Although this catalog was prepared on the basis of the best information available at the time of publication, all information, including statements of tuition and fees, course offerings, and admission and graduation requirements, is subject to change without notice or obligation. The catalog is produced by the Office of University Relations, in cooperation with university administration.

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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Undergraduate Degrees

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Administration of Justice B.S. (Public and International Affairs Dept.)
Anthropology B.A.
Art History B.A.
Art Studio B.A., B.F.A.
Biology B.A., B.S.
Chemistry B.A., 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.
Earth Systems Science 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.

Government and International Politics B.A.
Health, Fitness, and Recreation Resources B.S. (Graduate School of Education)
Health Science B.S. (College of Nursing and Health Science)
History B.A.
Individualized Study B.I.S.
Integrative Studies B.A., B.S. (New Century College)
Interdisciplinary Studies B.A.
Management B.S.
Marketing B.S.
Mathematics B.A., B.S.
Medical Technology B.S. (Biology Dept.)
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. (Public and International Affairs Dept.)
Russian Studies B.A. (Modern and Classical Languages Dept.)
Social Work B.S.
Sociology B.A.
Systems Engineering B.S.
Theater B.A.
Urban Systems Engineering B.S.

Undergraduate Certificate Programs

Applied Statistics
Environmental Chemistry
Environmental Management (Biology Dept.)
Gerontology
Leadership Studies
Microelectronics Fabrication
Operations Research and Engineering
Teaching English as a Second Language

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**Interdisciplinary Minors**

- African American Studies
- Ancient Mediterranean Art and Archaeology
- Asia-Pacific Studies
- Arts Administration
- Contemporary Europe
- Film and Media Studies
- Folklore and Mythology
- Global Systems
- Interdisciplinary Arts
- Linguistics
- Multimedia
- Study of the Americas
- Urban and Suburban Studies
- Women's Studies

**Graduate and Professional Degrees**

- Biology M.S.
- Business Administration M.B.A.
- Chemistry M.S.
- Community College Education D.A.
  (The National Center for Community College Education)
- Computational Sciences and Informatics Ph.D.
- Computer Science M.S.
- Conflict Analysis and Resolution M.S., Ph.D.
- Counseling and Development M.Ed.
- Creative Writing M.F.A.
- Cultural Studies Ph.D. (College of Arts and Sciences)
- Curriculum and Instruction M.Ed.
  - Adult Education
  - Advanced Studies in Teaching and Learning
  - Bilingual/Multicultural Education
  - English as a Second Language
- Dance M.F.A.
- Economics M.A., Ph.D.
- Education Ph.D.
- Education Leadership M.Ed.
- Electrical Engineering M.S.
- English M.A.
  - Linguistics
  - Literature
  - Professional Writing and Editing
  - Teaching of Writing and Literature
- Environmental Science and Public Policy Ph.D.
  (College of Arts and Sciences)
- 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.
- Information Systems M.S.
- Information Technology Ph.D.
- Instructional Technology M.Ed.
- Interdisciplinary Studies M.A.I.S.
  (College of Arts and Sciences)
  - Individualized Studies
  - Liberal Studies
- International Commerce and Policy M.A.
- Law J.D.
- Mathematics M.S.
- Music M.A.
- New Professional Studies M.A., M.S.
  - Bioinformatics
  - Biotechnology
  - Forensic Biosciences
  - Organizational Learning
  - Teaching
  - Technology Management
  - Nursing M.S.N., M.S.N./M.B.A., Ph.D.
  - Operations Research and Management Science M.S.
  - Physics, Applied and Engineering M.S.
  - Psychology M.A., Ph.D.
  - Public Administration M.P.A.
  (Public and International Affairs Dept.)
  - Public Policy Ph.D.
  - Sociology M.A.
  - Software Systems Engineering M.S.
  - Special Education M.Ed.
  - Statistical Science M.S.
  - Systems Engineering M.S.
  - Telecommunications M.A.
  (College of Arts and Sciences)
- Urban Systems Engineering M.S.
- Visual Information Technologies M.A., M.F.A.
  (Institute of the Arts)

**Graduate Certificate Programs**

- Assistive/Special Education Technology
- Command, Control, Communications, and Intelligence Systems Engineering
- Communications and Networking
- Community College Education
- Computational Modeling
- Computational Techniques and Applications
- Federal Statistics
- Gerontology
- Global Trade Management
- Information Engineering
- Information Systems Security
- Integration of Technology in Schools
- International Business Planning
- International Health
- International Market Analysis
- Managing International Commerce
- Military Operations Research
- Multimedia Development
- Nonprofit Management
- Nursing Administration
- Nursing Education
- Quality Improvement and Outcomes Management in Health Care Systems
- Regional Trade Policy and Planning
- 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 (English Dept.)
- VLSI Design/Manufacturing

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George Mason University is a distributed university with three campuses, each with a distinctive academic focus that plays a critical role in the economy of its region. At each campus, students and faculty have full access to all the university's resources, while duplication of programs and support services is minimized through the use of technology. In addition to the main campus in Fairfax, the university has campuses in Arlington and Prince William Counties.

### Fairfax Campus

The Fairfax Campus, situated on 677 acres of wooded land, offers a wealth of opportunities beyond the numerous academic programs. 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, music, and other entertainment. 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

The Arlington Campus's course offerings focus on law, economics, and public policy. The following graduate programs are based at the Arlington Campus: J.D. in Law, M.A. in New Professional Studies: Teaching, M.A. in International Commerce and Policy, M.P.A. (public administration, nonprofit management, and public policy), Fast Track M.B.A., M.S. in Mathematics (actuarial mathematics), and the Fast Train program (a teacher licensure program for those who want to teach abroad).

In 1996, ground was broken for construction of the first new building for the Arlington Campus. Completed in early 1999, the 140,000-square-foot building is the first one in a three-phase plan to develop the 5.2-acre site. The School of Law is housed on the first three floors and part of the fourth floor of the new building. The Mercatus Center, the James M. Buchanan Center for Political Economy, and the Institute for Humane Studies, an independent entity affiliated with the university, occupy the fourth floor. All these groups work together on projects of mutual interest. The campus also houses the Professional Center. The general phone number for the campus is (703) 993-8999.
Prince William Campus

The Prince William Campus is an integral part of George Mason University’s distributed university. The new campus 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. The 124-acre campus is under construction adjacent to the Rt. 234 bypass. A primary focus of the campus is the bio-sciences and education program in an innovative partnership with the company American Type Culture Collection (ATCC). The new Institute for Bioscience, Bioinformatics, and Biotechnology (IB3) is working with ATCC in developing master’s and doctoral degree programs and in planning collaborative research efforts in these areas. Other programs are under development in information technology areas such as computer science; electrical engineering; and civil, environmental, and infrastructure engineering. The campus offers other creative programs of instruction, research, and public/private partnership in a higher education service district in the Prince William County area. These programs include the Transition to Technology training program; the site-based M.A. in New Professional Studies: Teaching; the M.A.I.S. with a concentration in recreation resource management and graduate courses in National Forest Lands Management and Natural Resource Recreation Management through the Distance Learning program; a B.S. in Administration of Justice; and graduate/undergraduate programs in Health, Fitness, and Recreation Resources. The general phone number is (703) 993-8350.

Board of Visitors

Membership as of July 1998

The Honorable Edwin Meese, III, Rector, B.A., Yale University; J.D., University of California, Berkeley; McLean, Va.

W. Scott McGearry, Vice Rector, B.A., George Washington University; J.D., George Mason University; Arlington, Va.

Horace Cooper, Secretary, B.A., University of Texas; J.D., George Mason University; Kingstowne, Va.

M. Constance Bedell, B.A., George Mason University; Springfield, Va.

Joann P. DiGennaro, B.S., Purdue University; M.S., University of Maryland; J.D., George Mason University; Oakton, 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.

Janice S. Golec, B.S., American University; Arlington, Va.

James Hazel, B.A., Harvard University; J.D., George Mason University; Oakton, Va.

William Kristol, A.B., Ph.D., Harvard University; McLean, Va.

Scott LaRose, B.S., Radford University; Fairfax, Va.


James C. Miller, III, B.B.A., University of Georgia, Ph.D., University of Virginia; McLean, Va.

Marvin R. Murray, B.A., University of Washington; M.A., University of South Florida; Alexandria, Va.

David N. Olson, B.A., Upsala College; M.B.A., The Wharton School of the University of Pennsylvania; Ashburn, Va.

Leonard M. Pomata, B.S., Brooklyn Polytechnic; M.S., New York University; Great Falls, Va.

George Mason, 1725-92

When George Mason of Gunston Hall wrote the Virginia Declaration of Rights in 1776, he gave the United States 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, himself a slave owner, did not recognize that these 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 university began as the Northern Virginia branch of the University of Virginia in 1957, offering courses in engineering and the liberal arts. Called University College, 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 it 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

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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 442 acres. By the end of 1970, the college's Fairfax Campus reached 571 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 27 years, enrollment has risen from 4,166 to more than 24,000 in 1999. 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 James M. Buchanan, Nobel laureate in economics, 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. 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 also the first in the country to offer a doctoral degree in information technology.

The establishment of the Institute of the Arts in 1990 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 Theater Space, are all components of the institute.

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 university 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, will lead to academic programs spanning microbiology and make Prince William County a center for biotechnology. Construction of the first two buildings has been completed. The university is also expanding its presence in Arlington. Construction has been completed on a new building, and plans are to increase programming at Arlington with the addition of course offerings and degree programs.

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.

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 enabling 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 undergraduate, graduate, and professional courses of study that are interdisciplinary and innovative. 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, and 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 and will be an intellectual and cultural nexus between Northern Virginia, the nation, and the world.


Faculty and Students

The university's more than 700 full-time instructional faculty members are experts in a broad range of fields, who have published widely, contributed to major research findings, and consulted with government and business. The faculty includes a Nobel laureate, winners of awards from the Guggenheim Foundation, the Templeton Foundation, the National Science Foundation, and the National Endowments for the Arts and the Humanities, and winners of Fulbright Awards 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 more than 24,000 students are from Virginia, with all 50 states, the District of Columbia, and 114 countries well 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, 25 and up, are growing in numbers. George Mason welcomes qualified students with a wide range of interests and backgrounds.

Consortium of Universities of the Washington Metropolitan Area

George Mason University is a member of the Consortium of Universities of the Washington Metropolitan Area. Full participating consortium members are American University, The Catholic University of America, Gallaudet University, George Mason University, The George Washington University, Georgetown University, Howard University, Marymount University, Mount Vernon College, Trinity College, Southeastern University, University of the District of Columbia, and the University of Maryland-College Park.

Eligible students have the opportunity to benefit from the academic offerings of member institutions and to enroll for courses at any of the participating institutions. Students register and pay the tuition of their home institution for all consortium courses. See the "Academic Policies" chapter of this catalog for information on consortium course registration procedures.

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, and is a member of the Council of Graduate Schools in the United States.

ORAU Statement

Since 1993, students and faculty of George Mason University have benefited from its membership in Oak Ridge Associated Universities (ORAU). Located in Oak Ridge, Tennessee, ORAU is a consortium of colleges and universities and a management and operating contractor for the U.S. Department of Energy (DOE). 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, the DOE facility that ORAU manages, undergraduates, graduates, postgraduates, and 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 lengths range from one month to four years. Many of these programs are especially designed to increase the numbers of under-represented 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 Resource Guide, which is available on the World Wide Web at www.orau.gov/orise/resgd.htm, or by calling either of the contacts below.

ORAU's Office of Higher Education Initiatives seeks opportunities for partnerships and alliances among ORAU's members, private industry, and major federal facilities. Activities include faculty development programs, such as the Junior Faculty Enhancement Awards and the Visiting Industrial Scientist Program, and various services to chief research officers.

For more information about ORAU and its programs, contact the vice provost for research, ORAU council member, at (703) 993-8865; contact Monnie E. Champion, ORAU corporate secretary, at (423) 576-3306; or look at the ORAU home page at www.orau.gov.
Admission

Undergraduate Admission Policies

Admission to George Mason is competitive in that the number of qualified candidates for admission exceeds the number of new students who can be accommodated. The university expects applicants for undergraduate admission to be in the upper 50 percent of their class. They must also demonstrate considerable facility in using the English language and an understanding of basic mathematical processes.

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 may require a second review process for admission.

Admission Procedures

Applying for Admission

Application for undergraduate admission should be made to the Office of Admissions on forms provided upon request. A nonrefundable and nontransferable fee of $30 must accompany the application.

Admissions Home Page

Admissions applications are available on the Internet at www.admissions.gmu.edu/onapps.html.

Catalog information, the Schedule of Classes, tuition information, campus events listings, and departmental information are available at www.gmu.edu.

Application Deadlines

Undergraduate applications for fall admission should be submitted no later than February 1 for freshman applicants and March 15 for transfers. The application deadline for the spring semester is November 1. 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 Notification

Fall freshman applicants who apply for admission before December 1 are reviewed automatically for early consideration. Successful candidates are notified beginning in December and continuing until January 15. If an early decision cannot be given, the student's application is considered at the time all other applications are reviewed and evaluated. Early notification is nonbinding.

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Early Admission
High school juniors who have completed high school graduation requirements except for senior English and government 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, SAT/ACT scores, and a high school course of study demonstrating rigorous academic preparation for university-level work. Candidates for this program must arrange an interview with the dean or director of admissions.

Right to Withdraw Offer of Admission
The university reserves the right to withdraw offers of admission if applicants fail to satisfy all requirements before the closing of spring or fall registration, or thereafter, 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 Mason may be withheld.

Admissions Committee
The Admissions Committee reviews undergraduate admission decisions and appeals.

Other Stipulations
The Office of Admissions or the Admissions Committee may make other stipulations or recommendations regarding the admission of an individual.

Freshman Requirements
The following factors are considered when reviewing applications for admission:

- Cumulative high school grade point average for course work completed in grades 9 through 12
- Level of difficulty of course work elected throughout the high school years, particularly in English, mathematics, laboratory science, and foreign language
- Scores from the Scholastic Aptitude Test (SAT) and/or the American College Test (ACT), and/or Test of English as a Foreign Language (TOEFL)
- Results of a personal interview

The Admissions Office evaluates applications after all required materials have been received. Applicants are notified of decisions in the first week of April.

To ensure that applicants with unusual qualifications are not denied admission, the above criteria are applied flexibly. Applicants with unusual qualifications should describe them in the narrative section of the application for admission. Personal interviews and recommendations are required unless waived.

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:

<table>
<thead>
<tr>
<th>Course</th>
<th>Required Minimum</th>
<th>Recommended Minimum</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(1)</td>
<td>(2)</td>
</tr>
<tr>
<td>English</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Social Studies</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Mathematics*</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Laboratory Science**</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Foreign Language</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Other Academic Electives</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Total</td>
<td>17</td>
<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 sciences

Test Requirements
Freshman candidates for admission are required to take the SAT or the ACT. Official test scores should be sent directly from the appropriate testing service.

Acceptance of Offer of Admission
The university complies with the College Board candidate reply date of May 1, but encourages students to confirm their intention to enroll by returning the confirmation card before that date. Prompt confirmation of the offer of admission qualifies students for early advising, registration, housing, and other services. Candidates approved for admission must confirm their intention to enroll. Failure to comply may adversely affect the applicant's reserved space.

Transfer Requirements
The university accepts qualified students who wish to transfer from other colleges. A transfer applicant who has completed at least 30 transferable credits 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.

Application for admission as a transfer student is competitive. To be academically eligible for consideration, a transfer student must present a grade point average of at least 2.00 on a 4.00 scale on all collegiate work attempted. Students on active social or academic probation, suspension, or dismissal are not eligible for transfer admission.

Transfer Information Sessions
Students who are considering transfer to George Mason are encouraged to attend a transfer information session. Sessions are held each Wednesday at 4 p.m. in the Office of Admissions, and generally last about one hour.

Transfer Credit
A student transferring into the university receives a formal evaluation of transfer credit following acceptance of an offer of admission. The student is responsible for seeing that the Office of Admissions receives official transcripts of all work taken elsewhere.
In general, credits are accepted from institutions accredited by the appropriate regional association, provided that the credits carry a grade of C or better and that the courses are of a content equal to those offered at George Mason University.

1. A maximum of six credits may be transferred from correspondence courses sponsored by regionally accredited institutions.

2. 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.

For students enrolled on a campus of the Virginia Community College System (VCCS), Northern Virginia Community College campus counseling offices maintain supplies of printed, advance-ordered transcripts for transfer students. Other VCCS institutions provide information from a computer database, the Transfer Assistance Profile (TAP), located in VCCS counseling offices throughout the commonwealth.

The university fully supports and complies with the State Council of Higher Education for Virginia's Policy on Transfer. Students who have questions concerning transfer issues should contact the Office of Admissions.

Credit Earned at Nonaccredited Colleges
Transfer credit is not granted for study in noncollegiate institutions, except in the Bachelor of Individualized Study (B.I.S.) degree program. Transfer credits from nonaccredited colleges are tentatively evaluated upon admission to the B.I.S. program. Transcript information is used for purposes of advanced placement, and transfer credit is recommended after the performance of the student at George Mason has been established.

Credit to Be Earned at Other Institutions
A student who applies for admission to the university to profit from its educational programs would not normally be expected to seek simultaneous credit enrollment at another collegiate institution. In those unique situations when a student seeks to enroll in credit courses at another collegiate institution concurrently, the student must obtain advance written approval from the appropriate George Mason dean. (This rule applies to courses taken through the Consortium of Universities of the Washington Metropolitan Area as well.) 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 coursework 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 January 1 for the subsequent academic year. The deadline is enforced to ensure adequate time to process applications.

Applications from international students are reviewed with all other applications. Students in the English Language Institute (ELI) should consult the Admissions Office for application procedures. Applicants with permanent residence in the United States and nonimmigrant visa holders must meet freshman or transfer admission requirements. 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 offers of admission that the university can make is determined by the number of applicants, the qualifications of the applicant pool, and the amount of available space. In addition to overall admission requirements, some schools and colleges have individual requirements for acceptance into the major. (See school or college admission requirements.)

Freshman Requirements
1. If applicants have not completed a year of work at a college or university in the United States, they are required to submit a satisfactory score on the Scholastic Aptitude Test (SAT) or American College Test (ACT).

2. Persons whose native language is not English are required to take the Test of English as a Foreign Language (TOEFL) in addition to the SAT or ACT exam.

3. A minimum score of 230 on the computer-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.

Transfer Requirements
A transfer student is a student who has completed a year or more of work at a college or university in the United States. In addition to the above requirements, international transfer students must meet the standards listed below.

1. International students (F-1 or J-1 visa holders) transferring from American colleges or universities must complete the equivalent of a year of college-level academic work (30 semester credits or 45 quarter credits) before admission to George Mason University. The academic work must include a year of college-level English composition.

2. Transfer applicants from American colleges or universities who have not completed one year of English composition and one year of literature with grades of C or better must also submit satisfactory SAT or ACT, and TOEFL scores.

3. Transfer applicants from non-American colleges and universities are required to submit satisfactory scores on the SAT examination.

4. American citizens and/or permanent residents whose native language is not English are required to take the Test of English as a Foreign Language (TOEFL) in addition to the SAT.

http://catalog.gmu.edu
5. All transcripts must be evaluated and translated 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. (Suggested evaluation agencies are World Education Services, Inc., P.O. Box 745, Old Chelsea Station, New York, NY 10011; Credentials Evaluation Services, Inc., P.O. Box 66940, Los Angeles, CA 90066; World Educational Credentials Evaluators and College Planning, P.O. Box 726, Herndon, VA 22070.)

6. Students must complete immigration transfer procedures no later than two weeks after classes begin at George Mason University in the semester for which they have been accepted. Contact the Office of International Programs and Services for additional information at (703) 993-2970.

Additional Requirements for International Applicants
In addition to the academic requirements mentioned above, international students must meet the following conditions:

1. All international students must comply with current U.S. Immigration and Naturalization Service regulations.

2. With the application for admission, a student must present certified documents on subjects studied, grades received, examinations taken, and degrees earned from all secondary schools, colleges, and universities attended. Records of state or national examinations and certificates are also required. Students must establish that they have completed at least the equivalent of a U.S. high school diploma. Non-English documents must be presented in original form, with certified translations.

3. Applicants must also provide a completed George Mason University financial statement accompanied by a current bank statement verifying that funds are available for the first year and will be available for subsequent years. Yearly expenses are estimated to be $24,000 (subject to change). International students may be required to have their financial resources verified by an American banking institution.

4. Students enrolled at the university on F-1 or J-1 visas must maintain full-time status each semester, excluding summer session (12 credits undergraduate, 9 credits graduate).

5. 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 inoculations are current. The basic immunizations required are polio, DPT, measles, mumps, rubella, and TB screening. A hepatitis B vaccine is encouraged.

6. Health insurance is mandatory for international students on F-1 and J-1 visas. Students are required to purchase the policy arranged by the university unless an exemption is granted by the Student Health Center. To be exempted, the student must submit evidence of an alternative insurance policy that meets the following criteria:

- The plan must include coverage for repatriation ($7,500) and medical evacuation ($10,000). This means that, in the event of death or serious illness, the insurance policy will pay to return the student to his or her home country.
- The coverage must be for at least $100,000 per year with no more than a $500 deductible for noncovered expenses incurred before coverage is granted.
- The student must show proof that the coverage is valid until August 19 of the following year.
- Exemptions must be obtained by the final add/drop day of the student’s first semester at the university. Continuing students are required to establish eligibility for an exemption by the final add/drop day of each fall semester.
- 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). These students must show proof of coverage by the final add/drop day of the student’s first semester, and continuing students must renew their exemptions by the final add/drop day of each fall semester.
- International students are required to purchase insurance for the entire year. However, if a student graduates or terminates attendance before the end of the insurance year, the student must submit a written request with proof of return to the home country for a prorated refund.
- Insurance coverage derived from unauthorized employment will not be accepted.
- The health insurance premium is due with the tuition payment and is assessed by the Office of Student Accounts. Late fees may be assessed if the premium is not paid by the date established by the Cash Office. Failure to pay or obtain an exemption results in the cancellation of registration and/or financial suspension. All F-1 and J-1 students are automatically enrolled and covered by the insurance plan unless an exemption is obtained.

Re-enrollment after Previous Attendance
Students who have missed two consecutive fall or spring semesters of enrollment at George Mason may re-enter the university (providing they were in good standing when they left) by completing a Re-Enrollment Form available through the Registrar’s Office.

Re-admission after Attending Another College
An undergraduate student returning to George Mason following an absence during which he or she studied at another institution, without prior written permission of his or her academic department, is considered a transfer student and must reapply to the Office of Admissions as a transfer student.

Graduate Admission Policies
Admission to graduate programs is competitive. The criteria for admission selection differ 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 they may extend by the university resources available for their program.

For an applicant who wishes to obtain a graduate degree, the general university admission requirements are as follows:
1. A baccalaureate degree or equivalent 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. (For students with postbaccalaureate credits, a separate GPA is calculated for each institution.)

3. Undergraduate preparation for the chosen field of graduate study or appropriate experience in that field.

4. Standardized test scores and letters of recommendation as required by each program.

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

A degree-seeking applicant with a baccalaureate degree who has not met all other admission requirements may be offered provisional admission if sufficient evidence is presented to suggest an applicant has the ability to pursue graduate work. A student with provisional status must have as initial objectives the removal of any deficiencies and advancement to degree status. For a change from provisional status to be considered, a graduate student must have completed 12 graduate credits in provisional status with at least a 3.00 GPA, supplied all admission credentials, and removed all deficiencies as established in the student's letter of admission. Please refer to the Graduate Policies section in the "Academic Policies" chapter for further information.

Graduate Applications
With the exception of the School of Management, the Graduate School of Education, and the School of Law, graduate applications may be requested through the Office of Admissions, Finley Building (MS 3A4), 4400 University Dr., George Mason University, Fairfax, VA 22030-4444; (703) 993-2400; e-mail admissions@gmu.edu; or fax to (703) 993-2392. To request a graduate application for the School of Management, the Graduate School of Education or the School of Law, please contact the appropriate Graduate Admissions Processing Center below.

