. B.A. 1965, Ohio Wesleyan University; M.Ed. 1975, Westfield State University; Ph.D. 1980, Syracuse University.

Barton, Orrin A., Interim Head Coach, Women's Track, B.S. 1993, George Mason University.

Bateson, Mary Catherine, Robinson Professor of Anthropology and English. B.A. 1960, Radcliffe College; Ph.D. 1963, Harvard University.

Bauer, Colleen, Assistant Registrar, Records. B.A. 1982, Indiana State University.

Baum, Richard Frederick, Associate Professor of Information and Software Engineering. B.A. 1962, Oberlin College; M.S. 1964, Ph.D. 1969, University of Michigan.

Bauch, Richard C., Professor of English. B.A. 1974, George Mason University; M.F.A. 1975, University of Iowa.


Beach, Sheryl Luzzadder, Associate Professor of Geographical and Cartographic Sciences; Associate Provost for General Education. B.A. 1982, California State University, Chico; M.A. 1984, Ph.D. 1990, University of Minnesota, Minneapolis.

Beauly, Guy O., Associate Professor of Educational and Computer Engineering. B.S. 1967, Virginia Polytechnic Institute and State University; M.S. 1974, Lynchburg College; Ph.D. 1977, University of Virginia.

Beale, Susan, Assistant Director of Distance Learning Program, Department of Health, Fitness, and Recreation Resources. B.S. 1957, M.Ed. 1982, Lynchburg College.

Beall, James H., Senior Contract Professor of Computational Sciences and Informatics and Space Sciences. B.A. 1972, University of Colorado; M.S. 1975, University of Maryland; Ph.D. 1979, University of Maryland.


Beck, Cynthia L., Visiting Assistant Professor of Biology. B.S. 1980, Michigan State University; M.S. 1992, Ph.D. 2000 George Mason University.

Becker, Peter Adam, Assistant Dean, School of Computational Sciences; Associate Professor of Computational Sciences and Space Sciences, and Physics. B.A. 1981, Rutgers University; M.S. 1985, Ph.D. 1987, University of Colorado.


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Beekman, Amy V., Assistant Professor of Management. B.A. 1980, University of Florida; M.B.A. 1984, Florida Atlantic University; J.D. 1987, University of Florida; Ph.D. 1997, University of South Carolina.

Behrman, Michael Mitts, Helen A. Kellar Professor of Special Education. B.S. 1971, M.Ed. 1972, University of Cincinnati; Ed.D. 1978, Teachers College, Columbia University.


Bell, Kristine L., Assistant Professor of Applied and Engineering Statistics. B.S.E.E. 1985, Rice University; M.S.E.E. 1990, Ph.D. 1995, George Mason University.


Bennett, James T., William P. Snively Professor of Economics. B.S. 1964, M.S. 1966, Ph.D. 1970, Case Western Reserve University.

Bennington, Tammy L., Assistant Professor of Economics, and Program on Social and Organizational Learning. B.A., M.A. 1984, Washington University; Ph.D. 1995, State University of New York at Binghamton.

Bensimon, Simon, Adjunct Professor of International Commerce and Policy. B.S. 1967, Columbia University; M.A. 1968, New York University; Ph.D. 1975, University of Chicago.

Benson, Brien, Research Associate Professor of Public Policy. Ph.D. 1998, George Mason University.

Berg, Scott, Assistant Director, University Writing Center. B.A. 1992, University, Minnesota; M.A. 1995, Miami University; M.F.A. 1997, George Mason University.


Bergoffen, Debra Beth, Professor of Philosophy. A.B. 1962, Syracuse University; M.A. 1966, Ph.D. 1974, Georgetown University.

Berkowitz, Peter, Associate Professor of Law. B.A. Swarthmore College; M.A., Hebrew University of Jerusalem; Ph.D., J.D., Yale University.


Bernstein, David E., Associate Professor of Law. B.A. 1988, Brandeis University; J.D. 1991, Yale University.

Bernstein, Susan, Assistant Professor of Nursing. B.A. 1968, University of Denver; M.A. 1971, The George Washington School of Public and International Affairs.


Berry, Alok K., Associate Professor of Electrical and Computer Engineering. B.S. 1967, M.S. 1969, University of Delhi; M.S. 1981, Ph.D. 1985, University of Missouri.


Bethea, Mary Elizabeth Sparks, Assistant Professor of Communication; Basic Course Director, Department of Communication. B.A. 1988, M.A. 1993, Ph.D. 1998, University of Oklahoma.

Bethea, Robert Harrison, Assistant Professor of Communication, B.A. 1988, J.D. 1991, University of Oklahoma; LL.M. 1999, Georgetown University.

Betznar, Chip, Fitness Coordinator for Aquatic and Fitness Center, Intercollegiate Athletics. B.A. 1995, University of North Carolina at Wilmington; M.A. 1998, George Mason University.

Bever, David L., Associate Professor of Health, Fitness, and Recreation Resources. B.S. 1970, University of Dayton; M.A. 1973, Ball State University; Ph.D. 1978, Purdue University.

Beyoglu, Kamal, Adjunct Professor of Government and Politics. B.A. 1970, San Diego State University; M.A. 1971, Tufts University; Ph.D. 1983, University of California, Berkeley.


Binninger, Pamela, Career Consultant, Career Services. B.A. 1970, Georgia State University; M.Ed. 1979, George Mason University.

Birchard, Geoffrey French, Associate Professor of Biology. B.A. 1975, The Colorado College; M.A. 1979, University of Montana; Ph.D. 1985, Dartmouth Medical School.

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