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

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
Robinson Hall, Room A380, MS 5A8
(703) 993-4636, fax: (703) 993-3606

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

School of Information Technology and Engineering (IT&E)
Science and Technology, Room 100, MS 3D5
(703) 993-1505, fax: (703) 993-1734

School of Management
Enterprise Hall, Lower Level, Room 038, MS 5A2
(703) 993-2136, fax: (703) 993-1886

Institutes
Robinson Hall, Room A380, MS 5A8
(703) 993-4636, fax: (703) 993-3606

Computational Sciences and Informatics, Ph.D.
Science and Technology, Room 103, MS 5C3
(703) 993-1990, fax: (703) 993-1993

New Professional Studies: Teaching, M.A.
Prince William Campus
Initiatives for Educational Transformation, MS 4E4
10900 University Blvd., Suite 217
Manassas, VA 20110-2203
(703) 993-8320, fax (703) 993-8360

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

School of Law
3401 North Fairfax Dr.
Arlington, VA 22201-4498
(703) 993-8000, fax: (703) 993-8088

Graduate Admission Process
As a part of the application process, an applicant seeking admission to a graduate program must submit the following:

1. An application form
2. Two official copies of transcripts from each institution attended
3. An application fee (nonrefundable)
4. An Application for Virginia In-State Tuition Rates (Virginia domicile classification form)
5. Official examinations scores (GRE, GMAT, etc.) reported directly from the Educational Testing Service as required by certain departments (refer to Graduate Program Chart in Application for Graduate Study)
6. Letters of recommendation and departmental forms as required by departments
7. For international applicants (J-1 and F-1 visas), the International Student Information form and certified bank statement showing first-year funds are available
8. For non-native English-speaking applicants, the Test of English as a Foreign Language (TOEFL) with a score of 575 or higher on the paper examination, or a 230 for the computer-based TOEFL.
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 Application for Graduate Study Graduate Program Chart for departmental admissions test requirements.

The Graduate Record Examination (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.

The Graduate Management Admission Test (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.

The Miller Analogies Test is a test of 100 analogies and may be a substitute for the GRE in some graduate programs. The George Mason University Testing Center in the Office of Admissions 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 numbers: GRE: (800) 473-2255; GMAT: (800) 462-8669; TOEFL: (800) 468-6335; or the Praxis Series: (800) 853-6773.

Students who wish to take computer-based graduate admissions exams at George Mason University should indicate George Mason's Test Center Number: 7712 on their registration form. 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 George Mason University, please list George Mason University's Institutional Code: 5827 on the registration form. For information regarding the tests given by the Testing Center, call (703) 993-2390.

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.

Admission of International Students

1. Students must meet all requirements and regulations of the university and their school or department.

2. Students must present with their application for admission official international transcripts translated and evaluated by an accredited evaluation service certifying their previous educational training. Graduate applicants' documents should show the award of either a bachelor's degree or equivalent, or a graduate degree. Personal student papers, photocasts, or attested copies are not accepted for evaluation.

3. Students must have completed the Test of English as a Foreign Language (TOEFL) and have attained a score of 575 or higher on the paper exam (230 on the computer-based exam) with a 4.5 on the Test of Written English. A TOEFL score of at least 600 on the paper-based exam (250 on the computer-based exam) is required of teaching and research assistants. Information concerning the time and place of the TOEFL can be obtained from TOEFL, Educational Testing Service, Princeton, NJ 08541, or through the Testing Center.

4. Students already in J-1 or F-1 status, or those who wish to enter the United States on F-1 or J-1 visas, must submit the International Student Information Form along with original bank statements showing that funding is available for the first year of study. Students should be prepared to demonstrate support for the duration of their study. Sponsors who wish to be billed directly must have a U.S. billing address.

5. After applicants receive a written offer of admission, an immigration document (I-20 or IAP-66) will be provided to those who have verified financial support through the documents noted in 4. International students outside the U.S. must obtain the appropriate F-1 or J-1 visa at the nearest U.S. embassy or consulate, and enter the United States in that status. Students already in the United States studying at another institution must follow procedures for an immigration transfer to George Mason University. Students 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).

6. The U.S. Department of Justice, Immigration and Naturalization Service regulations governing nonimmigrant F-1 students and United States Information Agency regulations regarding J-1 students require that international students in this category pursue a full course of study (nine credits for graduate students) to maintain nonimmigrant student status. Part-time degree programs and provisional admission are therefore not available to students in F-1 or J-1 status.

7. All students in J-1 or F-1 status will be automatically billed for the mandatory health insurance plan for international students. A waiver may be obtained by presenting proof of alternate insurance coverage to the student health insurance representative at the start of the semester.

8. Students in valid nonimmigrant status other than F-1/J-1 should contact Office of International Programs and Services at (703) 993-2970 with questions pertaining to their status.

9. International students must meet and conform to all current regulations of the U.S. Immigration and Naturalization Service.

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.

 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.

 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 for applicants who (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).

 Permission to Re-enroll in Graduate Study
Permission to re-enroll in a program must be obtained by all 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 and by all master's students who have failed to enroll in at least one credit of course work for two or more consecutive semesters at George Mason University. Permission is obtained from the department. Forms are available from the Office of the Registrar, (703) 993-2441.

 Change in Field of Graduate Study
Admission for graduate study is admission to a specific department. 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 fee for admission. Previous acceptance into one graduate program does not guarantee acceptance into another.

 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.

 Students accepted for fall are considered admitted students and may take courses during the previous summer. Students close to graduating should not rely on the Summer Term for courses required to complete their degrees.

 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.

 Extended Studies students may be restricted to undergraduate and 500- and 600-level graduate courses, and enrollment is based on eligibility criteria and availability of space in courses. Enrollment in high-demand fields may be restricted or prohibited. Prospective enrollees are required to supply unofficial evidence of their academic background along with the Extended Studies application to the Admissions Office.

 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 anytime by following the standard undergraduate or graduate admission procedures. One may apply a maximum of 18 undergraduate credits to a future 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 applicants, with the approval of a school or college dean, may apply a maximum of 12 graduate credits toward a master's 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.
Graduate Nondegree Status

School of Information Technology and Engineering (IT&E)

Admission for nondegree 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 nondegree application, official or unofficial transcripts, nonrefundable application fee, and a Course Request Form. A resume is optional.

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 nondegree status does not guarantee admission for a degree program at a later date. 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.

Institute for Computational Sciences and Informatics (CSI)

Nondegree status is available for professionals who are interested in taking a limited number of CSI courses. Up to 12 credit hours taken in nondegree status may be transferred into the CSI doctoral or certificate programs at a later date. Note that approval for nondegree status does not guarantee admission into either the doctoral or certificate programs. For admission into nondegree 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 nondegree application, official or unofficial transcripts, and a nonrefundable application fee. A resume is optional. The CSI nondegree application can be downloaded from the CSI website at www.csi.gmu.edu.

Guest Matriculant/Concurrent

Persons enrolled in high school or in undergraduate or graduate programs at other accredited institutions who wish to take courses at George Mason for transfer to their home institutions may enroll through the Extended Studies program. Guest matriculants require special documentation before admission. Undergraduate or graduate guest matriculants require written permission from their home college or university before admission. High school guest matriculants require permission from their high school principals, parents, and a George Mason faculty member. An admissions interview is also required. All this needs to be submitted before admission. Interested students should contact the Office of Admissions 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 during normal registration periods without payment of tuition and fees.

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. 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 Course Enrollment by Undergraduates

Undergraduates may request approval to take a 500-level 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. Therefore, 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

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), Medical College Admission Test (MCAT), and the Miller Analogies Test (MAT), 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 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 for any of the national exams (available at the information booth 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 a student’s advantage to register early.
National Teacher Examinations

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: Academic Skills Assessments (either PPST or CBT in Reading, Writing, and Mathematics) and Praxis II: Specialty Area 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 (899) 853-6773 to register for the Computer-Based Test (CBT) version of Praxis I. George Mason University’s Computer-Based Testing Center (ETS Testing Center 7712) is in Krug Hall. Register online (www.ets.org/praxis) for Praxis II tests. Advanced Placement and Credit by Examination

Advanced Placement Program®

Students who have completed advanced courses in secondary schools and have passed the College Board Advanced Placement® Examinations with scores of 4 or 5 may be granted credit upon recommendation of the department concerned and with the approval of the appropriate dean. Credit for a score of 3 is at the discretion of the department. Advanced credit earned in this manner by students will be counted toward or will fulfill any pertinent university or departmental graduation requirements.

International Baccalaureate® (IB) Program

George Mason University recognizes the IB curriculum as a strong pre-university academic program and encourages applicants to complete the requirements for the IB diploma. Advanced standing may be awarded for Higher Level (HL) examinations with scores of 5, 6, and 7. Official transcripts must be issued by the International Baccalaureate North America, 200 Madison Avenue, Suite 2403, New York, NY 10016-3903.

The College Level Examination Program® (CLEP)

The university does not recognize credit earned by the CLEP General Examinations. As part of the credit by examination process, academic departments may use CLEP Subject Examination scores for total or partial credit in certain courses.

A “Credit by Examination” brochure explaining the amount of credit to be awarded for Advanced Placement (AP), International Baccalaureate (IB), and College Level Examination Program (CLEP) examinations may be obtained from the Admissions Office.

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. Freshmen 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 test and obtain its results before enrolling in a foreign language course. The dates for testing on campus are listed in the Schedule of Classes. 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 taking courses at another college or university.

Math Placement Exam

The Math Placement Exam is a computer-based test (CBT) to help assess a student’s proficiency in math. Students seeking to register for MATH 105 Precalculus Mathematics, MATH 108 Introductory Calculus with Business Applications, MATH 113 Analytic Geometry and Calculus I, or CS 112 Computer Science I are required to successfully complete the exam. The testing schedule for the Math Placement Exam appears in the Schedule of Classes and on the university’s home page at www.gmu.edu.
Tuition, Expenses, & Financial Aid

Tuition and Fees

General Guidelines and Student Responsibilities

1. By registering for classes, students accept responsibility for charges for the entire semester.
2. Registration shall not be completed unless all outstanding balances due the university are paid in full.
3. Refer to the Payment Schedule and Tuition Liability charts on page 2 in the Schedule of Classes for payment due dates and penalties.
4. Payments are due at the Cash Office on or before due dates, regardless of postmark if mailed.
5. Failure to receive a reminder bill confirming charges does not waive the requirement for payment when due. The 4GMU telephone system (Option 4) will confirm last payment received and the balance due.
6. The student is responsible for maintaining a current billing address at the Registrar’s Office.
7. The student’s registration is cancelled if payment or payment arrangements are not made in full by the due date (see the Payment Schedule in the Schedule of Classes). A $25 cancellation fee is assessed.
8. Nonreturning 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.
9. Student enrolling in Mason off-campus courses are assessed tuition and fees at the same rates as those for on-campus courses.
10. A few 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 institution.

Tuition and Required Fees

Pending Board of Visitors approval and subject to change. For current tuition charges, call (703) 993-1000. Choose the Student Accounts option.

<table>
<thead>
<tr>
<th></th>
<th>In-State Undergraduate</th>
<th>In-State Graduate</th>
<th>In-State School of Mgmt.</th>
<th>Out-of-State Undergraduate</th>
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</thead>
<tbody>
<tr>
<td>Full-time (12-17 credits)</td>
<td>$1,188</td>
<td>$1,488</td>
<td>$2,400</td>
<td>$5,568</td>
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<tr>
<td>Tuition</td>
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<tr>
<td>Required fees</td>
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<td>684</td>
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<td>684</td>
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<tr>
<td>Total</td>
<td>$1,872</td>
<td>$2,172</td>
<td>$3,084</td>
<td>$6,252</td>
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Per credit (fewer than 12 hrs. or more than 17 hrs.)

<table>
<thead>
<tr>
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<th>In-State Graduate</th>
<th>In-State School of Mgmt.</th>
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<tbody>
<tr>
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<td>$7</td>
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<tr>
<td>Total</td>
<td>$106</td>
<td>$131</td>
<td>$207</td>
<td>$471</td>
</tr>
</tbody>
</table>

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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
Students are responsible for applying for change in their domiciliary status. 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 date they are received.

If a student is deemed out-of-state at the intermediate level, 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 domiciliary 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, Enterprise Hall, Room 416, (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 chart on page 2 of the Schedule of Classes. In cases where tuition liability is less than the payment 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. A check from the state treasurer's office in Richmond is mailed to the student.

Related Fees
<table>
<thead>
<tr>
<th>Fee</th>
<th>Amount</th>
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</thead>
<tbody>
<tr>
<td>Application Fee</td>
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<tr>
<td>New Student Fee</td>
<td>$100</td>
</tr>
<tr>
<td>Health Insurance Fee for International</td>
<td>$676 annually</td>
</tr>
<tr>
<td>Students</td>
<td></td>
</tr>
</tbody>
</table>

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 by registering for Special Registration (SREG 200, Section 001) for a $45 fee. Written approval of the student's advisor or instructor and the academic department chair is required. This 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.

International Student Health Insurance Fee
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.

New Student Fee
Newly admitted undergraduate students are assessed a new student fee of $100.

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 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

Motor Vehicle Registration Fee
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 Room 201A off the main lobby of Student Union I, Monday through Thursday, 9 a.m. to 7 p.m., and Friday, 9 a.m. to 5 p.m. For special requests or problems, come to Student Union II, Room 354, Monday through Friday, 9 a.m. to 5 p.m. For more information, call (703) 993-2710.

Payment Methods
Where to Pay
Phone: (703) 993-4GMU, Option 4. MasterCard or VISA
Window: Cash Office, Student Union I, Room 104, 9 a.m. to 4:30 p.m., Monday–Friday
Drop Box: Outside Cash Office, Student Union I, Room 104
U.S. Mail: George Mason University, Cash Office, MS 2E1, 4400 University Drive, Fairfax, VA 22030-4444. Postmarks are not considered.

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How to Pay

Cash: At window only
Check: Payable to GMU, student ID# written on front. Third-party checks are not accepted. Checks must be payable in U.S. dollars.
Credit card: (subject to credit approval): MasterCard or Visa. Daytime phone number must be provided. Written authorizations or call (703) 993-4GMU, Option 4.
Fax: (703) 993-2492. Use Fax Payment Authorization form in back of Schedule of Classes.

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 use 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 who need to budget a minimum of $500. A payment contract, available at the Cash Office, Student Accounts Office, or in the back of the Schedule of Classes, must be submitted to the Cash Office with the required down payment (one-half of contracted amount plus fee) by the due date. The contract fee is $25 and nonrefundable. Failure to pay the outstanding balance by the due date on the contract will result in a late fee, financial suspension, and ineligibility to defer payments in future terms.

Monthly Installment Plan
Students may budget all or part of their fall/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. 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 to the Student Accounts Office, Enterprise Hall, fourth floor, or mail to MS 2E2, 4400 University Dr., Fairfax, VA 22030-4444, or fax to (703) 993-2460 before the student’s individual payment due date(s). (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 registrar.gmu.edu/calendars.html.

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 service 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, including the reinstatement fee, 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
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 President’s Park, a cluster of traditional-style residence halls. Housing costs range from $1,600 to $2,100 per semester. All new students to 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. To apply for housing, contact the Office of Housing and Residence Life in Carroll Hall, (703) 993-2720.

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 in Carroll Hall, (703) 993-2720.

Dining Services
George Mason Dining Services offers a variety of food options for students living on campus or commuting to all three George Mason campuses. The Dining Services locations at the Fairfax Campus include a traditional all-you-care-to-eat dining facility called Ciao Hall; 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 and low-fat ethnic cuisine.
in the Bistro; and convenience stores in the Johnson Center and Student Union Building I. Dining Services units are also located at the Arlington and Prince William Campuses.

Meal plans for students living on campus range from $830 to $999 a semester. Students commuting to campus may choose from a variety of meal plans that range in price from $115 to $545 a semester. Faculty and staff meal plans are also available.

For more information, call Dining Services at (703) 993-3407 or 993-2870.

Dining Plan Changes
New residents may change plans during the designated change period at the beginning of the semester. Current residents may change plans for the spring semester during the designated change period in November to ensure accurate billing. Changes also will be accepted during the designated period at the beginning of the spring semester.

Financial Aid

Office of Student Financial Aid
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 and loans. Awards are based on financial need, although there are some alternative financial aid resources available for those who may not qualify for need-based financial aid. Located on the third floor of Enterprise Hall, 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, 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. Transfer students beginning at Mason in the spring semester must have the school from which they are departing send a financial aid transcript to Mason's Office of Student Financial Aid.

Financial aid for Summer Term is generally limited to those students graduating at the end of the summer or fall terms. Contact the Office of Student Financial Aid for specific details regarding summer financial aid eligibility. The deadline for the summer aid application is April 1.

All students receiving financial aid must
1. be enrolled in an eligible degree or the TEAC certificate program for at least six credits in any given semester;
2. be maintaining satisfactory academic progress as defined by the Office of Student Financial Aid, in accordance with federal guidelines (see below); and
3. be a U.S. citizen or eligible noncitizen 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, the George Mason University student aid information resources, and the student aid satisfactory academic progress policy, available in the Office of Student Financial Aid.

Satisfactory Academic Progress Standards for Financial Aid
Federal legislation governing the administration of the 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 on the World Wide Web (apollo.gmu.edu/finaid), or call the Direct On-Line Aid Resource System (DOLARS) at (703) 993-4GMU.

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 on the World Wide Web (apollo.gmu.edu/finaid), or call the Direct On-Line Aid Resource System (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 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...

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at least half time, are Virginia residents, and who demonstrate significant financial need.

**Virginia Transfer Grant Program**
The Virginia Transfer Grant Program awards grants to other-race students who are enrolled in a traditionally white or a historically black four-year Virginia public college or university. Applicants must meet minimum merit criteria and qualify for entry as a first-time transfer student.

**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 programs.

**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.

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Academic Policies

Policies and Procedures Affecting Both Undergraduates and Graduates

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 the 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.

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 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, non-voting 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
Currently enrolled students may withhold disclosure of directory information under FERPA. To withhold disclosure, students must present a photo ID in person at the Registrar’s Office, 416 Enterprise Hall, and complete the Request to Prevent Disclosure of Directory Information form. The form may be submitted at any time throughout the year and will immediately affect prospective disclosures. George Mason University assumes that failure on the part of any student to specifically request the withholding of a category of directory information indicates individual approval for disclosure. Former students may not place a new request for nondisclosure of directory information on their education records; however, they may request its removal.

Requests to withhold a student’s information from the campus directory must be submitted to the Registrar’s Office by 5 p.m. on Friday of the first week of classes of the fall semester.

* Please note: Photo images from ID cards are no longer deemed to be directory information. Photo images from ID cards will not be released to third parties without the student’s consent except as authorized by FERPA.

** Students who elect this category must conduct all university business in person with a photo ID card; those at a distance must submit a notarized request. Such students’ names will be published in the commencement program unless the students request exclusion in writing. Students in this category are eligible to use interactive voice response (telephone) and other electronic systems, such as MasonLink, for transactions including registration that are protected by a personal identification number (PIN).

Student Identification Card
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; validation stickers are sent by mail. Questions may be directed to the Photo ID Office at (703) 993-1004.

Change of Status and Address
Each student is required to notify the Registrar’s Office of any change in local home address and telephone number, permanent address, or legal name. Addresses may be updated over the Internet using Mason OnLine as well as in person. When a student’s legal name is changed, the Registrar’s Office requires a certified copy of documents authorizing the change. Such documents may be kept in the student’s permanent file.

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. Therefore, students are responsible 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. Therefore, 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**

Duties of the Honor Committee:
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. Students 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.

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, 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 provost for academic affairs.

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 provost for academic affairs 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.

REGISTRATION AND ATTENDANCE

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

Students are responsible for registering properly. They should confirm the correctness of their enrollments and report any apparent error immediately to the Registrar’s Office. Students must be present at the first meeting of every laboratory course (lecture and laboratory) to validate their enrollment or 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 that class roll in both lecture and lab.

Unless stated otherwise in the Schedule of Classes, registration is not canceled for failure to attend lecture courses. Students are responsible for full tuition payment and grades received for all courses in which they are registered unless (1) they are canceled for nonpayment; (2) they are canceled administratively by the university staff due to suspension or dismissal; or (3) the section in which they are registered is canceled.

Academic Load
The minimum full-time load for undergraduate students is 12 credits per semester. Graduate students are considered full-time once enrolled in nine credits per semester. Graduate research or teaching assistants are considered full-time when enrolled in six credits a semester. (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 failing to observe these guidelines may expect no special consideration for academic problems arising from the pressures of employment. Although 12 credits per semester represents 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
Course prerequisites 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 prerequisites as stated in the catalog. Students not meeting prerequisites 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.

Repeating a Course
Unless a course is annotated in its catalog description as “repeatable for credit” (e.g., Special Topics, Independent Study), 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.

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. 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 both the original and repeat grades; 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 600 and above are normally closed to undergraduates. Permission for an undergraduate to enroll in 500-level graduate courses must be obtained in writing before registration. Forms are available at the Office of the Registrar. Students are responsible for obtaining all signatures required. (This written permission is waived in the few undergraduate programs that request or encourage seniors to take 500-level courses to meet undergraduate degree requirements.)

To enroll in 500-level 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 a minimum of 12 credits at the university, have a cumulative grade point average of 3.000 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.

Credit for the same course is not given toward both graduate and undergraduate degrees.

Preregistration
Preregistration for the next semester (including Summer Term) begins after mid-semester (fall or spring) and is by priority group (graduate students, seniors, juniors, etc.). The Registrar's Office assigns each student a particular date and time after which a student may register, based on the number of credits earned. Thus, dates and times to register may not be the same for all students within a particular priority group.

Students should consult the Schedule of Classes and 4GMU for information about their registration date and time.

Special Registration for Nonenrolled 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 matriculation, can retain active status by registering for Special Registration (SREG 200, Section 001) for a $45 fee. Written approval of the student's advisor and the academic department chair is required. This 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.

Changing Registration (Schedule Adjustment)
Changes to registration are normally made using the telephone system (4GMU). However, if a section is closed or controlled, permission 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. Registration changes must be completed within the schedule adjustment period defined below and indicated in the Schedule of Classes.

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 and including the first day of classes. Courses meeting for fewer than 14 weeks have add, drop, and other deadlines proportional to their length.

After the date listed in the Schedule of Classes for adding and dropping 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. Late 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 procedure below).

None of these transactions is complete until it is processed by the Office of Student Accounts and the Office of the Registrar.

Enrolling for Credit without Grade Points
Undergraduates may elect to have up to six credits of electives outside the major field graded S/NC (Satisfactory/No Credit). Students must obtain the instructor’s permission on a Credit without Grade form for this provision and submit
the form to the Registrar's Office by the end of the add period, as defined above. A Credit without Grade form is not required for enrollment in courses normally graded in this way. See also the section Additional Grade Notations.

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 for credit at a later date. A student may also audit a course previously taken and passed. A student may not change from credit to audit status after the end of the drop period, as defined above. The usual tuition and fees apply to audit status.

Enrolling in Consortium Courses
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 Mason students may enroll in courses at any of the consortium institutions.

To be eligible for enrollment, students must be enrolled at George Mason University and admitted to a degree program. Nondegree and Extended Studies students are not permitted to enroll in consortium courses. Undergraduate students must be enrolled, in good academic standing, and have attained at least junior status. Graduate students must be currently enrolled, in good academic standing, and in degree-seeking status. Auditing courses through the consortium is not permitted.

George Mason University students may register for any course through the consortium providing the course is not available at George Mason University during the same semester and are not exempt from consortium registration at the visited institution. Courses that are off-campus at George Washington and American Universities are not open to consortium registrants. Independent study projects, special institutes, or tutorials are also exempt from consortium registration.

All course work attempted by a George Mason student must be authorized by the appropriate dean and chairman for the field of study in which the student is enrolled at George Mason. Course work is also subject to the requirements of the particular school in which the student is enrolled. The allowable number of credits to be taken through the consortium during an academic career are limited by university policy.

Credits earned through the consortium are considered resident credit. Grades for consortium courses are sent to the George Mason Office of the Registrar, recorded, and calculated into the cumulative grade point average of the George Mason University student and become a permanent part of the student's official record.

Any academic courses that do not carry credit at the visited institution will not be counted for credit at George Mason University. Courses that do not carry credit at George Mason, but do receive credit at the host university, will not be given credit at George Mason University.

Registration for Air Force ROTC course work at the University of Maryland-College Park is processed through the Office of the Consortium. Only senior-level Air Force ROTC courses will be given credits at George Mason University.

George Mason consortium students pay the George Mason tuition rate to the George Mason Office of Student Accounts. Credits taken through the consortium are counted toward full- or part-time status at George Mason University for purposes of financial aid. Any additional fees are to be paid by the student to the visited institution.

Special inquiries and further information is available through the Office of the Registrar. Registration is processed through the Office of the Registrar by the consortium coordinator. Schedules and catalogs of participating universities are located in the same office.

Academic Common Market
The Academic Common Market (ACM) is a cooperative tuition-reduction program agreement among 15 southern states, including Virginia. Its purpose is to provide programs of study to students that are not available in their home states. Students who are not legal residents of Virginia, but who wish to pursue a degree in selected George Mason programs 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. Further information about this program is available at the Office of the Registrar, Enterprise Hall, Room 416.

Class Rosters (Verifying Enrollment)
All students are expected to enroll by the end of the add period and will be added to a class after this period only for extraordinary reasons. Students are advised that they will not receive credit for courses unless their names are on the official class rosters and final grade sheets. This must be done through the official registration procedures such as 4GMU. Students will not receive written confirmation of schedule changes and are responsible for checking their schedules on 4GMU or MasonLink 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. "Retroactive credit" will not be awarded to students who report that they attended classes but were not on the official rosters. All classes for which a student is enrolled past the drop deadline will remain part of the official academic record.

Canceling Registration/Withdrawal
Students who cannot attend classes during the semester for which they have preregistered should cancel registration using the telephone registration system (4GMU) before the early registration deadline for payment. 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 Scale 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.

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Withdrawal from a Semester
Upon approval by the student's academic dean, a student may withdraw from a semester after the end of the drop period without academic penalty, but only for nonacademic reasons preventing completion of the courses. A student who stops attending without the dean's approval receives Fs in all courses. Withdrawal forms are available at the Registrar's Office.

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

Attendance Policies
Students are expected to attend the class periods of the courses for which they register. Although absence alone is not 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. In particular, a student who misses an exam without an excuse may have the course grade lowered. Students who fail to participate (because of absences) in a course in which participation is a factor in evaluation may have the grade lowered.

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 reasonable alternative opportunity to complete such 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 be sensitive to religious observances in their construction of class schedules and syllabi.

EXAMINATIONS AND GRADES
Final Examination Policies
Final examinations are normally given at the end of all undergraduate courses. In predominantly laboratory courses, examinations may be given in the last regularly scheduled laboratory period. Scheduled final examinations may not exceed two hours and 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 should inform the students at the beginning of the semester. Such examinations 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/director. The effect of missing a final undergraduate 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.

A student whose absence from an examination is excused is assigned a temporary grade of AB. A rescheduled exam must be administered within 10 business days of the original date of the examination, at a time to be arranged between the student and the instructor, or the AB will automatically become an F.

Grading Policies
University course work is measured in terms of quantity and quality. A credit normally represents one hour per week of lecture 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.

Grading System
The university-wide system for undergraduate and graduate grading is as follows:

<table>
<thead>
<tr>
<th>Letter Grade</th>
<th>Grade Points</th>
<th>Application of Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>4.00</td>
<td>Minimum satisfactory graduate letter grade</td>
</tr>
<tr>
<td>A-</td>
<td>3.67</td>
<td>Undergraduate grading only</td>
</tr>
<tr>
<td>B+</td>
<td>3.33</td>
<td>Undergraduate grading only</td>
</tr>
<tr>
<td>B</td>
<td>3.00</td>
<td>Minimum satisfactory undergraduate letter grade</td>
</tr>
<tr>
<td>B-</td>
<td>2.67</td>
<td>Undergraduate grading only</td>
</tr>
<tr>
<td>C+</td>
<td>2.33</td>
<td>Undergraduate grading only</td>
</tr>
<tr>
<td>C</td>
<td>2.00</td>
<td>Undergraduate grading only</td>
</tr>
<tr>
<td>D</td>
<td>1.00</td>
<td>Undergraduate grading only</td>
</tr>
<tr>
<td>F</td>
<td>0.00</td>
<td>Undergraduate grading only</td>
</tr>
</tbody>
</table>

Some courses may be assigned a letter grade of S (satisfactory), NC (no credit), or IP (in progress). The grade of IN (incomplete) may be given when all course requirements have been completed except for assigned papers or reports that the student has been compelled to postpone for reasons beyond the student's control. Regulations concerning incomplete grades may be found under the section Change of Grade.

Plus and minus grades are used inside the range of satisfactory performance. Grades below B (graduate) or C (undergraduate) are unsatisfactory and consist of two categories: unsatisfactory, passing (C graduate, D undergraduate); unsatisfactory, failing (F). No credit 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.

The separate grading system of the George Mason University School of Law is described in its catalog.

Grade Point Average
Grade points for each credit are assigned with letter grades as indicated in the preceding 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.

Three kinds of grade point average (GPA) are used at George Mason. Current GPA is the measure of academic performance in one semester, affecting both the dean's list and...
Academic Policies

academic standing. Cumulative GPA is calculated on all work at George Mason University and is one of several criteria affecting academic dismissal. Degree GPA is bestowed at the time of degree conferral and is computed from courses applied to the degree.

Dividing the total grade points earned in a semester by the number of letter-graded credits attempted in that semester gives the current GPA. Similarly, dividing the number of grade points earned in all George Mason University courses by the number of normally graded credits attempted at the university gives the cumulative GPA. A degree GPA is computed at graduation on the basis of the normally graded courses the student completes at the university and includes in the degree application. This GPA is noted on the transcript, under the degree conferred. Courses not used in this calculation are noted as excluded on the transcript.

Additional Grade Notations

S/NC (Satisfactory/No Credit). An S grade (available only in courses for undergraduate credit) reflects satisfactory (C or better) work; otherwise, the student receives no credit (NC). S and NC have no effect on the grade point average. Courses normally graded in this way are annotated in their catalog descriptions. In addition, undergraduates may take up to six credits to be graded S/NC; this option applies only to electives outside the major field. See also Enrolling for Credit without Grade Points in the section Registration and Attendance.

A/B/C/NC. A student successfully completing English Composition and Introduction 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). A student who is passing a course may be unable to complete scheduled course work for a cause beyond reasonable control. In such a case, the instructor assigns a temporary grade of Incomplete (IN). 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 obtained and filed with the Registrar's Office by the faculty deadline, the grade of IN is changed to F. Students who have filed their intent to graduate have only six weeks from date of degree conferral to resolve any INs and have the final grade recorded by the Registrar's Office. The student is responsible for submitting work to the instructor with sufficient time for evaluation.

While 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). Courses normally graded in this way are annotated in their catalog descriptions. 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) is entered on the record. IP is not treated as an unsatisfactory grade. 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.

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. 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 reported as having never attended, or who stopped attending, a grade of FA is noted on internal documents. Official documents, including official transcripts and the grade mailer, contain the official grade of F.

Grade Reports

Semester grade reports are available over the 4GMU telephone system, (703) 993-4468. Students who wish to receive a copy of their grades must request one from 4GMU. Though grades covering the past three terms may be accessed by phone, a paper copy of grades can be requested by phone only for the most recent semester. Transcripts of all complete academic work may be ordered at any time with a written request to the Office of the Registrar.

Change of Grade

Grades in courses for undergraduate or graduate credit may be changed only under the following circumstances and procedures.

Change from temporary to final grade. See the definitions of IN, IP, AB and SP in Additional Grade Notations for conditions and time limits. The student is responsible for submitting work to the instructor with sufficient time for evaluation.

Change of recorded final grade. 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 grades).

Appeal of Grade

Although faculty 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

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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.

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**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. Concentrations are approved by a school, college, or institute at the undergraduate level, or by the university's 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, college, or institute at the undergraduate level, and by the university Graduate Council at the graduate level. The name of a certificate program is printed on the transcript upon completion, after the conferral of a degree.

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

**Option:** The choice of a thesis or non-thesis path in graduate programs.

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**Catalog Requirements for Degrees**

All degree candidates may choose to graduate under the catalog in effect at conferment. Not all programs and program variations 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 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. (Students who have been absent from two to nine consecutive semesters and have not attended another institution may also choose to graduate under their initial catalog.)

Master's and doctoral degree candidates who have been continuously enrolled may choose to graduate under any catalog in effect at or after their admission. However, students who have been inactive more than one year must graduate under a catalog in effect after they have been granted permission to re-enroll.

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**Application for Degree**

All students should initially declare and then maintain an "expected graduation date" from George Mason through 4GMU. In their final semester, students who expect to complete degree requirements must confirm their intent to graduate through the university website (www.gmu.edu; select "Students," then "Graduation Processes") 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 applications are obtained through the registrar's graduation website. Separate applications for each degree or certificate are

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**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. Concentrations are approved by a school, college, or institute at the undergraduate level, or by the university's 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, college, or institute at the undergraduate level, and by the university Graduate Council at the graduate level. The name of a certificate program is printed on the transcript upon completion, after the conferral of a degree.

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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. Graduate students must also complete non-course degree requirements (i.e., orals, comprehensive exam, thesis or dissertation, defense) by the stipulated deadlines. 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. 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 conferment 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. The system will accept their 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. Students who have completed all degree requirements except for a required internship may participate if they will have completed the internship by September 10. 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 last Friday of classes in the spring semester.

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.

Academic Advising
Undergraduate students are encouraged to 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 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 and tracking of approved modifications to a student's degree plan. Students access their individualized reports through the university's secure website (argosy.gmu.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 should plan their schedules with Honors advisors. Every department coordinates advising of its honors students through this office (Student Union 1, Room 208).

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.

Academic Support and Advising Services
Students who have not yet decided on a major or who are considering a change of major are advised by Academic Support and Advising Services, (703) 993-2470. Staff members are available for advising Monday through Friday, 8:30 a.m. until 5 p.m., and Tuesday evening until 8 p.m.

Students are encouraged to walk in or call for information about general education requirements, programs, policies, and procedures, and other academic concerns. Academic Support and Advising Services provides information and guidance for students who are interested in pre-professional programs in law or health fields.

Advising upon Entrance into the Upper Division (Junior Standing)
Every student is especially encouraged to meet with an advisor upon entrance into the upper division to adopt a program of study. This meeting should include (1) a review of the requirements for the degree and major the student has chosen, (2) a review of the student's record including any deficiencies, which must be made up, (3) a discussion of the career and/or graduate study options open to the student enrolled in such a program, and (4) an opportunity for departmental faculty to evaluate the student's suitability to major in the chosen discipline.

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

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
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

http://catalog.gmu.edu
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, Academic Advising and Support Services, MS 2E6, Fairfax, Virginia 22030-4444; telephone (703) 993-2470.

Academic Standing

Academic Period

For determining academic standing, including the duration of academic probation and suspension, an academic period is defined as follows:

Each academic period (semester or Summer Term) 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.

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.

Satisfactory Performance

Students perform satisfactorily during any academic period in which they earn a grade point average for that period 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).

Academic Probation

Students who receive two warnings during any four consecutive academic periods of enrollment are on probation during the academic period of enrollment following the second warning. (Consecutive academic periods of enrollment are successive periods during which the student enrolled, regardless of whether there were intervening periods during which the student did not enroll.)

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 attempts fewer than 12 credits during either of those 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, for example, two regular semesters and a Summer Term. A third suspension results in dismissal.

Suspension is 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 period results in continuation of probation but not suspension; however, a student will be dismissed at the end of that period if the dismissal criteria apply. Two consecutive warnings 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 unsatisfactory.
3. The student's cumulative grade point average for all work attempted at the university is below a minimum acceptable value that depends on the number of cumulative quality credits earned at the university plus credits transferred from other institutions or obtained by testing as follows:

<table>
<thead>
<tr>
<th>Credits</th>
<th>GPA</th>
<th>Credits</th>
<th>GPA</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.00</td>
<td>0.00</td>
<td>80-84</td>
<td>1.025</td>
</tr>
<tr>
<td>40-44</td>
<td>1.250</td>
<td>85-89</td>
<td>1.647</td>
</tr>
<tr>
<td>45-49</td>
<td>1.333</td>
<td>90-94</td>
<td>1.667</td>
</tr>
<tr>
<td>50-54</td>
<td>1.400</td>
<td>95-99</td>
<td>1.684</td>
</tr>
<tr>
<td>55-59</td>
<td>1.455</td>
<td>100-104</td>
<td>1.700</td>
</tr>
<tr>
<td>60-64</td>
<td>1.500</td>
<td>105-109</td>
<td>1.714</td>
</tr>
<tr>
<td>65-69</td>
<td>1.538</td>
<td>110-114</td>
<td>1.727</td>
</tr>
<tr>
<td>70-74</td>
<td>1.571</td>
<td>115-119</td>
<td>1.739</td>
</tr>
<tr>
<td>75-79</td>
<td>1.600</td>
<td>120-</td>
<td>1.750</td>
</tr>
</tbody>
</table>

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

Students who earn a GPA of less than 2.000 in any one semester may enroll for a maximum of 13 credits the following semester. Students who are returning from suspension may take a maximum of 13 credits the following semester and must meet with an advisor before re-registering. This policy does not apply to Summer Term classes, due to its unique structure.

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 participate 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, Academic Support and Advising Services, and 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 Academic Support and Advising Services.

Change of Academic Program
Students who wish to change their academic programs (degree and/or major) should see a faculty advisor or Academic Support and Advising Services. 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). Department chairs and deans/directors when required 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 contemplated 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 “University Academic Programs and Resources” chapter to determine whether minors are offered and their specific requirements.

BACCALAUREATE DEGREE REQUIREMENTS

General Education Requirements
Each undergraduate degree program requires a substantial General Education core from the arts and sciences (30 credits). Because literacy—the ability to read, write and understand complex ideas in prose—is the cornerstone of a liberal education, a substantial amount of writing, in some appropriate form, is required in all university programs. Six credits must be in English composition (see English Composition Requirement). Of the remaining 24 credits, at least 6 must be in each of the following three areas:

<table>
<thead>
<tr>
<th>Area A</th>
<th>Area B</th>
<th>Area C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Art</td>
<td>Astronomy</td>
<td>Anthropology</td>
</tr>
<tr>
<td>Comm.</td>
<td>Biology</td>
<td>Economics</td>
</tr>
<tr>
<td>Eng.</td>
<td>Chemistry</td>
<td>Geography</td>
</tr>
<tr>
<td>Foreign</td>
<td>Computer</td>
<td>(except 102 and 309)</td>
</tr>
<tr>
<td>Langs.</td>
<td>Science</td>
<td>Government</td>
</tr>
<tr>
<td>Litter</td>
<td>Engineering</td>
<td>History</td>
</tr>
<tr>
<td>P. Arts</td>
<td>Geography</td>
<td>Linguistics</td>
</tr>
<tr>
<td>173 and 376</td>
<td>102 and 309</td>
<td>Psychology</td>
</tr>
<tr>
<td>Rel.</td>
<td>Geology</td>
<td>Sociology</td>
</tr>
<tr>
<td>Spe.</td>
<td>Mathematics</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Philosophy 173</td>
<td></td>
</tr>
<tr>
<td></td>
<td>and 376</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Physics</td>
<td></td>
</tr>
</tbody>
</table>

General education 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, and often more than one, has been designated as “writing intensive.” While other courses in the major might require written projects, the “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 description of each major for the specific courses that fulfill this requirement in that major.

http://catalog.gmu.edu
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 credits of upper-level 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 may be granted a George Mason bachelor's degree while enrolled in a professional 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 courses that are to be applied only as elective credits to the total credits requirement for the bachelor's degree.

Additional Academic Requirements
To qualify for a bachelor's degree, a student must have been admitted, must have fulfilled 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. However, a student may not use a grade of D in BIS 490 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 failing 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.

Graduation with Distinction
A student graduates with distinction from the university when at least 60 credits earned at the university are applied toward graduation 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
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 (certain programs may enforce higher standards). The Office of the Provost administers university graduate policies for the Graduate Council.

Classification of Students
Graduate students enrolled in nine or more credits per semester are considered full-time. Research and teaching assistants are considered full-time students when enrolled in six or more credits per semester.

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 rules 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.
Change from Provisional to Degree Status

For a change from provisional status to be considered, a graduate student must have completed 12 credits of graduate course work in provisional status with at least a 3.000 GPA, supplied all admission credentials, and removed all deficiencies as established in the student's letter of admission. Written confirmation from the college/school/institute dean or director indicating the change of status is sent to the student.

Credits earned in the provisional status may be used subsequently in meeting minimum hour and program degree requirements. However, a maximum of 12 graduate credits earned in nondegree status may be applied toward a graduate degree. Students admitted in these categories are therefore strongly urged to obtain faculty guidance before beginning course work. Credits cannot be applied toward a graduate degree unless they are specifically approved for that purpose.

Change from Nondegree to Degree Status

A student admitted for graduate study in nondegree 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 nondegree status toward a degree, the credits must be approved on the college/school/institute’s Transfer of Credit form. However, a maximum of 12 graduate credits earned in nondegree status may be applied toward a graduate degree.

Transfer of Credit for Work Taken Before Admission

With the recommendation of the appropriate program faculty and approval of the appropriate dean or director, a master’s student may transfer up to six graduate credits earned at other accredited institutions. Up to 12 credits may be transferred within the Commonwealth Graduate Engineering Program, the Master of Arts in Interdisciplinary Studies program, and the Master of Arts in Telecommunications program. Undergraduate courses taken at other institutions are not transferable for credit to graduate programs within the university. All graduate work offered as transfer credit must be applicable to the degree program the student is pursuing at George Mason University.

Credit is normally considered for transfer, upon the request of the student, at the time of initial registration as a degree student. Transfer of credit requests from provisional students are not considered until such students are advanced to degree status. The collegiate dean/director sends students written confirmation of all credits approved for transfer.

A maximum of three transfer credits from other universities may be applied toward a graduate certificate program with the approval of the certificate coordinator and the appropriate dean or director. All other general policies applicable to transfer credit to degree programs apply to transfer credit for certificate programs.

Criteria for Transferable Credit

To be accepted for transfer, previous credits must have been earned within six years prior to admission. Credits previously applied toward a degree at another institution or at George Mason are not allowed as transfer credit for degree programs. Up to three credits previously earned in a master's program may be transferred into a certificate program.

In all cases of courses accepted for transfer of credit, a minimum grade of B must have been earned and the courses 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 part of a degree program are not acceptable for transfer to the university. The student is responsible for furnishing such evidence. The college/school/institute dean or director decides whether work taken elsewhere and presented for transfer credit to a graduate program at the university is acceptable. Departmental recommendation alone is insufficient.

Courses at Other Institutions

A student 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 the prior approval of the department and the college/school/institute. Students may earn up to 6 transfer credits toward a master’s degree or 12 credits toward a doctoral degree. Permission to take a course elsewhere must be secured in writing from the college/school/institute dean or director before registering at the other institution. Permission forms to take course work elsewhere are available in the graduate office of the college, school, or institute. The student is responsible for having an official transcript submitted to the college/school/institute’s office for evaluation.

Permission does not exempt a graduate student from satisfying the 18-credit minimum for a master’s degree or the 36-credit minimum for a doctoral degree of course work taken at the university.

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

A provisional graduate student who fails to achieve at least a 3.000 GPA after completing 12 credits as a provisional student is terminated from provisional status. The notation of academic termination is affixed to the graduate student’s official record. Provisional students are also terminated after accumulating 12 credits of unsatisfactory undergraduate course work. Graduate and undergraduate grades are not combined in the calculation of credits toward termination or dismissal for provisional students. However, nondegree students are terminated after the accumulation of 12 credits of unsatisfactory grades in graduate or undergraduate courses combined.
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.

Graduate Degree Requirements
Requirements Applicable to All Master’s Degrees
Candidates must satisfy all university degree requirements and all requirements established by the master’s program faculty. Specific departmental degree requirements are listed under the respective graduate programs in this catalog.

General Requirements
The following requirements apply to all master’s degrees:
1. A candidate must have earned a minimum of 30 graduate credits.
2. Only graduate courses may apply toward the degree.
3. A graduate student may apply up to six credits of C grades in graduate courses and must have a grade point average of at least 3.00 on the degree application. The GPA calculation excludes all transfer courses and George Mason Extended Studies credits not formally approved for the degree.
4. A candidate must have completed at least 18 graduate credits at the university after having been admitted to degree status.
5. A candidate must have completed at least 24 credits at the university, of which
   a. a maximum of 6 credits may be in master’s thesis research (799) or in master’s project research (798);
   b. no more than 12 credits may have been earned through enrollment in nondegree status or through Extended Studies enrollment before acceptance in a degree program;
   c. no more than 6 credits may be transfer credit for course work taken before admission, with credit earned in nondegree status or through Extended Studies enrollment reduced accordingly (exceptions are noted under individual degree programs); and
   d. a maximum of 6 transfer credits may be taken after admission to the university.

Time Limit
A student must complete all requirements for the desired master’s degree or postbaccalaureate certificate or diploma within six years from the date of initial registration as an admitted (degree or provisional) graduate student. A graduate student who terminates enrollment and later is granted permission to re-enroll may not count the six-year time limit as beginning on the date of re-enrollment.

Thesis and Nonthesis Options
Requirements regarding a thesis vary with the degree program. A number of master’s programs offer both a thesis and nonthesis 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.

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 the thesis research course (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 must 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.

The master’s thesis committee is named by the candidate’s department chair, who also 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 of whom must be members of the graduate faculty, and one of whom may be from outside the department. At least two committee members must be members of the graduate faculty.

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 the Guide for Preparing Graduate Theses, Dissertations, and Projects, which is available in the course materials store in the Johnson Center and on the university website (www.gmu.edu; in the Search Mason box, enter “Preparing Graduate Theses”). Students may register in the thesis course (799) only after a 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 thesis with two original signed cover sheets must be deposited with the college/school/institute dean or director on or before the date specified below:

<table>
<thead>
<tr>
<th>Date</th>
<th>Graduation Date</th>
</tr>
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<tbody>
<tr>
<td>November 15</td>
<td>January graduation</td>
</tr>
<tr>
<td>March 31</td>
<td>May graduation</td>
</tr>
<tr>
<td>July 15</td>
<td>August graduation</td>
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</tbody>
</table>
Requirements Applicable to All Doctoral Degrees

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

General Requirements

The minimum requirements that follow apply to all doctoral degrees. Programs may impose stricter requirements. A doctoral candidate must

1. acquire a minimum of 72 graduate credits beyond the baccalaureate degree, with the following limitations:
   a. no more than 24 credits in doctoral dissertation research (999) or doctoral proposal (998) combined, and
   b. no more than 12 transfer credits taken after admission to doctoral degree status;
2. pass a written and/or oral doctoral candidacy (qualifying) examination;
3. obtain approval for a final oral doctoral examination from the doctoral dissertation committee, the department chair, and the dean or director of the school, college, or institute. Approval by Ph.D. program directors varies among disciplines. Candidates should check with their college/school/institute; and
4. apply no more than six credits of C grades in graduate courses and have a minimum grade point average of 3.000 on the degree application. The GPA calculation excludes all transfer courses and George Mason Extended Studies credits not formally approved for the degree.

The number of credits required by a doctoral degree program may be reduced by a maximum of 30 credits if a master's degree or other appropriate credits have been earned before admission. These credits should be noted on the program of study.

Residence

All doctoral students are required to spend a minimum of two consecutive semesters, not including Summer Term, in continuous registration. The doctoral program of study must include a minimum of 36 graduate credits taken at George Mason University after admission to degree status.

Time Limit

Doctoral students have six years from the time of admission to become advanced to candidacy. Students have five years from the time of advancement to complete their dissertation.

Dissertation Committee

By the time that a doctoral student is advanced to candidacy, the dean or director of the college/school/institute appoints a dissertation committee upon recommendation by the department chair or institute director. The committee consists of a professor from the department of the student's major and at least two other members of the faculty, one of whom must be from outside the student's department. 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 institute director in consultation with the committee; such changes would be for extenuating circumstances only. Faculty may resign from a dissertation committee with appropriate notice; such resignations must be submitted in writing to the dean or institute director.

For a dissertation to be approved, all committee members are expected to sign the dissertation. If a committee member refuses to sign the dissertation, the student or any member of the committee may petition the unit dean or institute director for a review and ruling to resolve the stalemate. The dean/director may seek the advice of outside reviewers to provide assessment of the work. The final decision is that of the unit dean or institute director.

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.
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 the Guide for Preparing Graduate Theses, Dissertations, and Projects, which is available in the course materials store in the Johnson Center and on the university website (www.gmu.edu; in the Search Mason box, enter "Preparing Graduate Theses"). The guide also includes information on the number of copies required, and 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.

Continuous Dissertation Registration
Registration for doctoral research proposal courses (998) and doctoral dissertation courses (999) must be completed during early registration or by the end of the schedule adjustment period. If this date is missed, students must register for these courses the following semester.

All registration for doctoral dissertation research (999) must be planned with the dissertation director and doctoral coordinator in the college, school, or institute. Students must register for a minimum of three credits per semester (six credits per semester is required to be considered full time) until the last three dissertation credits are reached. Once the student has three or fewer credits remaining, a student may register for one credit of 998 or 999 and be considered a full-time student as long as his/her advisor and department chair certify each semester that the student is working full time on the proposal or dissertation.

Doctoral Defense
As soon as all degree requirements have been satisfied, including the completion of the doctoral dissertation, the doctoral candidate may arrange with the dissertation committee to schedule the doctoral defense. Defense fliers or notices must be circulated two weeks before the defense date.

The oral 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, securing the signatures of the director and other members of the dissertation committee, and submitting the original and required copies to the graduating candidate's school, college, or institute for approval by the unit dean or director.

Dissertation Submission and Fee
Two original copies on 100 percent cotton bond and one photocopied copy of the dissertation must be deposited with the unit dean or director. In addition, submission of the dissertation to University Microfilms International is required; a fee of approximately $50 is paid by the student for this process. All copies of the dissertation must be submitted and fees paid before the doctoral degree is awarded. Dissertation due dates are as follows:

- November 15: January graduation
- March 31: May graduation
- July 15: August graduation

Note also the conditions for participating in the commencement ceremony, as specified in the section Commencement under Degree Conferral Policies.
Statement on Equal Opportunity and Affirmative Action

George Mason University is an equal opportunity and affirmative action institution committed to the principle that access to study or 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 shall maintain a continuing affirmative program to promote equal opportunity and to identify and eliminate discriminatory practices in every phase of university operations. Furthermore, affirmative action will be 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 will make 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.

General Policies

Students and employees should bring problems or questions regarding EO/AA/sexual harassment policies to the attention of the supervisor, department chair, the vice president for University Life, the student ombudsmen, an academic dean, 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 1, 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.

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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.

Immunization Requirements
University policy requires that all students show documented evidence that they are immunized against certain communicable diseases. Immunizations that are required before registration for classes are as follows:

- Polio: original series of three
- DPT: original series of three
- Tetanus/diphtheria: last booster within 10 years
- Measles: two doses for anyone born after 1956; both doses must have been administered after 1967 and after the first birthday
- Rubella: one dose required after the first birthday
- Mumps: one dose required
- PPD (TB screening): required within the past year for admission
- Hepatitis B vaccine is recommended

Records of immunization are to be sent to the Student Health Center, SUB I, MS 2D3, or faxed to the center at (703) 993-4053. If you have questions, or need additional information, 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 incompatible with the goals of the university. By defining standards of behavior and by providing educational programs to create an awareness of drug- and alcohol-related problems, the university attempts to prepare individuals to act responsibly. Those in need of assistance may be directed to the Judicial Affairs Office, (703) 993-4053. If you have questions, or need additional information, call (703) 993-2836.

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. The University Police will enforce all applicable local, state, and federal laws in accord with established standing orders, procedures, and guidelines.
3. There will be a university judicial review of all reports of drug offenses occurring on campus. Action under the University Judicial Code will neither prejudice nor be prejudiced by action taken either in the criminal justice system or by the management of university housing.
4. Any student found responsible for a violation of law or regulation involving illegal drugs will be required to undergo an evaluation administered by personnel of the university's Drug Education 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 the 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, on the basis of the result of an evaluation by the Drug Education Center and any mitigating circumstances, the judicial administrator may reduce the sanction to one-year probationary status with any future violation resulting in permanent separation from the university. Additional educational sanctions may be included in the conditions of probation.
7. Any student 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. Any student 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. The suspended student must provide evidence of successful participation in a drug treatment program prior to reinstatement.

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 other than 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 resident 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. Housing discipline sanctions 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 the Drug Education Center for appropriate evaluation and referral.
8. All students referred to the university judicial administrator will have their alcohol abuse evaluated by personnel of the Drug Education Services. The sanctions...
imposed in these cases will be designed to offer assistance in overcoming any identified problem. 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 that we inform you 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/or will be required to satisfactorily participate in a drug abuse assistance or rehabilitation program at the discretion of management. As a condition of employment, each employee must abide by the terms of this prohibition and notify his/her supervisor of any criminal drug statute conviction occurring in the workplace no later than five days after such conviction. 

I. General Laws and Regulations  
A. Those who choose to purchase, possess, and consume alcoholic beverages on campus must do so responsibly and be of legal age (21). All members of the university community, to include students, faculty, staff, alumni, and their guests, are expected to comply with federal and state laws regarding the use of alcohol and university-related regulations contained in this policy. This 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. It is also prohibited to purchase for, or to serve such beverages to, a person under 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 beverages prohibited to them shall have their driver’s licenses revoked for not fewer than 30 days but for not more than one year. Consuming alcohol in nonlicensed public places or offering a drink to another in a nonlicensed public place is also a violation of Virginia law. The sale of alcoholic beverages to an intoxicated person is prohibited. It is also unlawful for an intoxicated person to purchase or possess alcoholic beverages. While this purchase or possession is a misdemeanor, violators are also subject to having their driver’s licenses revoked for one year. It is illegal to operate a motor vehicle—including mopeds—while a person has a blood alcohol concentration (BAC) of .08 percent or higher. For a driver under 21 who drives with a BAC of more than .02 percent, but less than .08 percent, the driver’s license is suspended for six months and a fine of up to $500 is imposed. If a person is arrested for driving with a license revoked or suspended under a prior DUI conviction, the offender’s car is immediately impounded for 30 days. The court can impound the vehicle for an additional 90 days following conviction. If the car does not belong to the offender, the car owner may petition the court for release of the vehicle. 

Your driver’s license will automatically be revoked for seven days if you refuse a breath test or if your BAC is .08 percent or higher. You no longer have the option of requesting a blood test instead of a breath test for an alcohol-related offense. Sobriety spot-checks to detect drunken drivers are legal. It is illegal to serve alcohol from an unregistered keg (common container holding four gallons or more). Only University Dining Services or authorized entity may serve alcohol from kegs. 

C. Possession, use, sale, or distribution of controlled substances, including marijuana, is a violation of both 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; civil proceedings may occur in certain situations. University sanctions are intended not to punish individuals but to provide education and rehabilitation services. 

Sanctions vary with severity of violation and range from written warnings to expulsion from the university. Included in most sanctions for students is an evaluation by the director of Drug Education Services to ascertain severity of alcohol and other drug problems and a referral to arrange community service hours. Employees found in violation may be subject to action by their 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. They also include 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, which can cause negative consequences such as risky sexual behavior. It is expected that all students and employees respect those who choose not to drink. Drinking alcohol should be avoided particularly by pregnant women and anyone taking prescribed 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. Tolerance and physical and psychological dependence can develop. The potential for health problems can also develop

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from the use of nicotine or caffeine products. Excess use of alcohol can cause death due to alcohol poisoning.

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.

Those in need of assistance in dealing with alcohol and other drug problems are encouraged to seek the confidential services of campus departments 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 Drug Education Services.

IV. Campus and Community Resources

Drug Education Services—Nancy Schulte, LCSW, MSWAC
Student Union I, Room 252D, (703) 993-3686
Health and Wellness Resources
Student Union I, Room 238, (703) 993-3686
The State Employee Assistance Service (SEAS), (804) 786-6741
Alcoholics Anonymous—for campus meetings, call (703) 993-3686; in Virginia, call (703) 281-7501
Narcotics Anonymous—in Virginia, call (703) 281-8638

The Alcohol and Other Drug Policy, composed of these four sections, outlines subject matter pertaining to university regulations on substance use and abuse. This policy is annually distributed 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 Alcohol and Other Drug Policy have been developed by a committee of faculty, staff, and students. This policy statement is available in Drug Education Services in Student Union I, Room 252D. This policy is also distributed through the student and faculty/staff handbooks and the university’s two 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 accomplish these ends, this policy supports investigations of complaints involving George Mason computing abuse, including sexual harassment, 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 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 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:

1. 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.

2. Don’t intercept or monitor any network communications not explicitly meant for you.

3. 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.

4. 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 their 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.

1. 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.

2. Don’t use George Mason computing resources to violate harassment laws or policies. Various types of harassment, including sexual or racial, are proscribed by university policies.

3. Don’t use George Mason computing resources to violate the Honor Code.

4. 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.

5. Don’t use George Mason computing resources to harass or threaten others.

6. Don’t use George Mason computing resources to transmit fraudulent messages.

7. Don’t use George Mason computing resources to transmit, store, download, print or intentionally receive 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 or 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, listservs, 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 computers. 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 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 website. 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 "stopit" 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 SA's decisions, responding to complaints, and periodically reviewing this policy. The SRP consists of three faculty members, one graduate student, one undergraduate student, one University Computing and Information Systems (UCIS) staff member, and one non-UCIS 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.

http://catalog.gmu.edu
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 (CERT), 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 MIT, 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
Notice 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:

“Someone using your account did [whatever the offense is].” This is followed by an explanation of why this behavior violates which policy. “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.

Parking Policy

All faculty, staff, and students who park in lots owned or operated by George Mason University must display a valid decal or day pass, or must park in the Parking Deck and pay an hourly or daily rate. The Parking Deck is located on Mason 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.

http://catalog.gmu.edu
Decal and day pass enforcement runs from 7 a.m. to 8 p.m., Monday through Friday, and 9 a.m. to 2 p.m. on Saturday. Metered parking is designated for short-term use and is monitored from 7 a.m. to 11 p.m., seven days a week, at Presidents Park, Student Apartments, and Lot T. Meters at Finley, SUB I, and Lot E are monitored Monday through Friday, 7 a.m. to 8 p.m., and Saturday, 7 a.m. to 2 p.m. Broken meters are considered closed parking spaces, and any vehicle parked in such spaces are subject to citation.

Restricted areas such as yellow curbs, crosswalks, sidewalks, landscaped/barricaded areas, loading zones, handicapped spaces, and fire/emergency lanes are monitored 24 hours, 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. Day passes are available for faculty, staff, and students with a valid ID from an accredited university. Decals and multiple-day passes may be purchased at the Parking Services Sales Office located in Room 201 off the main lobby of Student Union I. The hours of operation are 9 a.m. to 7 p.m., Monday through Thursday, and until 5 p.m. on Friday when classes are in session.

Single-day passes may be purchased at the parking information booths located in front of the Finley Building and in Lot K off Roanoke Lane. The information booths are open from 7 a.m. to 8 p.m., Monday through Friday. Finley Booth is also open on Saturday from 9 a.m. to 2 p.m. Hours of operation for the summer can be obtained by calling the Parking Services Office.

Handicapped parking is available at a number of convenient locations at George Mason University facilities. A DMV handicapped permit must be presented to obtain a permanent George Mason handicapped permit. Temporarily handicapped persons must display a decal or day pass along with a valid George Mason handicapped permit to avoid citation. Parking in or blocking access to a handicapped space carries a fine at the prevailing rate.

Some parking lots have designated spaces that are reserved for special permit holders, or for service and repair vehicles. Please read all signs posted at entrances to the parking lots. For additional parking information, call the Parking Services Office at (703) 993-2710.

Motorist Assistance Program
The Motorist Assistance Program helps motorists with flat tires, jump starts, and lockouts. Call (703) 993-2715 to access this service.

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 the threat of unwelcome and unwanted sexual actions. It strongly condemns sexual offenses and will not tolerate sexual offenders.

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 are punishable by fines and/or imprisonment. In addition, these actions are subject to civil suit for damages.

The university will respond promptly, fairly, and decisively to all reports of sexual assault. Members of the university community accused of these actions 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 assault includes the attempt or act of rape (sexual intercourse without consent, both by a stranger and acquaintance), forced sodomy (oral or anal sex), or forced penetration by a foreign object including a finger. Nonpenetration sexual assault includes the act of touching an unwilling person's intimate parts such as genitalia, groin, breast, or buttocks or the clothing covering these parts, or forcing an unwilling person to touch another's intimate parts.

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 sexual assault.

Sexual Harassment Policy
Sexual harassment is unacceptable conduct and will not be 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. Therefore, George Mason University 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 (1) 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; (2) 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; (3) 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 I 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. Students are responsible for providing appropriate documentation for their files and for requesting reasonable accommodation services in a timely manner. Applicants for employment and employees should contact Human Resources at (703) 993-2600 or the University Equity Office.

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 University Police, (703) 993-2810.

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 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 Auxiliary Enterprises Office.
University Academic Programs & Resources

University Libraries

Administration
John G. Zenelis, University Librarian
Fenwick Library, Room A227

Administrative Faculty
Abrahamson, Breivold, Burns, Burright, Bushallow, Chandhoke, Connors, Edelman, Gibson, Grotophorst, Halford, Hannan, Hardesty, Kelso, Keys, Kifer, Killian, Koda, Kowal, Mao, O’Hair, Perry, Posner, Sheehan-Harris, Simons, Suh, Taylor, van Schaik, Walsh, Wang, Young

Resources and Services
Resources and services of the George Mason University Libraries are housed in Fenwick Library and the George W. Johnson Center Library on the Fairfax Campus, the Arlington Campus Library, and the Prince William Library. (The School of Law Library at Arlington is administered separately.) The combined holdings of George Mason’s libraries, including the law library, comprise approximately 800,000 books and bound journal volumes, 10,000 current serial subscriptions, 2.3 million microform units, 330,000 government documents, 215,000 maps, 20,000 media materials, 3,300 electronic databases (including online journals), and significant holdings of manuscripts and archives. All of the libraries support faculty and student research.

George Mason’s integrated library information system provides a public access catalog, online access to a variety of electronic resources (increasingly many with full text), the online catalog of the Washington Research Libraries Consortium (WRLC), automated 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 libraries also provide a wealth of bibliographic databases through a libraries-wide CD-ROM network as well as on individual computer workstations, in addition to maintaining a strong presence on the World Wide Web. University Libraries’ websites offer nearly all their information systems components for use with web browsers, as well as a large number of full-text database resources made available through the Virtual Library of Virginia (VIVA) initiative.

The library liaison program to academic departments and programs supports a variety of cooperative and collaborative activities, including library resources development and development of user education programs. The libraries provide an intercampus 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, interlibrary loan through the international Online Computer Library Center network, or through commercial document services when required.
Fenwick Library is the main research library in the university library system. Fenwick holds most of the libraries' book collections in all 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. Liaison librarians work collaboratively with academic departments and programs to develop print collections and electronic resources, and partner to offer introductory, intermediate, and advanced information competency group instructional sessions for students and faculty. Additional services available at Fenwick Library include the Periodicals/Microforms collection, and the Circulation, Document Acquisition and Delivery (Interlibrary Loan), and Collection Management departments. Also, the Office of the University Librarian is located in Fenwick.

The Johnson Center Library, as part of the George W. Johnson Center, is an integrated learning environment. The primary service point spaces of the Johnson Center Library have been conceived as a prototype of an electronic "gateway" library that supports information access and research activities through the libraries' information technology systems and the Internet/World Wide Web. Electronic access to scholarly information is complemented by a print reference collection, media collections, and a growing circulating book collection composed of core texts and readings supporting the interdisciplinary and multicultural 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 is the center for media collections and services for the university library system. These materials are available for viewing and/or listening in the library; some are available for external circulation to George Mason students, faculty, and staff. The Johnson Center Library also provides course reserve materials for students 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.

The Arlington Campus Library is a full-service research facility supporting the teaching and research needs of George Mason faculty, staff, and students on this campus. The library's collection emphasizes international relations and commercial transactions, business, finance, trade, and related policy issues. The Arlington Campus Library also holds a core of reference materials, and is a depository of European Union documents. Library staff provide assistance and instruction for faculty, staff, and students in identifying and using various resources. 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.

The Prince William Library, a 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. In 1998, the library integrated into its collection the American Type Culture Collection, consisting primarily 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
Donna R. Bafundo, Director, Krug Hall, Room 213

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 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. UNIV 498 and UNIV 499 are required for the B.A. in Interdisciplinary Studies degree and can be taken only by those students.

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

- **African American Studies**

**Faculty and Staff**
Carton, Clark, Dennis, Fuchs, Horton, Levine, McFerson, Miller, Mobley McKenzie, Morris (coordinator), Paden, Slade Martin, Smith, Smith-Bermiss, Stewart, 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 it 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
- ENGL 370 or 371 Foundations of African American Literature or African American Literature of the 20th Century
- HIST 335 or 336 The African American Experience in the United States: African Background to 1885 or Reconstruction to the Present
- AFAM 499 Independent Study

**Elective Courses**

- AFAM 490 Internship
- ANTH 308 People and Cultures of Africa
- ARTH 380 History of African Art
- DANC 118 World Dance: African
- ENGL 360 Foundations of African American Literature
- ENGL 414 The Harlem Renaissance
- ENGL 439 African Women Writers
- ENGL 478 Toni Morrison in Context
- FREN 451 Writers of French-Speaking Africa and the Caribbean
- GEOG 325 Geography of North Africa and the Middle East
- HIST 130 Modern Global Systems
- HIST 261 Survey of African Civilization to the 1800s
- HIST 262 Africa Since 1800: Legacies of Colonialism and Liberation
- HIST 335 The Afro-American Experience in the United States: African Background to 1885
- HIST 340 History of American Racial Thought
- HIST 390 History of the Civil Rights Movement
- HIST 418 Ethnic Groups in American Cities
- HIST 466 Origins of Conflict in Southern Africa
- SOCI 413 Seminar in Social Issues: Afro-American Social Thought
- SOCI 517 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), Lytton, Mattusch, Winkler

**Course Work**
The interdisciplinary minor in ancient Mediterranean art and archaeology is designed for students whose interests in the ancient world include aspects of archaeology, Greek and Roman literature, the ancient Near East, the history of art, philosophy, myth and religion, and the late antique civilizations of Byzantium and early Islam. The program represents the sort of 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.

http://catalog.gmu.edu
Requirements
A minimum of 18 interdisciplinary credits is required.

1. Preparatory work. At least three credits of Greek, Latin, or a modern research language in addition to the basic George Mason University required two-year sequence; or lower-level course work in myth (ARTH 102 or CLAS 250).

2. Upper-level work
Six to nine credits of electives from ARTH 319, 320, 321, 322, 333, 399 (with approval); HIST 301, 302, 480; CLAS 301, 302, 310, 390; PHIL 301; ANTH 320, 325, 375, 420, 430; other courses pertaining to the region and period, with approval. At least three credits should be in ARTH.

Three credits of seminar: ARTH 420 Advanced Studies in Ancient Art or ARTH 430 Advanced Studies in Medieval Art, if appropriate.

Three to six credits of practicum: museum course (ARTH 394 or similar) and/or museum internship or excavation for credit.

♦ Arts Administration
Faculty
Brininger, Mandes (coordinator)

Requirements
The interdisciplinary minor in arts administration consists of 18 credits, including ARIN 350 (3 credits) and ARIN 489 (3-6 credits). All other credits are to be selected from courses in business administration, public affairs, communication, or other areas in conjunction with the approval of a program advisor, who must approve the total program. The minor is open to all Institute of the Arts majors, as well as art history or music majors. All other students must complete nine credits of arts-related courses to be eligible for this minor. See the director of academic affairs of the Institute of the Arts for more information.

♦ Asia-Pacific Studies
Faculty
Black, Butler, Cheng, Cuong, Hung (coordinator), Liu, Meyer-Fong, Paden, Platt, Ro, Wan, Williams

Course Work
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 in the cultural mosaic of human experience. In particular, a new type of transregionalism is explored, i.e., the links between Asia and North America.

The minor in Asia-Pacific Studies requires a minimum of 18 credits—9 credits of required courses and 12 credits of electives—chosen from the list below. Approved study abroad or internship also may be used for elective credit.

Required Courses

Elective Courses

Contemporary Europe
Faculty
Brunette, Crampton, Deshmukh, Dinan (coordinator), Jensen, Katz, Levine, Orens, Verheyen, Wade

Requirements
The interdisciplinary minor in contemporary Europe requires a minimum of 18 credits: 6 credits of required courses and 12 credits of electives (at least 3 credits from Elective List I or Elective List II). Prerequisites for each course are listed in parentheses. Relevant special topics courses, seminars, independent study, internships, and study abroad courses may be also be taken for elective credits, with permission of the contemporary Europe coordinator.

Required Courses

Elective List I: History and Politics

Germany Today
(Six credits of GERM or permission of instructor)

GoVT 338 Government and Politics of the Former USSR
(GoVT 132 and 133 or permission of instructor)

GoVT 445 Soviet/Russian Foreign Policy
(GoVT 132 and 133 or permission of instructor)

GoVT 490 The European Union
(GoVT 103 and 104, or six credits of HIST, or permission of instructor)

HIST 314 History of Germany
(Six credits of HIST or permission of instructor)

HIST 322 Modern Britain
(Six credits of HIST or permission of instructor)

HIST 329 Modern Russia and the Soviet Union
(Six credits of HIST or permission of instructor)

RUSS 354 Contemporary Post-Soviet Life
(Six credits of RUSS or permission of instructor)
Elective List II: Philosophy, Literature, the Arts

ARTH 362 20th-Century European Art
(24 credits of ARTH)
FREN 442 20th-Century Drama and Poetry
(18 credits of FREN or permission of instructor)
GERM 451 Modern German Literature
(15 credits of GERM or permission of instructor)
HIST 436 European Society and Culture
(Six credits of HIST or permission of instructor)
PHIL 336 Contemporary Continental Thought
(Three credits of PHIL or permission of instructor)
SPAN 484 Literature of Spain
(Span 311 or permission of instructor)

Film and Media Studies

Faculty
Brunette (co-coordinator), Burton, Christensen, Foreman, Fuchs (co-coordinator), Lont, Ricouart, P. Smith, Winkler

We are inundated on a daily basis with mass culture, especially as it is purveyed through the mass media. The effects of this inundation are enormous and often unconscious, and 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
A minimum of 18 credits of related course work is required, taken from two groups as follows:

Group 1: Required Courses
Two required courses (six 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 semester)

Group 2: Elective Courses
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 may decide to emphasize the study of mass culture. Or, they may choose some mixture of the courses that suits their own interests.

Communication majors must choose at least six credits outside of Communication for their FAMS elective courses.

COMM 302 Foundations of Mass Communication
COMM 350 Mass Communication and Public Policy
COMM 355 Video I: Principles and Practices
COMM 358 Video II: Editing and Directing (pre-requisite: COMM 355)
COMM 360 Video II: Intermediate Production (pre-requisite: COMM 355)
COMM 365 Women and Media
COMM 452 Media Production Practice (pre-requisite: COMM 355)
COMM 456 Comparative Mass Media
COMM 502 Theories of Mass Communication
COMM 555 Theories of Visual Communication
ENGL 327 Intro to Cultural Studies (may only be taken with approval of the coordinator, who will review the course to determine relevance to FAMS)
ENGL 334 Literary Approaches to Popular Culture (may only be taken with approval of the coordinator, who will review the course to determine relevance to FAMS)
ENGL 421 Topics in Film History (may be repeated if the topic is different) Sample topics include Italian Film, Films of the Fifties, and French Film.
ENGL 422 Topics in Film Theory (may be repeated if the topic is different) Sample topics include Reading Television, and Hitchcock and Film Theory.
ENGL 490 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.
ENGL 493 Special Topics in Popular Culture (requires approval of FAMS coordinator)
ENGL 499 Independent Study (requires approval of FAMS coordinator)
ENGL 499 Internship (requires approval of FAMS coordinator)
MUSI 301 Music in the Motion Pictures
RUSS 470 Topics in (Post) Soviet Cinema

For further information, contact Peter Brunette, Department of English, Robinson Hall, Room A465, (703) 993-1190, or Cindy Fuchs, Department of English, Robinson Hall, Room A458, (703) 993-2768.

Folklore and Mythology

Faculty
Burns, ffolliott, Fuchs, Gras, 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 program offers students the tools with which to explore the compelling meanings within these seemingly simple, everyday cultural texts and to become more aware of the ways these texts are used by individuals and institutions for a variety of 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.
A minimum of 18 credits of related course work is required, taken from three groupings of courses.

**Required Courses**

**Group 1: 3 credits**
- ARTH 102 Symbols and Stories in Art
- CLAS 250 Classical Mythology
- RELI 100 The Human Religious Experience
- RELI 211 Religions of the Near East
- RELI 212 Religions of the Orient

Students may take only one Group 1 course from a department for credit toward the minor. 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 2: 12-15 credits**
- ANTH 450 Qualitative Methods in Sociocultural Research
- ARTH 319 Art of the Ancient Near East
- ARTH 321 Greek Art
- ARTH 322 Roman Art
- CLAS 350 Greek and Roman Tragedy
- CLAS 340 Greek and Roman Epic
- ENGL 311 Writing Ethnography
- ENGL 333 American Folklore
- ENGL 337 Special Topics in Myth and Literature
- ENGL 491 Special Topics in Folklore and Folklife
- ENGL 513 Advanced Special Topics in English: Studies in Folklore and Folklife
- RELI 341 Mythology of the Ancient Near East

**Group 3: 0-3 credits**
- Independent Study and Internships: ANTH 299, ANTH 495, ARTH 393, ARTH 490, ARTS 491, ENGL 499, ENGL 504, summer fieldwork schools offered by the American Folklife Center at the Library of Congress and at other institutions approved by the faculty.

(To avoid duplication of courses, English majors who choose the folklore and mythology interdisciplinary minor should not elect the English Department's folklore, mythology, and literature concentration.)

For further information, contact Margaret Yocom, Department of English, Robinson Hall, Room A439, (703) 993-1172, or Carol Mattusch, Department of History and Art History, Robinson Hall, Room B355, (703) 993-1017.

**Global Systems**

**Faculty**
- Clark (coordinator)

**Requirements**

The interdisciplinary minor in global systems consists of 18 credits of nonregion-specific courses that deal with global connections or transactions. It is ideal for majors in business disciplines, economics, modern and classical languages, geography, government and international politics, history, and other disciplines taking a global view of the world. The minor requires GOVT 149 Global Awareness, and 15 credits drawn from at least two of the following fields. At least nine credits must be at the 300 level or above.

**Field A: Government and Geography**
- 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 Program on Social and Organizational Learning**
- ANTH 300 Civilizations
- ANTH 375 Anthropological Perspectives on History
- ECON 360 Economics of Developing Areas
- ECON 390 International Economics
- HIST 130 History of the Modern Global System
- HIST 387 Topics in Global History
- LRGB 572 Taming the Electronic Frontier
- MKTG 407 International Business

**Field C: Environmental Science, Nursing, Physics, Systems Engineering, Urban and Suburban Studies**
- BIOL 307 Ecology
- BIOL 377 Applied Ecology
- EVSC 206 Environmental Science II
- NURS/HSCI 543 Global Health: Trends and Policy
- SYST 201 Systems Modeling I
- USE 300 Urban Systems Planning and Management I
- USST 301 Urban Growth in a Shrinking World

**Field D: Communication and Foreign Languages**
- *(courses taught in a language other than English)*
- COMM 305 Foundations of Intercultural Communication
- COMM 456 Comparative Mass Media
- COMM 556 Global Communication
- FREN 376 French Civilization*
- FREN 580 Contemporary French Society and Culture*
- GERM 580 Contemporary Germany*
- SPAN 461 Spanish Civilization and Culture*
- SPAN 466 Latin American Civilization and Culture*
- SPAN 580 Contemporary Hispanic Institutions*

Other courses such as UNIV or special topics courses may also fulfill the requirements of this program, with the written permission of the coordinator. Permission must be obtained before registration in the course.

For more information, contact the coordinator at the Department of Public and International Affairs, Robinson Hall, Room A201, (703) 993-1400.

**Interdisciplinary Arts**

**Faculty**
- Brininger, Burton, Carbonneau, R. Davis, Haroutounian, Hazen, Mandes (coordinator), Rutledge

**Requirements**

The interdisciplinary minor in interdisciplinary arts consists of any 15 credits of courses with the ARIN designation.
**Linguistics**

**Faculty**
Broome, Chamberlain, Collier, Goldin, Golom, Hamburg, Holisky, Jones (coordinator), Lazaratou, Levine, Rothbart, Sanford, Weinberger

Linguistics is the scientific study of language. Language is studied in a variety of ways: descriptively, theoretically, computationally, 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**
The interdisciplinary minor in linguistics consists of 15 credits, distributed as follows:

1. Three credits in general linguistics
2. Three credits from syntactic theory, phonological theory, or linguistic semantics
3. Nine credits of electives, chosen in consultation with an advisor in the linguistics minor. A list of approved electives is available from the coordinator.

**Multimedia**

**Faculty**
Chung, Crouch, Higgins, S. Kim, S. Martin, Montecino, O’Connor, L. Smith, G. White, J. Young

The multimedia minor seeks to use computer technologies for the convergence, integration, and fusion of images, sound, video, and text to better convey ideas, educate, and inform. Together with the student’s major, the multimedia minor will provide the tools to comprehensively communicate findings and investigate new perspectives within the student’s chosen discipline. Students minoring in this area augment their major by adding a new dimension of communication and investigation, aesthetics, citizenship, and community. In addition, students are preparing for graduate study in visual technologies, information design, multimedia design, new media concentrations, or employment in the growing high-tech multimedia/information technology industry.

**Required Courses**
The multimedia minor consists of nine core credits and nine credits of electives.

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>ARIN 280 Computers in the Creative Arts</td>
<td>9</td>
</tr>
<tr>
<td>COMM 157 Video Workshop</td>
<td>3</td>
</tr>
<tr>
<td>NCLC 249 Internet Literacy: HTML Tools and Virtual Communities</td>
<td>1</td>
</tr>
<tr>
<td>NCLC 250 Introduction to Multimedia</td>
<td>5</td>
</tr>
</tbody>
</table>

**Electives**
Students select courses in each knowledge area (Practice, and Aesthetics and Theory) for a total of nine credits of electives.

**Practice**

- ARTS 280 Computer Graphics I ........................................... 4
- NCLC 195 Networked Graphics ...................................... 1
- NCLC 250 Introduction to Multimedia ......................... 5

**Aesthetics and Theory**

- ARTS 382 Arts and Animation ........................................... 4
- ARTS 383 Internet-Multimedia Art ................................... 4
- ARTS 390 Digital Media and Video Art .......................... 4
- ARTS 393 Internship ..................................................... 1-6
- COMM 202 Mass Media and Communication Systems ............... 3
- COMM 380 Media Criticism .............................................. 3
- NCLC 350 Counterculture, Cybertulture .......................... 4
- NCLC 450 Special Topics in Multimedia ......................... 5
- NCLC 390 Internship ..................................................... 1-6

**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**
A minor in the Study of the Americas requires a minimum of 18 credits. All students take STAM 303, 304, and 410. In addition, students take nine credits from the following: STAM 310, 320, 330, 340, or 490.

Two of the courses should be in the same regional area. The third may be in a different regional area. Different subtopics are offered each semester. For more information, contact the director of the Study of the Americas program.

**Internships**
Internships are possible with the U.S Congress and with local governments, community organizations, environmental organizations, foundations, government and nongovernment agencies, human rights organizations, international business organizations, labor unions, legal organizations, libraries, media organizations, museums, political parties, public interest organizations, publications, and religious organizations.

http://catalog.gmu.edu
Urban and Suburban Studies

Faculty
Clapsaddle, Clark, Dumont, ffolliott, Gifford, Hart-Nibbrig, K. Haynes, Horton, Hysom, Mattusch, Potter, Rosenzweig, Ryan, Schintler, Stough, Todd, Travis, Verheyen, Wong, J. Wood (coordinator)

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 related course work from the list below.

Approved Courses
(Students should consult the “Course Descriptions” chapter of this catalog for course prerequisites.)

- ARTH 311, 315
- BULE 304
- ECON 350
- FNAN 351
- GEOG 306, 357
- GOVT 309, 357, 365
- HIST 416, 417, 418
- SOCI 332, 373
- USE 300, 400
- USST 301, 390, 401, 490

In addition, departmental directed-reading and special topics courses may be approved for USST credit at the discretion of the USST Coordinating Committee.

For more information, contact Joseph S. Wood, coordinator of Urban and Suburban Studies, Department of Geography and Earth Science.

Women's Studies

Faculty
Balenger, Bartholomew, Bateson, Beach, Bergoffen (coordinator), Brinig, Brown, Burr, Censer, Cherabin, Choi, Christenson, Cohen, Copelman, Cordero, Cruz, Eby, Erdwins, Fischer, ffolliott, Flieger-Samuelian, Francescato, Fuchs, Gilbert, Gunn, Hanrahan, Hodges, Horton, Irvine, Irving, Kaplan, Kirkland, Knight, Koch, Kolker, Liu, Lont, Melosh, Mobley McKenzie, Moylan, Oates, Rabin, Rader, Regan, Ricouart, Rosenblum, Rosenzweig, Samuels, Seligmann, Sypher, Taylor, Tichy, Todd, Travis, Weitzman, Williams, D. Wood, J. Wood, Yocom, Zambrana, Zawacki

Course Work
The women's studies faculty offers all course work designated WMST in the “Course Descriptions” chapter of this catalog.

Requirements
1. Nine credits in women's studies seminars: WMST 200, 300, and 330
2. Twelve credits selected from approved course offerings in other departments. No more than six of these credits may be taken in any one department.

International Programs
As befits George Mason's location near the nation's capital, diversity of its student body, and commitment to internationalizing the curriculum, the university offers a variety of academic programs with an international component, some of which are listed below. See the following academic programs elsewhere in this catalog:

- B.A. in Communication, with a concentration in international and intercultural communication (Communication Department)
- B.A., B.S., M.A., Ph.D. in Economics (Economics Department)
- B.A. in English, with a concentration in linguistics
- B.S. in Finance (School of Management)
- B.A., B.S. in Geography (Geography and Earth Science Department)
- B.A. in Government and International Politics, with a concentration in international and comparative politics (Public and International Affairs Department)
- B.S. in Marketing (School of Management)
- B.A. in Russian Studies (Modern and Classical Languages Department)
- B.A. in Foreign Languages, with concentrations in French and Spanish (Modern and Classical Languages Department)
- B.A. in Public Administration (Public and International Affairs Department)
- M.A., Ph.D. in Conflict Analysis and Resolution (Institute for Conflict Analysis and Resolution)
- M.Ed. in Curriculum and Instruction, with tracks in bilingual/multicultural education, and teaching English as a second language
- M.A. in English, with a track in linguistics
- M.A. in Foreign Languages, with concentrations in one or two languages, or in Spanish/bilingual-multicultural education (Modern and Classical Languages Department)
- M.A. in History, with concentrations in comparative world history and modern European history (History and Art History Department)
- M.A. in International Commerce and Policy (The Institute of Public Policy)
- M.S. in New Professional Studies: Technology Management (The Institute of New Professional Studies: Technology Management)
- M.A. in Telecommunications (Telecommunications Program)
- M.B.A. (Business Administration) (School of Management)
- M.P.A. (Public Administration) (Public and International Affairs Department)
- Ph.D. in Public Policy (The Institute of Public Policy)

Interdisciplinary minors in Asia-Pacific studies, contemporary Europe, global systems, linguistics, and study of the Americas (University Academic Programs and Resources)

Minor 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

Center for Global Education
The Center for Global Education at George Mason University provides academic travel opportunities around the world for students, professionals, and the general public.
The Center for Global Education offers a wide selection of study abroad programs, including short-term study tours and semester or yearlong programs. Students may study at a host university and have credits earned transferred to George Mason University. Students proficient in a foreign language may enroll in an intensive language program at a host university. Those with tighter schedules can take advantage of breaks and vacations to participate in the center's short-term study tours, available during the summer, winter, and spring breaks for periods of one to eight weeks and on topics from a broad range of academic disciplines.

The Center for Global Education also provides study abroad advising, a travel and study abroad resource library, assistance with ISIC cards, Fulbright scholarship applications, and travel insurance.

For assistance or more information, please contact the center at (703) 993-2154, e-mail cge@gmu.edu or visit its website through the university's main page at www.gmu.edu.

Office of Continuing Professional Education

Administration
Janet Niblock, Executive Director, Krug Hall, Room 211

The Office of Continuing Professional Education (OCPE) serves as George Mason University's initial point of contact and referral for the business and professional community to respond to all professional development and continuing education inquiries, requests, and needs. Supported program activities include the following:

- Contracted academic credit programs
- Noncredit 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

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. A fourth office is planned for the Arlington Campus.

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 measurement earned for satisfactory completion of qualified programs of continuing education. OCPE provides this service to all George Mason academic groups that deliver noncredit 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 strengths of the programs at the Prince William Campus and 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, located in Northern Virginia's high-tech corridor in the Center for Innovative Technology building, 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 short noncredit training courses and certificate programs. Both 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.

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

Administration
Tojo Thatchenkery, Director
Johnson Center, Room 311

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.

The New Professional Studies program is an umbrella degree program with six tracks:

- Bioinformatics
- Biotechnology
- Forensic Biosciences
- Organizational Learning
- Teaching
- Technology Management

http://catalog.gmu.edu
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 organizational learning track, see the College of Arts and Sciences; for the teaching track, see the Graduate School of Education; for the technology management track, see the School of Management; for the forensic biosciences, biotechnology, and bioinformatics tracks, see the Institute for Biosciences, Bioinformatics, and Biotechnology.

Reserve Officers' Training Corps (ROTC)

Administration
Lieutenant Colonel Leslie M. Brehm, Director and Professor of Military Science
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. Credits are not awarded for freshman through junior classes, although grades will appear on the transcript. Senior classes (MLSC 400 and 401) are three 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, as long as the student initiates participation before the end of the sophomore year (a minimum of four semesters must remain in the student's academic curriculum to complete commissioning requirements). 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. 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 (scheduling conflicts, etc.)

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. Upper-class 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, and Army PT standards do not have to be met until the junior year.

Over the four-year program, there are progressive requirements for meeting physical fitness standards, weight limits, and assumed leadership positions. Much emphasis is placed on cadets to meet established academic standards. A student must be academically successful to participate in and complete ROTC.

Army ROTC also organizes numerous optional adventure and social events including paintball, 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 400 and 401 are three credits each. Normally, Advanced Course cadets contract to become commissioned officers and thus incur some type of service obligation upon graduation and commissioning. An active duty tour is not guaranteed, although most cadets request and receive active duty tours upon graduation.
The 300-level courses emphasize squad and platoon leadership, tactics, and preparation for Advanced Camp. Advanced Camp is a five-week training and evaluation activity required for contracted students. Cadets attend Advanced Camp in the summer between their junior and senior years. A salary, travel expenses, and room and board are all provided during camp. Advanced Camp is a critical part of the ROTC program that students must pass to receive a commission.

There are also professional military education requirements in which 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). “Non-contract” students who wish to take MLSC 400 and 401 must have junior or senior standing in their majors and 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: 1) a student may complete the four-year program; 2) the freshman and sophomore classes may be compressed into the sophomore year; 3) a veteran may enter directly into the junior year (when academically aligned as a junior); 4) a sophomore student may attend a five-week Basic Camp between the sophomore and junior years to gain experience equivalent to the Basic Course; and 5) a special four-semester program is available to nursing majors in which Basic Camp 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 tuition, a book allowance ($450/year), and a stipend of $150/month during the school year (to a maximum of $1,500), all tax free. On-campus scholarship applications are due by February 28 to begin the following fall semester. 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 must apply by December 1 of their senior year for a scholarship that would start in the fall semester of their freshman year. Call 1-800-USA-ROTC for details and an application.

Many students participate in ROTC as nonscholarship cadets. A nonscholarship cadet cannot contract to receive a commission until the junior year. For the junior and senior years, nonscholarship, contracted students receive the $150/month stipend for the school year (to a maximum of $1,500).

George Mason Army ROTC is an extension center of the Georgetown University ROTC Program (Hoya Battalion). The unit is designated “The Patriot Company.” Contact the ROTC director at (703) 993-2706 or send a fax to (703) 993-2708.

AIR FORCE ROTC

Administration

AFROTC Detachment 330
2126 Cole Student Activities Bldg.
University of Maryland
College Park, MD 20742-1021
(301) 314-3242

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 of courses, located at the University of Maryland, is mandatory. Car pools among George Mason cadets are usually available.

Four-Year Program

This program is composed 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 (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 nontaxable 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.
"We at George Mason are 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 Institute of the Arts (IOA) was established in August 1990 to implement George Mason University's long-term commitment to the arts. The institute has adopted a three-fold mission:

• To make the arts an intrinsic part of all students' university experience
• To develop audiences within and outside the university that are knowledgeable and passionate about the arts and broadly representative of the area's diverse communities
• To support artists and new works, with emphasis on multicultural and global perspectives

The institute searches for innovative ways to involve all students in the artistic process, professional performances, and arts-based, nontraditional curricula. IOA makes the arts a pervasive presence in the lives of students regardless of age, ethnic background, or academic specialization.

IOA strives to maintain a balance between presenting master works of the past and creating a vital atmosphere for the production of new work. The institute is dedicated to the support and encouragement of all artists, including those of culturally diverse backgrounds, from here and abroad.

The institute is involved in the community by participating in appropriate community artistic activities, by inviting extraordinary regional artists to perform at the university, and by increasing audiences to all arts events.

Academic Programs
IOA houses five academic divisions:

• Art Studio (B.A., B.F.A.)
• Dance (B.A., B.F.A., M.F.A.)
• Theater (B.A.)
• Interdisciplinary Studies in the Arts
• Visual Information Technologies (M.A., M.F.A.)

These majors have strong academic backgrounds and discipline programs taught by professional artists. Undergraduate minors are offered in art studio, dance, interdisciplinary arts, and theater.
Course Work
IOA offers interdisciplinary courses with the prefix ARIN in the “Course Descriptions” chapter of this catalog.

Administration
Betsy Brininger, Director, Institute of the Arts
Evans Mandes, Director, Academic Affairs
Scott Martin, Director, Art Studio Division and Visual Information Technologies Division
Linda Miller, Director, Dance Division
Kristin Johnsen-Neshati, Director, Theater Division, and Dramaturg, Theater of the First Amendment

Core Faculty

◆ Interdisciplinary Minor in Multimedia
The Institute of the Arts and New Century College coordinate the interdisciplinary minor in multimedia. See the “University Academic Programs and Resources” chapter for a description of the minor.

Art Studio

Faculty
Professor: Kravitz
Associate professor: Clapsaddle
Visiting associate professors: Frederick, Kendall-Hull, Olgyay, White
Visiting assistant professors: Ashcraft, Chung, Feerick, Martin (director)
Lecturer: Crawford, Kim
Gallery director: Malone

Course Work
The Art Studio Division offers all course work designated ARTS in the “Course Descriptions” chapter of this catalog.

Writing-Intensive Requirement
The university requires all undergraduate students to complete at least one course designated “writing intensive” in their majors at the 300 level or above. Students majoring in art studio fulfill this requirement by successfully completing ARTS 371 and 372.

UNDERGRADUATE PROGRAMS
The Art Studio Division offers two degrees in art:
1. Bachelor of Arts in Art Studio
2. Bachelor of Fine Arts in Art Studio

These two programs prepare students for graduate study in studio art, as well as for research and professional work in art. These programs do not satisfy all requirements for teaching in the public schools.

Art Studio, B.A.
The B.A. in Art Studio offers a broad course background for those students who want a liberal arts education with a major in studio 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 select a concentration in computer graphics, digital arts and animation, drawing, graphic design, painting, photography, printmaking, or sculpture.

Students are required to take an art studio bus trip to New York each fall and spring semester. Seniors are required to participate in the critic program.

Degree Requirements

General Education .................................................. 35-47

1. English composition ........................................ 6
   ENGL 101, 302. Non-native speakers of English with limited proficiency in the language may substitute ENGL 100 for ENGL 101. A minimum grade of C in ENGL 100 or 101, and 302 is required to fulfill degree requirements.
2. Foreign language ............................................ 0-12
   A student must demonstrate intermediate-level proficiency in one foreign language. The requirement is fulfilled by one foreign language course at the 202 level or above, or by a satisfactory score on an approved proficiency test. International students should consult IOA about a possible waiver of this requirement.
3. Literature ....................................................... 6
   ENGL 201, and 203 or 204
4. Fine arts ......................................................... 3
   ARIN, DANC, or THR
5. PHIL 356 .......................................................... 3
6. Natural science .................................................. 8
   Any two-semester lab sequence chosen from ASTR, BIOL, CHEM, EVSC, GEOL, or PHYS
8. Analytical reasoning ......................................... 3
   MATH 106 or above, or PHIL 173
9. Social science .................................................. 6
   Six credits from ANTH, ECON, GOVT, HIST, PSYC, or SOCI

Art Studio Major Core .............................................. 45
1. ARTH 200 and 201 Survey of Art History .......... 6
2. ARTH 300-499 .................................................. 3
3. ARTH 374 Art Now ............................................ 3
4. ARIN 280 Computers in the Creative Arts .......... 3
5. ARTS 104 and 105 ............................................ 8
   Studio Fundamentals I and II
6. ARTS 222 Drawing I ......................................... 4
7. ARTS 371 and 372 ............................................ 6
   Visual Perception and Critical Thinking
8. ARTS 391, 393, or 491 ....................................... 4
   Collaborative Arts, Internship, Advanced Studio Problems
9. ARTS 495 Portfolio Preparation ....................... 4
10. ARTS 497 Senior Project .................................... 4

http://catalog.gmu.edu
Art Studio Concentrations ........................................ 20
1. Computer Graphics (ARTS 381, 382, and 12 credits from 300 to 499)
2. Digital Arts and Animation (ARTS 381, 382, 383, and eight credits from 390, 480, or 481)
3. Drawing (ARTS 323, 422, 423, and eight credits at the 300 level)
4. Graphic Design (ARTS 311, 313, 380, and eight credits from 252, 323, 351, 381, 382, 422, 423, 454, 491, or 492)
5. Painting (ARTS 333, 432, 433, and eight credits at the 300 level)
6. Photography (ARTS 353, and eight credits of 351, 452, and 453, and eight credits at the 300 level)
7. Printmaking (ARTS 344, 443, 444, and eight credits at the 300 level)
8. Sculpture (ARTS 363, 462, 463, and eight credits at the 300 level)

General Electives .................................................. 8
May include ARTS courses

Total ................................................................. 120

Art Studio, B.F.A.
The B.F.A. in Art Studio is an intensive 120-credit studio production honors program with emphasis in theoretical, analytical, critical, and experiential aspects of studio art and visual information technologies. This program is designed to prepare students professionally as visual artists or for graduate study in studio art and visual information technologies. Students in this program devote a significant portion of their college careers to an intensive level of studio art and visual information technologies study. Students select a concentration in computer graphics, digital arts and animation, drawing, graphic design, painting, photography, printmaking, or sculpture.

Students are required to take an art studio bus trip to New York each fall and spring semester. Seniors are required to participate in the crit program.

Application deadlines for the B.F.A. program are December 1 and May 1 of each year. Admission to this program is highly competitive. Admission requirements to the B.F.A. include the following:
1. Currently a B.A. in Art Studio major
2. Completion of ARTS 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 should contact the Art Studio Division for specific application information.

Degree Requirements

General Education .................................................. 30
1. English composition ............................................ 6
   ENGL 101, 302. Non-native speakers of English with limited proficiency in the language may substitute ENGL 100 for ENGL 101. A minimum grade of C in ENGL 100 or 101, and 302 is required to fulfill degree requirements.
2. Literature ....................................................... 6
   ENGL 201, and 203 or 204
3. PHIL 356 ......................................................... 3
4. Fine arts .......................................................... 3
   ARIN, DANC, or THR
5. Science ............................................................ 6
   (BIOL, CHEM, EVSC, GEOL, or PHYS)
   Recommended: BIOL 103, CHEM 101, GEOL 105, PHYS 101, and PHYS 103
6. Social science .................................................... 6
   Six credits from ANTH, ECON, GOVT, HIST, PSYC, or SOCI
   Recommended: ANTH 114, HIST 101 and/or 102, PSYC 100, SOCI 101

Art Studio Major Core ............................................. 53
1. ARTH 200, 201 ................................................... 6
   Survey of Art History
2. ARTH 300- or 400-level courses ......................... 3
3. ARTH 374 Art Now .............................................
4. ARIN 280 Computers in the Creative Arts ............ 3
5. ARTS 104, 105 .................................................. 8
   Studio Fundamentals I and II
6. ARTS 222 Drawing I ............................................ 4
7. ARTS 371 and 372 .............................................. 6
   Visual Perception and Critical Thinking
8. ARTS 391, 393, or 491 ........................................ 4
   Collaborative Arts, Internship, Advanced Studio Problems
9. ARTS 393 ......................................................... 4
   Internship
10. ARTS 491 ........................................................ 4
    Advanced Studio Problems
11. ARTS 495 ........................................................ 4
    Portfolio Preparation
12. ARTS 497 ....................................................... 4
    Senior Project

Art Studio Concentrations ........................................ 20
1. Computer Graphics (ARTS 381, 382, and 12 credits from 300-499)
2. Digital Arts and Animation (ARTS 381, 382, 383, and eight credits from 390, 480 or 481)
3. Drawing (ARTS 323, 422, 423, and eight credits at the 300 level)
4. Graphic Design (ARTS 311, 313, 380, and eight credits from 252, 323, 351, 381, 382, 422, 423, 454, 491, or 492)
5. Painting (ARTS 333, 432, 433, and eight credits at the 300 level)
6. Photography (ARTS 353, and eight credits of 351, 452, and 453, and eight credits at the 300 level)
7. Printmaking (ARTS 344, 443, 444, and eight credits at the 300 level)
8. Sculpture (ARTS 363, 462, 463, and eight credits at the 300 level)
Additional credits 300-499 level ......................... 16
(Total credits in a concentration must include 24 credits at the 300 level and 12 credits at the 400 level.)

General Electives ........................................... 1
May not include ARTS credits

Total ................................................................ 120

• Minor in Art Studio
The minor in art studio requires 20 credits and offers a core of foundational studies with the opportunity to explore one or more areas in depth. The requirements for this minor are as follows:
1. ARTS 104 Studio Fundamentals I and ARTS 105 Studio Fundamentals II (8)
2. Twelve credits of 300-level or above ARTS courses

Dance

Faculty
Professor: Miller (director)
Associate professors: Carbonneau, Lepore, Studd
Contractual associate professor: Price
Assistant professors: Shields
Visiting assistant professor: Austin
Instructor: Willis

Course Work
The Dance Division offers all course work designated DANC in the "Course Descriptions" chapter of this catalog.

UNDERGRADUATE PROGRAMS
Two degrees in dance are offered:
1. Bachelor of Fine Arts in Dance
2. Bachelor of Arts in Dance

The two dance degree programs prepare students for graduate work in performance, choreography, teaching, history, and criticism, and for professional and creative opportunities in dance.

• Dance, B.F.A.
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 devote a significant portion of their college careers to an intensive and comprehensive level of dance study.

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, and a strong emphasis on modern dance. Entrance into the B.F.A. program is by audition. Auditions are held twice a year, in April and November, and interested students must make arrangements in advance by contacting the Dance Division. Transfer students also are required to audition.

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. in Dance program fulfill this requirement by successfully completing DANC 390 or 391.

Approval for the dance program does not mean that a student has been admitted to the university. For admission to the university, each student must submit an application to the Office of Admissions.

Because of the professional nature of the B.F.A. degree, the program requires completion of 124 credits of course work.

Degree Requirements

General Education ................................................ Credits 44
1. English composition ........................................ 6
   ENGL 101, 302. 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.
2. Literature ....................................................... 6
   Any course in literature at the 200 level in English; the 300 level or above in a foreign language; or PHIL 253
3. Natural science ................................................ 8
   Chosen from ASTR, BIOL, CHEM, EVSC, GEOL, or PHYS
4. Social science .................................................. 9
   Three to six credits from ECON, GOVT, HIST, or GEOG. Three to six credits from ANTH, PSYC, or SOCI
5. Humanities ...................................................... 12
   a. MUSI 101
   b. THR 210
   c. Three credits from ARTH or ARTS
   d. Three credits from ARIN, ARTH, ARTS, MUSI, or THR
6. Non-Western culture ......................................... 3
   Three credits must be earned in courses devoted to non-Western culture. This requirement is waived for the student who has attended a native school in a non-Western country (for more than four years). Requests for a waiver should be made through the director of academic affairs of the Institute of the Arts. The following courses, which are designated as meeting this requirement, may also be presented in partial fulfillment of the requirements stated in sections 2, 4, and 5.
   ANTH 114, 300, 301, 304, 305, 306, 307, 308, 311, 313, 332
   ARTH 319, 320, 380, 381
   DANC 118
   FREN 451
   GEOG 101, 316, 325, 330
   GOVT 332, 333
   MUSI 103
   RELI 211, 212, 313, 314, 315, 337, 490
   RUSS 353, 354
# Dance Major Core

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>DANC 114 Rhythmic Analysis</td>
<td>3</td>
</tr>
<tr>
<td>DANC 150 Dance Improvisation</td>
<td>3</td>
</tr>
<tr>
<td>DANC 170 Orientation to Dance Production</td>
<td>1</td>
</tr>
<tr>
<td>DANC 210 Dynamic Alignment</td>
<td>3</td>
</tr>
<tr>
<td>DANC 251 Dance Composition I</td>
<td>3</td>
</tr>
<tr>
<td>DANC 252 Dance Composition II</td>
<td>3</td>
</tr>
<tr>
<td>DANC 270 Dance Production Lab</td>
<td>1</td>
</tr>
<tr>
<td>DANC 325/425 Int./Adv. Modern Dance Technique</td>
<td>18</td>
</tr>
<tr>
<td>DANC 345/445 Int./Adv. Ballet</td>
<td>9</td>
</tr>
<tr>
<td>DANC 360 Choreography</td>
<td>3</td>
</tr>
<tr>
<td>DANC 362 Directed Choreography</td>
<td>1</td>
</tr>
<tr>
<td>DANC 370 Dance Performance</td>
<td>4</td>
</tr>
<tr>
<td>DANC 372 Advanced Dance Production</td>
<td>1</td>
</tr>
<tr>
<td>DANC 390 Dance History: Pre-20th Century</td>
<td>3</td>
</tr>
<tr>
<td>DANC 391 Dance History: 20th Century</td>
<td>3</td>
</tr>
<tr>
<td>DANC 454 Teaching Principles of Modern Dance</td>
<td>3</td>
</tr>
<tr>
<td>DANC 480 Introduction to Laban Movement Analysis</td>
<td>3</td>
</tr>
</tbody>
</table>

## Dance Electives

Chosen from:

- DANC 131, 231 Beginning Jazz Technique
- DANC 161 Beginning Tap Dance
- DANC 314 Music Accompaniment for Dance
- DANC 325 Intermediate Modern Dance
- DANC 345 Intermediate Ballet
- DANC 350 Advanced Dance Improvisation
- DANC 351 Composition III
- DANC 360 Choreography
- DANC 370 Dance Performance
- DANC 371 Residency Workshop
- DANC 399 Independent Study
- DANC 420 Special Topics in Dance
- DANC 425 Advanced Modern Dance
- DANC 445 Advanced Ballet
- DANC 451 Composition IV
- DANC 455 Teaching Practicum

No more than nine credits of Intermediate Modern, Advanced Modern, Intermediate Ballet, or Advanced Ballet may be counted toward the dance concentration elective credits.

## Non-Dance Electives

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENGL 101, 302</td>
<td>6</td>
</tr>
<tr>
<td>STAT 250</td>
<td>3</td>
</tr>
</tbody>
</table>

## Degree Requirements

### General Education

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Communication</td>
<td>21</td>
</tr>
<tr>
<td>a. Written</td>
<td>6</td>
</tr>
<tr>
<td>ENGL 101, 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.</td>
<td></td>
</tr>
<tr>
<td>b. Oral</td>
<td>3</td>
</tr>
<tr>
<td>COMM 100 or 101</td>
<td></td>
</tr>
<tr>
<td>c. Foreign language</td>
<td>0-12</td>
</tr>
<tr>
<td>A student must demonstrate intermediate-level proficiency in one foreign language. The 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 Institute of the Arts about a possible waiver of this requirement.</td>
<td></td>
</tr>
<tr>
<td>2. Analytical reasoning</td>
<td>3</td>
</tr>
<tr>
<td>Logic (PHIL 173 or 376); Mathematics; or STAT 250</td>
<td></td>
</tr>
<tr>
<td>3. Humanities</td>
<td>15</td>
</tr>
<tr>
<td>a. Literature</td>
<td>6</td>
</tr>
<tr>
<td>ENGL 201, and 202, 203, or 204; a course at the 300 level or above in modern and classical languages; or PHIL 253</td>
<td></td>
</tr>
<tr>
<td>b. Fine arts</td>
<td>6</td>
</tr>
<tr>
<td>Courses designated by MUSI, THR, and ARTS</td>
<td></td>
</tr>
<tr>
<td>c. Philosophy or religion</td>
<td>3</td>
</tr>
<tr>
<td>A logic course does not satisfy this requirement.</td>
<td></td>
</tr>
<tr>
<td>4. Social science</td>
<td>9</td>
</tr>
<tr>
<td>a. Three to six credits in ECON, GEOG, GOVT, or HIST</td>
<td></td>
</tr>
<tr>
<td>b. Three to six credits in ANTH, PSYC, or SOCI</td>
<td></td>
</tr>
<tr>
<td>5. Natural science</td>
<td>8</td>
</tr>
<tr>
<td>ASTR, BIOL, CHEM, EVSC, GEOI, or PHYS</td>
<td></td>
</tr>
<tr>
<td>6. Non-Western culture</td>
<td>6</td>
</tr>
<tr>
<td>Six credits must be earned in courses devoted to non-Western culture. This requirement is waived for the student who has attended a native school in a non-Western country (for more than four years). Requests for a waiver should be made through the director of academic affairs of the Institute of the Arts. The following courses, which are designated as meeting this requirement, may also be presented in partial fulfillment of requirements stated in sections 1, 3, and 4.</td>
<td></td>
</tr>
<tr>
<td>ANTH 114, 300, 301, 304, 305, 306, 307, 308, 311, 313, 332</td>
<td></td>
</tr>
<tr>
<td>ARTH 319, 320, 380, 381</td>
<td></td>
</tr>
<tr>
<td>DAN 114</td>
<td></td>
</tr>
<tr>
<td>FREN 451</td>
<td></td>
</tr>
<tr>
<td>GEOG 101, 316, 325, 330</td>
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<tr>
<td>GOVT 332, 333</td>
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<tr>
<td>MUSI 103</td>
<td></td>
</tr>
<tr>
<td>RELI 211, 212, 313, 314, 315, 337, 490</td>
<td></td>
</tr>
<tr>
<td>RUSS 353, 354</td>
<td></td>
</tr>
</tbody>
</table>

The B.A. in Dance does not require an audition. The B.A. degree is a general program of study that gives students a broad range of creative and educational experiences while they pursue a liberal arts degree.

### 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 Dance program fulfill this requirement by successfully completing DAN 390 or 391.

In addition to general degree requirements for a B.A. degree, dance majors must complete a minimum of 44 credits in dance. A total of 120 credits is required to complete the degree.
Dance Major Core ................................................. 46
DANC 114 Rhythmic Analysis ................................. 3
DANC 150 Dance Improvisation ............................ 3
DANC 170 Orientation 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 ................. 6
DANC 345/445 Int./Adv. Ballet ......................... 3
DANC 360 Choreography ...................................... 3
DANC 370 Dance Performance ............................. 2
DANC 390 Dance History: Pre-20th Century ........... 3
DANC 391 Dance History: 20th Century ............... 3
DANC 454 Teaching Principles and Methods ........... 3
DANC 480 Introduction to Laban Movement Analysis .... 3
Dance Elective ....................................................... 3

Electives .................................................................... 12
Total .......................................................................... 120

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, teaching, and choreography. Candidates are expected to enter the program with advanced technical proficiency in either ballet or modern technique and are expected to take advantage of the diverse and abundant cultural opportunities in the Washington, D.C., area. The curriculum allows for and encourages apprenticeships and internships in professional and resident companies, experimentation in academic pursuits, and the development of independent and interdisciplinary artistic projects.

Admission Requirements
In addition to fulfilling the admission requirements for graduate study, the applicant must submit directly to the Dance Division of the Institute of the Arts a resume and a 10-minute VHS video that illustrates the applicant's choreography. All candidates also must demonstrate advanced technical proficiency through a personal audition or provide examples of their proficiency on VHS video. Applicants should call the Dance Division to schedule an on-site audition.

All candidates must satisfy the following prerequisites: advanced technical ability, improvisation, two semesters of dance composition, two semesters of dance history, rhythmic analysis or music for dance, anatomy/kinesiology, elementary Labanotation, and dance production. Prerequisite courses may be completed before or concurrent with graduate course work 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
DANC 525/545 Advanced Modern Dance or Modern Ballet Technique ......... 18
DANC 560 Advanced Choreography ................... 6
DANC 570 Advanced Dance Performance ............ 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 Project .................................... 6
Electives ................................................................. 6

The university does not guarantee the availability of these courses every semester. Some will be offered in alternating years.

♦ Minor in Dance
The minor in dance consists of 21 credits selected from any combination of dance courses. The program of study is designed by both the student and the dance faculty member 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 and a range of upper- and lower-level courses.

Interdisciplinary Studies in the Arts

Faculty
Brininger, Burton, Carbonneau, Crawford, R. Davis, Haroutounian, Hazen, Kim, Mandes (director), Rutledge

The Interdisciplinary Studies in the Arts Division provides faculty support in developing arts-based integrated programs for all George Mason students. The faculty of this division comes from any school or college within George Mason. The goal is an integrated arts experience that transcends any one particular Western "high-art" tradition. This division sponsors work in arts management, cross-disciplinary studies in the arts and world arts, and culture, among others.

The division staffs the current ARIN courses listed in this catalog and supports interdisciplinary minors in arts administration and interdisciplinary arts. See the "University Academic Programs and Resources" chapter for a description of these minors.

Theater

Faculty
Robinson professor: D'Andrea
Visiting associate professor: Davis
Visiting assistant professors: Austin, Gero, Johnsen-Neshati (director), Kurtz, Raybuck
Contractual assistant professor: McDonald

Course Work
The Theater Division offers all course work designated THR in the "Course Descriptions" chapter of this catalog.
UNDERGRADUATE PROGRAMS

Theater, B.A.

The B.A. in Theater stresses the breadth of a liberal arts education in the belief that such study, combined with serious 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 division's student population. The Theater Core, in conjunction with certain electives, also satisfies the requirements of a minor in theater.

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 division 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 division 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 351.

Diagnostic Examination

Theater students are required to take a diagnostic examination during their junior year or upon reaching 30 credits in Theater Division 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 division director.

Degree Requirements

General Education ........................................ 45-57

Major .......................................................... 47

Electives ....................................................... 16-28

General Education ........................................ 45-57

1. Language .................................................. 18
   a. English .................................................. 6
      ENGL 101, 302. 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.

2. Analytical reasoning ...................................... 3
   MATH, PHIL 173, or CS

3. Humanities ............................................... 16
   a. Literature ............................................ 6
      ENGL 201, and 202, 203, or 204; the 300 level or above in a foreign language; PHIL 253; or CLAS 250
   b. Fine arts ............................................. 9-10
      DANC 125, 131, 150, or 161 is recommended but any DANC course is acceptable (3 credits). ARTS 200, 202, 203, 322, or 399 is recommended but any ARTS course is acceptable (3-4 credits). ARIN, MUSI, or ARTH (3 credits)

4. Social science ............................................ 6
   ANTH, ECON, GEOG, GOVT, HIST, PSYC, SOCI

5. Natural science ......................................... 8
   ASTR, BIOL, CHEM, EVSC, GEOL, PHYS

6. Non-Western studies .................................... 3
   Three credits must be earned in courses devoted to non-Western culture. This requirement is waived for the student who has attended a native school in a non-Western country (for more than four years). Requests for a waiver should be made through the director of academic affairs of IOA. The following courses, which are designated as meeting this requirement, may also be presented in partial fulfillment of requirements stated in other sections.
   ANTH 114, 300, 301, 304, 305, 306, 307, 308, 311, 313, 332
   ARTH 319, 320, 380, 381
   DANC 118
   FREN 451
   GEOG 101, 316, 325, 330
   GOVT 332, 333
   HIST 130, 251, 252, 261, 262, 281, 282, 328, 329, 353, 354, 356, 463, 464, 465, 466
   MUSI 103
   RELI 211, 212, 313, 314, 315, 337, 490
   RUSS 353, 354
   7. PHIL or RELI ......................................... 3

Theater Core (and Minor in Theater)

Requirements ............................................... 23

   THR 150, 151 Drama, Stage, and Society I and II .... 6
   THR 200 Play Production Practicum
      (1-2 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 from the following group of one-credit minicourses: THR 201 Stage Management, THR 202 Literary Management, THR 203 Production/Company Management
Institute of the Arts

Practicum Credit
Students must acquire practicum credit in different areas (e.g., performance and technical production work).

Professional Productions
Theater of the First Amendment (TFA), a professional theater in residence within IOA, 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.

Participation in Theater Division productions is expected of all declared majors. Up to four practicum credits can be awarded for satisfactory completion of two to four production assignments in the major (i.e., faculty- or guest-directed) productions or on TFA productions.

Upper-Level Units
Twenty-four 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.

NOTE: Acting Ensemble (THR 320, 321, 420, 421) is open by audition only and may require concurrent enrollment in required courses. Auditions are held at the beginning of each semester and by appointment.

Design and Technical Theater
This area helps prepare 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.

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 in the Graduate School of 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 380 Playwriting I ........................................ 3
THR 381 Playwriting II ....................................... 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.

Minor in Theater
The minor in theater requires 23 credits as follows:

THR 150 and 151 Drama, Stage, and Society .......... 6
THR 200 Play Production Practicum 
   (1-2 each, repeated for a total of 4) ........ 4
THR 210 Acting I ............................................ 3
THR 230 Introduction to Technical Theater ............ 3
THR 240 Directing I ......................................... 3
THR 350 Script Analysis .................................... 3
THR 201 or 202 or 203 Stage, Literary, or Management/Production Management ........... 1

Visual Information Technologies

Faculty
Visiting associate professor: White
Visiting assistant professors: Martin (director), Olgyay

Course Work
The Visual Information Technologies Division offers all course work designated VIT in the "Course Descriptions" chapter of the catalog.

GRADUATE PROGRAMS

Visual Information Technologies, M.A., M.F.A.
The Visual Information Technologies Division offers an M.A. and an M.F.A. specializing in electronic and digital media technology. Computer imaging and animation provide students with a unique opportunity to integrate visual communication design with two- and three-dimensional computer modeling, animation, and image processing 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 houses, graphic design
firms, federal and local government training programs, and computer-related research industries, including those related to virtual reality and multimedia systems.

The M.F.A. degree requires 60 credits, during which time students explore an emphasis in depth. The M.F.A. is a terminal degree that includes the benefits of the M.A. degree, in addition to preparing students to teach at the university level. Students are encouraged to explore new forms of expression by integrating electronic multimedia technology with fine art information media tools.

Admission Requirements
In addition to meeting the general requirements for admission for graduate study, candidates for the M.A. or M.F.A. in Visual Information Technologies 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 group of 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. Candidates without computer experience may be required to complete some undergraduate course work in computer imaging. Students with an M.A. degree in another field who seek to earn an M.F.A. must complete a minimum of 30 credits.

The student's portfolio is a major selection criterion for graduate admission, regardless of the area of emphasis. Evidence of applications in the arts using emerging technologies for both the fine and applied arts is of particular interest. Portfolios from applicants must include 20 slides, labeled and numbered, with orientation information, and one optional 1/2" VHS NTSC videotape, not exceeding four minutes in length. Slides should represent the student's most accomplished work irrespective of studio application area. Some artwork representing skills in computer imaging must be included. Applicants may supplement their portfolios with CD-ROM's, zip disks, and/or web addresses.

Degree Requirements

Basic Requirements .................................................. 30

All students must complete the following courses:

VIT 600 Research Methodologies ............... 3
VIT 613 Graphic Design .................................. 3
VIT 620 Philosophy of Theory and Criticism ...... 3
VIT 696 Special Topics in VIT ......................... 3
ARTS 500+ Art Studio course work ............... 8
Elective in cognate area ................................. 4

M.A. candidates must complete supervised apprenticeships in professional business settings (VIT 693) ......................... 6
M.F.A. candidates must complete supervised classroom teaching practicum in the undergraduate program at George Mason or in a community college art program (VIT 670) ......................... 6

Emphases ................................................................. 15

Students must complete the requirements in one of the following emphases:

Computer Graphics

VIT 684 Two-Dimensional Computer Imaging .................. 5
VIT 686 Three-Dimensional Computer Imaging .............. 5
VIT 688 Computer Animation ......................... 5

Graphic Design

VIT 614 Problems in Typography .................. 5
VIT 616 Hypertext and Hypermedia .................. 5
VIT 618 Problems in Graphic Design .......... 5

Multimedia

VIT 616 Hypertext and Hypermedia .................. 5
VIT 676 Sound and Music ......................... 5
VIT 678 Interface and CD-ROM ................. 5

Total credits required for the M.A. ................. 45

M.F.A. Comprehensive Experience .................. 15

Candidates for the M.F.A. must complete all the above requirements and the following:

VIT 796 Directed Project ......................... 9
VIT 798 Directing Reading ......................... 3
VIT 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

Facilities and Equipment

The Visual Information Technologies program is situated in the Institute of the Arts complex. The program has four computer labs that contain Silicon Graphics Workstations and a variety of other platforms and personal computer terminals, in addition to video editing, image scanning, and digitizing facilities.
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 15 departments, 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 in them an attitude of 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
Zita E. Tyer, Senior Associate Dean
Doris A. Bitler, Associate Dean for Student Academic Affairs
Dee Ann Holisky, Associate Dean for Academic Programs
Richard Klimoski, Associate Dean for Outreach
Walter Rankin, Assistant Dean for Student Academic Affairs
Jo Ann Schrass, Assistant Dean for Student Academic Affairs

Graduate Degree Programs
The college offers 17 master's degrees, including a Master of Public Administration and a Master of Fine Arts in Creative Writing, and 4 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 general education, course work in a major area of study, and electives. The college offers 18 bachelor of arts (B.A.) degrees, 11 bachelor of science (B.S.) degrees, and a bachelor of music (B.M.) degree. To earn a bachelor's degree, students must complete 120 credits, of which at least 45 credits must be in upper-level courses (numbered 300 and above). All Bachelor of Arts and Bachelor of Music students entering the college who have not satisfied the analytical reasoning requirement are required to take a math placement test before initial enrollment.

Students are strongly advised to consult the "Academic Policies" chapter for information concerning university-wide requirements for undergraduate degrees.

General Education Program
The baccalaureate degree begins with general education, a range of courses 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 the general education requirements. But general 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 general education 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.

Students in the College of Arts and Sciences may complete their general education program either by completing the number of credits in the courses listed below or by completing the interdisciplinary courses of the Honors Program in General Education. The Linked Courses program provides a way for them to register for two or more complementary general education courses at the same time. The professors of linked courses have coordinated readings and assignments.

Bachelor of Arts
Students pursuing a bachelor of arts degree must complete a general education program that includes the study of six general areas 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.

- Communication (written communication, oral communication, and a foreign language)
- Analytical reasoning (math, statistics, or logic)
- Humanities (literature, fine arts, and philosophy or religious studies)
- Social sciences (economics, geography, government, or history, and anthropology, psychology, or sociology)
- Natural science (astronomy, biology, chemistry, geology, or physics)
- Non-Western culture

Degree Requirements

<table>
<thead>
<tr>
<th>General Education</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Communication</td>
<td>9-21</td>
</tr>
<tr>
<td>a. Written</td>
<td>6</td>
</tr>
<tr>
<td>b. Oral</td>
<td>3</td>
</tr>
<tr>
<td>c. Foreign language</td>
<td>0-12</td>
</tr>
<tr>
<td>2. Analytical reasoning</td>
<td>3</td>
</tr>
<tr>
<td>Mathematics [3], STAT 250, DESC 210, PHIL 173, or PHIL 376</td>
<td></td>
</tr>
<tr>
<td>3. Humanities</td>
<td>12</td>
</tr>
<tr>
<td>a. Literature</td>
<td>6</td>
</tr>
<tr>
<td>b. Fine arts</td>
<td>3</td>
</tr>
<tr>
<td>c. Philosophy or religious studies</td>
<td>3</td>
</tr>
<tr>
<td>4. Social science</td>
<td>12</td>
</tr>
<tr>
<td>a. Economics, geography, government, or history</td>
<td>6</td>
</tr>
<tr>
<td>b. Anthropology, psychology, or sociology</td>
<td>6</td>
</tr>
</tbody>
</table>

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College of Arts & Sciences 75

   A two-semester laboratory science sequence in
   astronomy, biology, chemistry, geology, or physics


Major ................................................................. 30-42
   Requirements for each major are listed in the depart­
   mental sections that follow. At least one course at or
   above the 300-level must be designated “writing
   intensive.”

Electives ................................................................. 16-40

Total minimum credits ......................................... 120
   (Forty-five of these must be upper-division credits.)

Bachelor of Science
   Students pursuing a bachelor of science degree must com­
   plete a general education program that includes the require­
   ments outlined below. The degree is designed to provide
   students with a more intensive approach to the core technical
   questions of their majors. This curriculum has a somewhat
   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 math and science.
   • English composition
   • Literature
   • Course work outside the area of concentration
   • Additional required course work specified by the degree

Specific details on the degree programs are provided in the
departmental and program entries in the remainder of this chapter.

Degree Requirements

General Education .................................................. 40-63

   ENGL 101, 302

2. Literature [4] .................................................. 6

3. Course work outside the area of concentration ......... 12
   • For majors in economics, geography, government,
     or history: 12 credits from disciplines outside
     these fields, of which at least 6 credits must
     be in science or mathematics.[8]
   • For majors in psychology or public administration:
     12 credits from disciplines outside
     these fields, of which at least 6 credits must
     be in science or mathematics.[8]
   • For majors in the natural sciences or mathematics:
     12 credits from disciplines outside
     these fields, of which at least 6 credits must
     be from the social sciences.[9]

4. Additional required courses ......................... 16-39
   Other required general education courses are listed
   with the degree program.

Major ................................................................. 38-74
   Requirements for each major are listed in the depart­
   mental sections that follow. At least one course at or
   above the 300 level must be designated “writing
   intensive.”

Electives ................................................................. 17-42

Total minimum credits ......................................... 120
   (Forty-five of these must be upper-division credits.)

Notes

[1] Communication
   • For information on testing out of ENGL 101 or 302,
     contact the English Department.
   • Students must attain a minimum grade of C to use
     ENGL 100, 101, or 302 to fulfill degree requirements.
   • Non-native speakers of English with limited profi­
     ciency in the language are encouraged to substitute
     ENGL 100 for ENGL 101.
   • The foreign language 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 the CAS Student Academic Affairs
     Office about a possible waiver of this requirement.

[2] Students with scores below a certain point on the math
   placement test are strongly recommended to take
   MATH 106 to satisfy the analytical reasoning require­
   ment. It will be required of students entering fall 2000.

[3] MATH 105, 271, or 272 may not be used to fulfill
   this requirement.

[4] Humanities
   • The literature requirement may be fulfilled by any
     courses in literature at the 200 level in English, the
     300 level or above in foreign languages, or PHIL 253.
   • The fine arts requirement may be fulfilled by any
     course in art, art history, dance, film, music, or the­
     ater, whether the course is delivered as lecture, stu­
     dio, ensemble, or private lessons.
   • The requirement in philosophy or religious studies
     may not be fulfilled by a logic course.

[5] The requirement for six credits in economics, geog­
   raphy, government, or history may be fulfilled by any
   course in geography except GEOG 102 or 309.

[6] The natural science requirement may not be fulfilled
   by BIOL 124, 125.

[7] Non-Western culture
   • Students who have attended a native school in a non-
     Western country for four or more years may request
     a waiver from this requirement through the Student
     Academic Affairs Office in the College of Arts and
     Sciences.

http://catalog.gmu.edu
• The following courses, which are designated as meeting this requirement, may also be presented in partial fulfillment of bachelor of arts requirements in communication, humanities, or social science. ANTH 114, 300, 301, 302, 304, 305, 306, 307, 308, 311, 313, 332
ARTH 319, 320, 380, 381
DANC 118
FREN 451
GEOG 101, 316, 325, 330
GOVT 332, 333, 432
MUSI 103
RELI 211, 212, 313, 314, 315, 337, 490
RUSS 353, 354
STAM 303, 304
[8] This includes courses in astronomy, biology, chemistry, computer science, engineering, geology, geography (only GEOG 102 or 309), mathematics, or physics.
[9] This includes courses in anthropology, economics, geography (except for GEOG 102 or 309), government, history, linguistics, psychology, or sociology.

Biology

Faculty
Professors: Ernst, Hart, Jones, Lawrey, Shaffer, Skog, Soyer (Distinguished University Professor), Taub, Taylor (chair)
Visiting professor: Talbot
Associate professors: Adamkewicz, Andrykovitch, Birchard, Bradley, Chandhoke, Christensen, Jonas, Kelso, Litchfield, Rockwood, Royt, Torzilli, Walbridge
Assistant professors: Fryxell, Megenical
Visiting assistant professors: Coss, Hamblin-Katnik, Piper, Shields
Visiting instructor: Fox

Course Work
The Biology Department offers all course work designated BIOL and MTCH in the "Course Descriptions" chapter of this catalog.

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 through the university's main page at www.gmu.edu 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 signature to register. See the Biology Department website through the university’s website at www.gmu.edu 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 the general requirements for the B.A. degree, candidates must present the following:
1. Thirty-two credits in biology, including BIOL 213, 303, 304, 305, 306, 307, 311, and 492 (or 494)
2. CHEM 103, 104 or 211, 212
3. Three credits of statistics
4. Six credits from the following: ASTR 103, 111-112, 113-114; GEOL 101, 102, 105; PHYS 106, 107, 243, 245

Students expecting to enter graduate or professional school are strongly urged to complete MATH 113 and 114. Organic chemistry and PHYS 106, 107 or 243, 244, 245, 246 are recommended.

■ Biology, B.S.
In addition to the general requirements for the B.S. degree, candidates must present the following:
1. Forty-four credits in biology, including BIOL 213, 303, 304, 307, 311, 305, 306, and 492 (or 494)
2. CHEM 211, 212, 313, 315, and one of the following options:
   a. CHEM 314 and either 318 or 320
   b. One three-credit chemistry course at the 300 or 400 level
   c. GEOL 101 and 102
3. PHYS 106, 107 or PHYS 243, 244, 245, 246
4. At least nine credits from among the following, including at least two math courses:
   MATH 110, 111 (6); MATH 113, 114 (8); CS 103 (3); STAT 250 (3); BIOL 312* (4)

Students are encouraged to consult with a biology faculty advisor to determine which option best meets his/her career goals.

◆ 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 the general requirements for the B.S. degree, the following courses are required for the concentration:
1. Twenty-five credits in biology, including BIOL 213, 303, 304, 305, 306, 307, 311, and 492 (or 494)
2. Nineteen credits of biotechnology, including BIOL 385, BIOL 483, or CHEM 502 and other courses chosen from BIOL 312, 377, 380, 402, 403*, 451, 452, 453*, 482, 484, 485*, 497**, 553, 556, 563, 568, 570, 572, 575**
   * Laboratories associated with courses are required.
   ** Subject to approval by program coordinator.

3. Eighteen credits in chemistry, including CHEM 211, 212, 313, 314, 315, and 318 or 320
4. Sixteen credits in mathematics and physics, including MATH 110, 111 or 113, 114, and PHYS 243, 244, 245 and 246

Laboratory Requirement
Many biology courses include a required or optional laboratory in which students are expected to participate. Laboratories include field trips, experiments with live plants and animals, and dissections of preserved specimens.

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 higher. 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 3.00 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 enter the program. 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, including the following courses: 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.

◆ Certificate in Environmental Management
The Biology Department offers an undergraduate certificate program 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.

The curriculum provides a substantive appreciation of the biological, physical, and social aspects of environmental problems and methods for their analysis and resolution. It should particularly interest students wishing to pursue graduate work or seeking employment in the environmental field. All biology majors are eligible to enroll. Inquiries should be made to the environmental management certificate director, Biology Department, (703) 993-1050.

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 are required to complete a two-semester laboratory science sequence in 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 with the help of the certificate director. The courses are divided into five categories. Courses listed in more than one category can only satisfy the requirements of one. Any substitution in the following list requires permission from the certificate director.

1. Environmental certificate core (four courses): BIOL 377; GEOG 303 or GECA 503; ECON 103, GOVT 241, or GOVT 357; one course in statistics
2. Physical perspective (one or two courses): BIOL 309, 535, 550, 577; GEOG 102, 309; GEOL 205, 313, 317, 403, 405; USE 350
4. Social perspective (one course): ANTH 305, 365, 370, 440; CONF 501; ECON 350, 360; GEOG 301, 304, 305, 306, 316, 325, 406; GOVT 318, 357, 364, 366, 537; MGMT 312; NURS 543; PHIL 555; PRLS 300, 402, 526; PUAD 502; SOCI 306, 541; USE 300, 350, 400, 451, 452, 453
5. Environmental methods (one course): DESC 301, 352; GEOG 310, 411, 412, 416; GECA 550, 553, 579, 580, 585; USE 340

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 305-306. Other requirements generally include organic chemistry (CHEM 313, 314, 315, and 318 or 320) and a year of college 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.

Secondary Teacher Licensure (Certification)
Students enrolled in either the B.A. or B.S. in Biology program and who wish to become licensed to teach biology in Virginia secondary schools must take a course in animal physiology, a course in physics, a course in geology, and a course in medical ethics, in addition to fulfilling the other degree requirements. Licensure also requires completion of an approved program of professional teacher education courses. Consult the Office of Teacher Licensure in the Graduate School of Education (Robinson Hall, Room 307A, (703) 993-2079) for specific discipline and teacher education course requirements.

The Office of Teacher Licensure can also provide information about the licensure program for those who do not hold a bachelor's degree in biology from George Mason.

Biology for Nonmajors
Students who are not majoring in science or mathematics and who wish to fulfill their natural science requirement with a two-semester laboratory sequence in biology, should enroll in BIOL 103 and 104. 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 Committee on Allied Health and Education Accreditation (CAHEA) of the American Medical Association.

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 CAHEA-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- or 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 45 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 the college requirements for B.S. degrees and MTCH 200, candidates for the B.S. in Medical Technology must present the following courses in their preprofessional programs:

1. Biology, a minimum of 20 credits, including BIOL 213, 303, 305, 306, 311, 452, and 453
2. Chemistry, a minimum of 18 credits, including CHEM 211, 212, 313, 314, 315, and either 318 or 320
3. Mathematics, a minimum of 6 credits (STAT 250 recommended; MATH 106 not applicable)

Students are encouraged to elect additional basic science courses during their preprofessional years. Recommended are BIOL 380, 465, 483, 484, 485; CS 103; CHEM 321; PHYS 106, 107.
The 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 401, 402, 403, 404, 405, and 406. The distribution of credits in these courses varies with the school of medical technology. No more than 30 professional credits may be applied toward the degree.

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, many students elect to complete a bachelor’s degree before entering the clinical program. Students who have completed a B.S. in Biology or Chemistry at George Mason and who 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.

GRADUATE PROGRAMS
■ Biology, M.S.
The Master of Science in Biology program provides advanced training for recent college graduates, professionals in teaching, technical, and other biology-related fields, and research-oriented persons. The degree encompasses traditional and contemporary areas such as animal behavior, biochemistry, botany, cell biology, ecology, evolution, genetics, microbiology, molecular genetics, physiology, systematics, and vertebrate zoology. Students may study one of these biological sciences, or choose from two concentrations: environmental science and policy, and bioinformatics and computational biology.

Deadlines
Deadlines for completed applications for admission are March 15 for fall semester and October 1 for spring semester. Notification of decisions will be made by May 1 for fall and December 1 for spring.

Program in Biological Sciences
Admission Requirements
Applicants for the program in biological sciences are expected to have a bachelor’s degree in biology or its equivalent, with a GPA of 3.000 or better in biology courses. Applicants must submit three letters of recommendation and scores on the Graduate Record General and Biology Examinations. To be accepted as a degree student, an applicant’s scores on the verbal and quantitative general test should total 1100 or more and should be in the 50th percentile or better on the biology subject portion, with no raw subscore of less than 60 (40th percentile). Applicants must also submit a substantial statement of interest in the program and an explanation of career goals. Prospective students are encouraged to contact potential advisors. Information concerning faculty interests can be obtained from the departmental office. Admission is contingent upon acceptance by an advisor.

Degree Requirements
A student must complete at least 30 credits, including BIOL 690, Introduction to Graduate Studies in Biology, and at least two seminar courses. During their first semester, new students should register for BIOL 690. Students are required to form a supervising committee and submit a program of study to the program coordinator for approval within the first 12 credits of course work. Course requirements may be fulfilled by completing courses from a variety of departments and institutes on campus.

Students have the option to conduct either a formal thesis (for which a minimum of three credits and a maximum of six credits of BIOL 799 could be earned), or a project (for which a minimum of one credit and a maximum of three credits of BIOL 798 could be earned). The difference between the two options is the depth and sophistication of the project. Whereas a thesis normally involves original research, independent acquisition, and interpretation of data, a project could be employment-related research or a comprehensive report resulting from an internship.

At the conclusion of the program, students pursuing the master’s project option must successfully complete comprehensive written and oral examinations. Students pursuing the master’s thesis option must defend their theses and present their results in a public seminar.

Lack of enrollment for two consecutive semesters results in inactive status. Reactivation of program enrollment is by application to the M.S. coordinator and is contingent on availability of program resources.

◆ Concentration in Environmental Science and Policy
The concentration in environmental science and policy is designed to meet the increasing need to train environmental scientists and managers who will address the problems of land and water pollution, hazardous waste management, land use and urbanization, wetland loss, and ecosystem preservation. These professionals will also 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.

Environmental problems are defined in the real world, and they do not necessarily conform to traditional academic disciplines; rather, they require creative combinations of diverse interests and subjects to be resolved. Effective training requires rigorous, problem-focused interdisciplinary education in a setting in which research is an essential element supporting instruction.

The concentration in environmental science and policy can also 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.

Admission Requirements
Applicants for the M.S. degree with a concentration in environmental science and policy should hold a bachelor's degree in natural or earth sciences, engineering, resource planning, or related fields from an accredited institution, with a GPA of 3.00. Applicants should have taken at least two semesters of chemistry and three semesters of biology, including ecology. If the degree is in a field other than those mentioned above, applicants should have taken several science courses beyond the introductory level. They may be required to make up deficiencies before being permitted to enroll in the program.

Applicants should submit three letters of recommendation, including at least one from a former professor. The aptitude portion of the Graduate Record Examination is required with a minimum score of 1100 for verbal and quantitative combined. Applicants must also submit a substantial statement of interest in the program and potential areas of emphasis as well as an explanation of career goals.

Degree Requirements
The environmental science and policy concentration encourages an independent and creative approach in the development of curricula. Students are required to form a supervisory committee and submit a program of study to the program coordinator for approval within the first 12 credits of course work. Course requirements may be fulfilled by completing courses from a variety of departments, centers, and institutes on campus.

Lack of enrollment for two consecutive semesters results in inactive status. Reactivation of program enrollment is by application to the M.S. coordinator and is contingent on availability of program resources.

The program requires a minimum of 33 graduate credits distributed in four categories to provide both depth and breadth in knowledge related to environmental problems.

Category 1—Natural sciences: A minimum of nine credits are required in areas such as biology, geology, geography, chemistry, or environmental engineering.

Category 2—Social sciences: A minimum of six credits are required in areas such as public policy, economics, law, sociology, ethics, business, or conflict management.

Category 3—Environmental methods: A minimum of six credits are required in areas such as statistics, remote sensing, cartography, instrumental analysis, computer, mathematics, modeling, or management and information systems.

Category 4—Individual program focus: A minimum of 12 credits are required that should reflect a cohesive area of study. Graduate seminars for credit and research credits belong in this category. The environmental science seminar must be taken once.

Students have the option to conduct either a formal thesis for three to six credits of BIOL 799 (master's thesis research) or a project for one to three credits of BIOL 791 (master's project research). The difference between the two options is the depth and sophistication of the project. Whereas a thesis normally involves original research, independent acquisition, and interpretation of data, a project can be employment-related research or a comprehensive report resulting from an internship.

A committee of three faculty members with two departments represented is required for both the project and thesis options. Requests for exceptions should be directed to the director of graduate programs in Environmental Science and Public Policy.

At the conclusion of the program, students pursuing the master's project option must successfully complete comprehensive written and oral examinations. Students pursuing the master's thesis option must defend their theses and present their results in a public seminar.

**Concentration in Bioinformatics and Computational Biology**

The concentration in bioinformatics and computational biology encompasses a study of the role of computation in science, mathematics, and engineering. Computational sciences is defined as the systematic development and application of computing systems and computational solution techniques to models of scientific and engineering phenomena; informatics is defined as the systematic development and application of computing systems and computational solution techniques for analyzing data obtained by experiments, modeling, database search, and instrumentation. Faculty from the Departments of Biology, Chemistry, Physics and Astronomy, Mathematical Sciences, the School of Information Technology and Engineering, the Institute for Computational Sciences and Informatics, and the Institute for Biosciences, Bioinformatics, and Biotechnology contribute to instructional and research components of the concentration. For information on the Ph.D. in Computational Sciences and Informatics, see the "Institute for Computational Sciences and Informatics" chapter of this catalog.

Admission Requirements
Students applying to the M.S. degree with a concentration in bioinformatics and computational biology should have a bachelor's degree in some field of the natural sciences, mathematics, engineering, or computer science, with a GPA of 3.00 or higher in the last 60 hours of study. Students are expected to have competency in the biological sciences or in computational sciences. Computational skills and biological knowledge are evaluated during the admissions procedure. Any deficiency in these areas is addressed in the completion of the degree requirements. With the university application, the applicant must submit three letters of recommendation, a statement of interest in the program, potential area of emphasis, career goals, and GRE-GEN scores. A minimum score of 1200 (verbal and quantitative) is requested on this exam. It is recommended that students take the GRE-SUB if they are seeking graduate support.

http://catalog.gmu.edu
Prospective students are encouraged to contact potential faculty advisors appropriate to their interests. The Biology Department and the Institute for Computational Sciences and Informatics will provide a list of faculty research interests. The list is also available through the university’s website at www.gmu.edu. Admission is contingent upon acceptance by an advisor.

Degree 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 complete a minimum of 35 graduate credits for the M.S. degree and must submit a program of study to the program coordinator for approval within the first 12 credits of course work.

Courses are taken from the following categories:

- **Category 1—Computational sciences**: A minimum of seven credits, including CSI 601, 602, 603, 604 and INFSc 614.
- **Category 2—Bioinformatics**: A minimum of nine credits, including CSI 650, 651, and 652.
- **Category 3—Biotechnology**: A minimum of seven credits, including BIOL 668 and CSI 739.
- **Category 4—Individual program focus**: A minimum of 12 credits, including three credits of seminar (including BIOL 690), and six credits of research thesis (BIOL 799) or three credits of a project (BIOL 798).

Students have the option to conduct either a formal thesis for which up to six credits of BIOL 799 may be earned, or a project for which up to three credits of BIOL 798 may be earned. The difference between the two options is the depth and sophistication of the work. Whereas a thesis normally involves original research, independent acquisition, and interpretation of data, a project could be employment-related research or a comprehensive report resulting from an internship.

At the conclusion of the program, students pursuing the master’s project option must successfully complete comprehensive written and oral examinations. Students pursuing the master’s thesis option must defend their theses and present their results in a public seminar.

Lack of enrollment for two consecutive semesters results in inactive status. Reactivation of program enrollment is by application to the program coordinator and is contingent on availability of program resources.

**Environmental Science and Public Policy, Ph.D.**
The College of Arts and Sciences offers an interdisciplinary Ph.D. in Environmental Science and Public Policy. This program is described under the section Environmental Science and Public Policy in this chapter.
Concentration in Biochemistry

Students planning professional careers in biochemistry, 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 the general requirements for the B.S., students must complete the following:

1. 49 credits of chemistry courses: CHEM 211, 212, 313, 314, 315, 318, 321, 331, 332, 336, 337, 422, 423, 441, 446, 463, 465
2. MATH 113, 114, 213, 214
3. PHYS 243-246 or PHYS 160, 260-263
4. CS 103, 112 or 161 (choose one)
5. BIOL 213

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. Students receiving the certificate 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 or 320, 321, 331 or 335, 505, 554; EVSC 203, EVSC 205 or 206; MATH 209 or STAT 344. To optimize employment and graduate opportunities, students are encouraged to take additional courses in natural science, computer science, and environmental law.

Minor in Chemistry

The Department of Chemistry offers an approved minor in chemistry. The program requires 16 credits of chemistry at the 300 level or higher.

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 chemistry fulfill this requirement by successfully completing CHEM 336 and 337.

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.

GRADUATE PROGRAM

The Department of Chemistry offers an M.S. in Chemistry with either 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 program, 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 Institute for Computational Sciences and Informatics.

Chemistry, M.S.

The M.S. in Chemistry provides advanced training for recent college graduates, professionals in teaching, and technical workers in research organizations with interests 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

Two options are available. The thesis option is for students planning to continue work for the Ph.D. degree or to begin or continue careers in chemical research. The nonthesis option is for those seeking to go on to professional schools, to teach chemistry in secondary schools, or to 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. The thesis written by a student is based on research, which must be preapproved by the thesis or advisory committee. The student's thesis or advisory committee is appointed during the first semester of registration in CHEM 799. A student in the nonthesis option is required to complete 32 graduate credits. For both thesis- and nonthesis-option students, 12 credits must be in core courses in chemistry (physical chemistry and one in each of three different areas chosen from analytical, biological, environmental, inorganic, and organic chemistry). Each thesis-option student defends the research project at an oral exam after submitting the first approved draft of the thesis, and presents an exit seminar. Each nonthesis-option student is required to pass qualifying exams in four areas of chemistry. Minimum credits for each option are as follows:

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<tr>
<th>Course Type</th>
<th>Thesis Option</th>
<th>Nonthesis Option</th>
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</thead>
<tbody>
<tr>
<td>Core curriculum</td>
<td>12</td>
<td>12</td>
</tr>
<tr>
<td>Electives in chemistry</td>
<td>3</td>
<td>9</td>
</tr>
<tr>
<td>Electives in chemistry</td>
<td></td>
<td></td>
</tr>
<tr>
<td>or related fields</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>CHEM 670</td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>CHEM 790</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 799</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>Total credits</td>
<td>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. Credits obtained for courses CHEM 502 through CHEM 510 are applicable toward the M.S. degree only with prior written approval of the department.

CHEM 500 and CHEM 501 are not applicable toward the M.S. degree.
Communication

Faculty

Professors: Boileau (chair), Broome, Decker, Friedley, Manchester, Taylor

Associate professors: Akwule, Lont, Looney, J. Muir (joint appointment with New Century College), S. Muir

Visiting instructors: Kimble, Mangus, Tomasovic, Weinstein


Course Work

The Communication Department offers all course work designated COMM 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 one of seven concentrations: international and intercultural communication, interpersonal and organizational communication, journalism, media production and criticism, persuasive and political communication, public relations, or an individualized concentration.

In addition to the general requirements for the B.A. degree, communication majors must complete 36 credits in communication, including the following:

1. Five required communication courses, which must be completed with grades of C or better: COMM 250, 300, 301, 302, and 420. (COMM 420 should be taken after 105 credits have been completed.)

2. The remaining 21 credits of communication electives, 12 of which must be at the 300 or 400 level, will be determined by the concentration the student chooses in consultation with an advisor. These 21 credits of COMM electives may include no more than 10 credits total from among the following courses: COMM 140, 141, 142, 143, 145, 148, 157, 340, 341, 342, 343, 345, 346, 349, 450, 451, 452, 499; and 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.

3. Of these 21 credits of electives, at least 12 credits must be selected from one of the seven department concentrations. A list of courses in each concentration (except of course, the individualized concentration) is available in the department. 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. With the approval of their advisors, students may construct an individualized concentration, but they may not declare an individualized concentration after they have earned 90 or more credits toward graduation.

All students are encouraged to participate in one of the communication activities: WGMU, Broadside, Mason Cable News, debate, forensics, and GMView. 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.

To fulfill the College of Arts and Sciences general education communication requirement, communication majors must take COMM 100, 101, or 102 (or have an equivalent transfer course). These courses do not count toward the 36 credits for the major.

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 communication fulfill this requirement by successfully completing COMM 300.

Minors

The department participates in minors in film and media studies, women’s studies, and telecommunications. See the “University Academic Programs and Resources” chapter for information about the first two minors, and the Telecommunications section of this chapter for information on the telecommunications minor.

Cultural Studies

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 processes 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 communications), 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 program, so that faculty members may review the students' 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, dependent on how well they perform in their M.A. programs, particularly in CULT 802. Students who complete CULT 802 as part of their M.A. program are required to complete only 45 credits at the doctoral level.

The following application materials are required of all students:
1. The standard George Mason graduate application
2. A transcript from the Educational Testing Service, indicating scores on the Graduate Record Examination (only the general test is required; subject tests are optional)
3. Official transcripts from all colleges and universities attended
4. Three letters of recommendation from individuals who can judge the applicant's scholarly potential
5. A statement of purpose
6. A writing sample

For applicants who are non-native English speakers, an English language competency exam is required.

Degree Requirements
As with all doctoral programs, the emphasis 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. Students are required to demonstrate proficiency in at least one foreign language before being permitted to defend their doctoral dissertation proposal.

The course of study consists of 48 credits beyond the M.A. degree.

Core Requirement

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<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>CULT 802</td>
<td>Histories of Cultural Studies</td>
<td>3</td>
</tr>
<tr>
<td>CULT 806</td>
<td>Research in Cultural Studies</td>
<td>3</td>
</tr>
<tr>
<td>CULT 808</td>
<td>Colloquium (three semesters)</td>
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Theory Requirement

Choose one:

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<td>Culture and Political Economy</td>
<td>3</td>
</tr>
<tr>
<td>CULT 814</td>
<td>Gender and Sexuality</td>
<td>3</td>
</tr>
<tr>
<td>CULT 820</td>
<td>After Colonialism: Race, Ethnicity, Nationalism</td>
<td>3</td>
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</tbody>
</table>

Methodology Requirement

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.

Topics Requirement

Choose one:

<table>
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<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
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<tbody>
<tr>
<td>CULT 812</td>
<td>Visual and Performative Culture</td>
<td>3</td>
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<tr>
<td>CULT 816</td>
<td>Science/Technology</td>
<td>3</td>
</tr>
<tr>
<td>CULT 818</td>
<td>Social Institutions</td>
<td>3</td>
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</tbody>
</table>

Fields (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, and special topics courses; students also are required to take a three-credit directed readings course in each field. Students demonstrate competence in each field by producing a field statement that consists of a comprehensive, critical literature review.

Comprehensive (Qualifying) Examination

The written field statements and an oral comprehensive exam based on them constitute the qualifying examination. Upon successful completion of this requirement, students are advanced to candidacy.

Dissertation Research (998, 999)

Economics

Faculty

University professor: Buchanan

Professors: Bennett, Bloch, Congleton, Cowen, Crain, Heiner, Rowley, Snively (emeritus), Tollison, Vaughn, Wagner, Williams (chair)

Associate professors: Chung, Levy, Meyer, Reid, Thorbecke, Wiest

Assistant professors: Caplan, Ramirez

Course Work

The Economics Department offers all course work designated ECON in the “Course Descriptions” chapter of the catalog.

UNDERGRADUATE PROGRAMS

<table>
<thead>
<tr>
<th>Economics, B.A.</th>
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<tbody>
<tr>
<td>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</td>
</tr>
</tbody>
</table>
law school or graduate programs in business or public administration.

In addition to satisfying the general 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, and 311
2. DESC 210 and MIS 102, or STAT 250 and 350
3. MATH 108

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.

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 in 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 the general requirements for a B.S. degree in the College of Arts and Sciences, candidates for the B.S. in Economics must complete the following:

1. Forty-two credits of economics courses, including ECON 103, 104, 306, 311, and 345
2. STAT 362 or ACCT 201
3. DESC 210 and MIS 102, or STAT 250 and 350
4. MATH 113 and 114
5. CS 103 or MIS 201
6. Eight credits of laboratory science

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.

ECON 340 can be substituted for either ECON 345 or for MATH 114, but not for both. ECON 345 is recommended for most B.S. majors, and MATH 114 is strongly recommended for students considering graduate school in economics. It is required for admission to most graduate programs.

Students considering graduate study in economics are advised to complete at least one course in calculus beyond MATH 114.

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 economics fulfill this requirement by successfully completing ECON 306 or 345.

Teacher Licensure (Certification)
Students who wish to become elementary or secondary school teachers should consult the sections on licensure (certification) in the “Graduate School of Education” chapter. Those interested in secondary school teaching should consult with the secondary education advisor in their department.

GRADUATE PROGRAMS

Economics, M.A.
The Master of Arts in Economics strengthens students’ knowledge of economic theory and improves their skill 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
- Undergraduate degree from an accredited institution
- MATH 108 or equivalent
- GPA of 3.00 in the last two years of undergraduate work and in all economics courses
- Satisfactory scores on the Graduate Record Examination

Students should be familiar with intermediate microeconomics and macroeconomics and with basic statistics and calculus to participate in the master's program.

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. The Department of Economics does not admit students for the spring semester.

Degree Requirements
Students must complete 30 graduate credits and pass comprehensive examinations in micro- and macroeconomics. The examinations are offered twice each year. All students are required to take ECON 611, 615, and 812. In addition, Mathematical Economics (ECON 630) is strongly recommended. Although the university does not guarantee the availability of these courses every semester, a typical first-year sequence includes ECON 611, ECON 630, and an elective in the fall; ECON 812, ECON 615, 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.

Up to 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 six credits of electives taken outside economics in closely related fields. Students may also elect the thesis option, which offers up to six credits for independent research and writing under the supervision of a faculty member.

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
- Undergraduate degree from an accredited institution
- One year of calculus and one year of statistics
- GPA of 3.000 in the last two years of undergraduate work and in all economics courses
- Satisfactory scores on the Graduate Record Examination, including the economics subject test

Although it is not required, students find it helpful to complete a semester of matrix algebra and a semester of econometrics before entering the doctoral program.

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 fall semester is April 1.

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 micro- 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 up to 30 credits of doctoral course work reduced 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 six 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), Econometrics (ECON 637), and History of Economic Thought (ECON 820 or 821). Also required are two courses (beyond the required courses) in 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 630, 611, 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
- Comparative Economic Systems
- Constitutional Political Economy
- Economic History
- Industrial Organization
- International Trade and Finance
- Monetary Theory
- Public Choice
- Public Finance
- Law and Economics

English

Faculty
Professors: Bausch, Baxter, Bergmann, L. Brown, Brunette, Cheuse, D’Andrea (Robinson Professor), Forche, Foster, Gras, Hodges, Irvine, Jann, Kelley, Klappert, Melosh, Nadeau, Pankey, Shreve, Smith, Thaiss (chair)

Associate professors: Albanese, Foreman, Fuchs, Gallehr, Goodwin, Henry, Holisky, Jones, Kaplan, Karlson, Kaufmann, Keaney, Kuebrich, Lathbury, Mobley, Moynan, O’Connor, Owens, Radner, Rutledge, Story, Sypher, Tichy, Weinberger, Yocom

Assistant professors: Burr, Clark, Cruz, Irving, Lazaraton, Matz, Trafton

Visiting assistant professors: Atkinson, Collum, Fischer, Koch, Michals, Miller, Samuelian, Scott, Taciuch, Thompson, Young, Zawacki

Adjuncts: Berg, Buckley-Fletcher, Carter, Casal, Craver, Crouch, DeFazio, DeNys, Dittberner, Farrington, George, Grogan-Barone, Humbertson, Jacobs, Johnston, King, Kruck, Kuhta, Leith, Levy, Montecino, Moody, Pyrek, Raffel, Rubin, Williams

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 ENGL course numbers; such courses may be counted toward the English major.

UNDERGRADUATE PROGRAMS
- English, B.A.

In addition to the general requirements for the B.A., English majors must complete 30 credits (nine courses) in English beyond ENGL 302. Students must achieve a minimum GPA of 2.000 in all courses counting toward the English major. The nine courses are distributed as follows:

1. Six credits of ENGL 325 Dimensions of Literature, with a minimum grade of C
2. Twelve credits in one of the following concentrations. See the department for requirements for each concentration.
   - Medieval and Renaissance Literature
   - 18th- and 19th-Century British and American Literature
   - 20th Century Literature
   - Nonfiction Writing and Editing
   - Creative Writing
   - Fiction
   - Poetry
   - Drama
   - Film and Media Studies
   - Gender and Sexualities
   - Cultural Studies
   - Folklore, Mythology, and Literature
   - Linguistics

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3. Twelve credits of core courses, distributed as follows:
   a. Three credits in British 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, 474, and by special topics courses
      as approved by the department.
   b. Three credits in American, British, or other
      world literatures before 1915 (may simulta-
      neously satisfy a concentration). This require-
      ment 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 noncanonical or minority litera-
      ture (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.

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 Lan-
guages offer a B.A. in English with an emphasis in compara-
tive 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 liter-
ary study. It requires 10 courses above ENGL 302, distribu-
ted as follows:
1. Two courses in English and/or American literature.
2. Two courses in a literature other than English or Ameri-
can, with selected reading in the original language.
3. Three courses designated as comparative or world litera-
ture courses by the Comparative Literature Committee.
   These courses include ENGL 431, 436, 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 for the student's
   focus.
6. CL 514 Theories of Comparative Literature.

Students should consult with their advisors to design a pro-
gram 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 "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 encour-
aged to discuss their plans with their English advisors and
the director of undergraduate programs in English.

Minor in English
A minor in English provides students with a sound intro-
duction to the field of literary studies and also allows them
to select a set of courses that accords with their individual
interests. The minor in English has as a prerequisite the
6-credit general education requirement in literature and
requires 18 credits above ENGL 302. Students must take
ENGL 325 (six credits), either three courses in a concentra-
tion listed under the English major or three courses that sat-
sify the core requirements for the major (nine credits), and
an elective (three credits).

Prerequisite: completion of the six-credit College of Arts
and Sciences general education requirement in literature.

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 interdis-
ciplinary minors in film and media studies, folklore and
mythology, and linguistics. See those sections in the “Uni-
versity Academic Programs and Resources” chapter of this
catalog 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 teach-
ing methods.

Admission Requirements
Undergraduates interested in the TESL certificate must first
complete three credit hours of LING course work in the
English Department, and they must 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. 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 cer-
ificate may apply toward the undergraduate major. (Stu-
dents 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 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 500-599, either for undergraduate or for reserve graduate credit. See the department for details on how to enroll.

Teacher Licensure (Certification)
Students interested in becoming elementary or secondary school teachers should consult the general requirements for teacher licensure (certification) listed in this catalog in the “Graduate School of Education” chapter. See the English Department’s secondary education advisor for more information.

Honors Program in English
Students who wish to graduate with honors in English must earn at least a 3.50 GPA in all courses taken to satisfy the English major (including honors seminars), and successfully complete one of the options below:

1. Seminar option: Students complete two Honors Seminars (ENGL 414). Although the Honors Seminars are open to all English majors, students must obtain permission from the department to enroll in them. See the English Department for application procedures and further information. In addition, students must submit term papers from their two Honors Seminars to the English Honors Committee for evaluation. If the committee judges both papers to be of distinguished quality, the student graduates with honors.

2. Thesis option: Following the completion of one Honors Seminar, students complete an honors thesis. The thesis is written in the Honors Thesis Writing Seminar offered each spring (ENGL 415), and in conjunction with study undertaken through another advanced literature or cultural studies course of the student’s own choosing. By arrangement of the student and faculty members teaching the Thesis Seminar and the second English course, production of the thesis may substitute for some of the work in the second course. If the thesis is judged to be of distinguished quality, the student graduates with honors. Students may use all Honors Seminars to satisfy core and concentration requirements.

The Writing Center
The Writing Center offers one-to-one conferencing on 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. Each summer, selected teachers attend an intensive five-week institute at which 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 (includes a cultural studies concentration), (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 and the D. A. in Community College 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 interpretative paper or 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 six graduate credits in courses in related disciplines may be substituted for six 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. Nine credits in literature courses. For the track in the teaching of writing and literature only, ENGL 610 may be used to fulfill three 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. Six credits in critical theory, including at least one of the following courses: ENGL 514, 551, 675, 676, 705. The other three credits may be in any graduate course in which theoretical issues form a major strand.
3. Nine 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. These credits customarily will be in addition to those used to satisfy the general requirements. In two courses of the core program, the candidate must write an M.A. paper—a substantial paper on a topic agreed upon with the course instructor at the beginning of the semester. The M.A. papers must receive a grade of B or better, and will be filed with the English Department.
4. Three credits of electives.
5. Optional: Six credits of thesis may be substituted for the core program.

Concentration in Cultural Studies
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. Three of the six credits in critical theory in ENGL 676.
2. Nine credits in a core program designed around designated cultural studies courses. ENGL 676 also may be used as one of these courses.
3. Four credits in CULT 802.

Track in Professional Writing and Editing
1. General requirements (above).
2. Three credits in nonfiction writing.
3. Nine credits in professional courses (e.g., editing, technical writing, scientific writing, internship in writing or editing, or Northern Virginia Writing Project).
4. Three credits of electives in writing or literature.
5. Three credits of thesis.

Track in the Teaching of Writing and Literature
1. General requirements.
2. Six credits in writing/publishing courses.
3. Three credits in linguistics.
4. Three credits in the teaching of writing and three credits in the teaching of literature.
5. Three credits in composition theory: either ENGL 697 or an appropriate section of ENGL 611.
6. Three 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).

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.

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 two copies of a portfolio. 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; 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. Twelve credits in literature.
2. Twelve 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. Three to nine credits in other genres.
4. Six credits in thesis. Thesis credits may be taken in the Summer Term only with the permission of the Thesis Committee.
5. Up to nine credits of electives chosen in consultation with the writing program faculty.
6. For M.F.A.-Poetry students, at least one credit of ENGL 699.
With the approval of the M.F.A. faculty and the graduate coordinator, 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 either 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, both 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. This 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 either 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. Certificate courses fulfill in part the requirements for an endorsement in ESL 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 must apply for admission to the graduate program no later than the second semester of study. At the time 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 work toward the certificate may be applicable 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 B or better in each.

1. LING 326/520, 521, 522, 523, and 582 (EDCI 519 or LING 507 may be substituted for LING 521)
2. One elective (a list of approved electives is available from the English Department)

Environmental Science and Public Policy

Faculty
Adamkiewicz, Andrykovich, Beach, Birchard, Botkin, Bradley, L. Brown, R. Brown, Christensen, Conlan, Cozzens, Crepeau, deMonsabert, Diecioche, Dietz, Emsley, Ernst, Foster, Fryxell, Gifford, Guagnano, Gunn, Haack, Hamblin-Katnik, Harris, Hart, Honeychurch, Houk, Jonas (director), R. Jones, Kalof, Kelso, Kozlowski, Lawrey, Litchfield, Mahler, Megenigal, Meyer, Morowitz, Mose, Mushrush, Nadeau, Oates, Palkovitch, Pffifner, Rao, Regan, Rockwood, Royt, Ryan, Schreffels, Skog, Soyfer, Stalick, Talbot, Taub, Torzilli, Walbridge, White, Willett, Wilson, Wright

Course Work
All course work designated EVPP in the "Course Descriptions" chapter of this catalog is offered by this program.

GRADUATE PROGRAM

Environmental Science and Public Policy, Ph.D.
The Ph.D. in Environmental Science and Public Policy is an interdisciplinary program centered in the Biology Department. The Departments of Public and International Affairs, Chemistry, Economics, Geography and Earth Science, and Sociology and Anthropology also participate.

This program provides students with training to contribute to the solution of complex environmental problems. This goal requires development of knowledge and skills in the collection, analysis, and interpretation of scientific data as well as 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 3.00. Applicants should have taken at least two semesters of chemistry and three semesters of biology including ecology. Application deadline for admission in the fall semester is Feb. 15. Admission to spring semester is not available.

All applicants must submit the following:
1. Scores on the aptitude portion of the Graduate Record Examination. (This 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 Ph.D.'s.)
3. Official transcripts from each college or university attended.
4. A recent resume.
5. A substantial statement of interest in the program, including potential focus—environmental science or environmental public policy—and an explanation of career goals.

In addition, it is recommended that each applicant schedule an interview with the program director or an environmental faculty member in the focus. Admission decisions are based on the student's qualifications and the availability of a faculty advisor.

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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 waiver 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 in areas of natural science such as biology, chemistry, geology, geography, or environmental engineering.

Category 2. Public policy. A minimum of 12 credits 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 six credits in research skills such as statistics, remote sensing, geographic information systems, analytical chemistry, modeling, or information technology.

Category 4. Doctoral seminar. Must be taken twice.

Beyond these basic requirements, students should indicate whether they intend to focus their study on environmental science or environmental public policy. Those focusing on environmental science should expect to take a total of 24 credits in natural science, whereas 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.

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 an original research project in their specific area of interest can be successfully completed.

Upon 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. 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.

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.

Upon 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. Upon 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 five years of admission to the program.

Dissertation

Students must complete a dissertation (12 to 24 credits) by registering under the combination of EVPP 998 and EVPP 999. No more than half the credits specified for dissertation credit on the student's program of study may be taken as EVPP 998 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, program director, and dean of the college. Guidelines for preparing the dissertation proposal and dissertation are available from the program director. In preparation for the dissertation, the student may enroll in the doctoral dissertation proposal course for credit.

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, program director, and dean. The dissertation and defense must be completed within five years of advancement to candidacy.

Lack of enrollment for two consecutive semesters will result in inactive status. Reactivation of program enrollment is by application to the doctoral program director and is contingent upon availability of program resources and past performance.

Geography and Earth Science

Faculty

Professors: Diecchio (chair), Haack, K. Haynes (director, The Institute of Public Policy), Hazen (Robinson Professor), Stough, Wood (vice provost)

Associate professor: Wong

Assistant professors: Beach, Crampton, McBride

Visiting assistant professors: Koulov, Marchildon, Nord

Visiting instructor: Dillon


Affiliate professors: Levine, Perlin

Lab manager: Villiger

Course Work

This department offers all course work designated GEOG and GEOL in the "Course Descriptions" chapter of this catalog.
UNDERGRADUATE PROGRAMS

Geography, B.A.

In addition to the general requirements for the B.A., candidates must complete the following:

A. Twenty-eight credits in geography, including
   1. 16 credits of GEOG 102, 103, 300, 310, and 415; and
   2. 12 additional credits of systematic or regional courses at the 300 level or above.

B. An approved double major, disciplinary minor, interdisciplinary minor, or certificate; or any other coherent 18-credit or greater package of courses approved by an advisor and the department chair. No more than seven credits used to meet the requirement in A may be used to meet the requirement in B.

Examples: Minor in biology, earth science, history, or sociology; interdisciplinary minor in global systems, urban and suburban studies, or women's studies; certificate in environmental management.

Geography, B.S.

In addition to the general requirements for the B.S. degree, candidates must complete the following:

A. Twenty-eight credits in geography, including
   1. 16 credits of GEOG 102, 103, 300, 310, and 415; and
   2. 12 additional credits of systematic or regional courses at the 300 level or above.

B. Minimum 18-credit sequence of geographical applications courses, including GEOG 311, 411, 412, 416 or 579, and 6 additional credits of electives, which may include an internship (GEOG 480), approved by the program advisor before enrollment.

C. Up to 25 credits of required science, mathematics, statistics, and computer science courses, including
   1. GEOG 101, 102, 317 or BIOL 103, 104, 377 (11)
   2. MATH 113, 114 (8)
   3. STAT 250 (3)
   4. CS 103 (3)

Other recommended courses: GEOG 203; MATH 203; STAT 350; CS 112, 211; USE 210, 300

Minor in Geography

The minor in geography consists of 18 credits in geography, including

1. GEOG 101 or 103 and GEOG 102; and
2. Four upper-level courses, including one systematic course (such as GEOG 301, 303, 304, 305, 306, or 309) and one regional course (such as GEOG 315, 316, 320, 325, 330, or 380).

Earth Systems Science, B.S.

Students pursuing a degree in earth systems science receive broad training in physical science and the natural science of earth's systems. Students must select a concentration to which they apply this science background.

In addition to the general requirements for the B.S. degree, candidates are required to submit the following:

1. Core science including MATH 113, 114; CHEM 211, 212; PHYS 160, 260, 261 or PHYS 243, 244, 245, 246; GEOE 101, 102; BIOL 103, 104 or BIOL 213, 303, 304; BIOI/GEOL 309; GEOG 203, 309
2. One of the following required concentrations.

Concentration in Geology

GEOG 302, 304*, 308*, 312, 317, 401, 404. (Field camp is recommended and may be substituted for GEOG 203 and GEOG 404.)

Concentration in Geographic Analysis

GEOG 102, 300, 310, 311, 412, 416 or 579; GEOG 302 or CHEM 341, GEOG 317, GEOG 305 or 306 or GEOG 303

Concentration in Earth Science Education

Credits

ASTR 111, 112; or 113, 114 ........................................ 4
Minimum of 12 credits of GEOG selected from 302, 304*, 308*, 312, 317, or 401 ........ 12
GEOG 408, 409 ..................................................... 2
EDUC 522 .......................................................... 3
EDCI 573 .............................................................. 3
HEAL 110 .............................................................. 3
ANTH 114, HIST 121 ................................................. 3

Optional Teacher Licensure Component

(in addition to the requirements for the earth science education concentration)

EDUC 529, 539 (years 4 or 5) .................................... 6
EDCI 673 (summer after year 4), 790 (year 5) .......... 9
EDIT 504 (year 4 or 5) ............................................. 3
EDRD 531 (year 4 or 5) ............................................. 3

Optional Master of Education Component

(in addition to the requirements for the earth science education concentration and licensure)

EDRS 531, 590 ....................................................... 6
EDUC 521 .......................................................... 3
EDCI 783 .............................................................. 3
approved elective .................................................. 3

A grade of C or better in GEOG 302 is required before taking GEOG 304 or 308.

Minimum Requirements for B.S. in Earth Systems Science

Credits

Core science (see above) .......................................... 49-53
Concentration (see above) ........................................ 24-30
ENGL 101, 302 ...................................................... 6
Literature (at the 200-400 level) .................................. 6
Electives outside natural science and math ....... 6**
Special electives from anthropology, economics, geography, government, history, linguistics, psychology, and sociology ....... 6**
General electives .................................................. 13-23
Total credits ......................................................... 120

** Students in the earth science education concentration must take ANTH 114, HIST 121, and six additional credits of social science.
**Geology, B.A.**

In addition to the general requirements for the B.A., candidates are required to submit the following:

1. Thirty-four credits including GEOG 203, GEOL 101, 102, 302, 304*, 308*, 312, 317, 401, 404. (Field camp is recommended and may be substituted for GEOG 203 and 404.)
2. MATH 110, 111, or 113
3. CHEM 211 and 212
4. GEOL 316 or a computer science course
5. Concentration: nine credits of degree-related course work in a coherent program designed in coordination with an advisor and approved by the department chair

* A grade of C or better in GEOL 302 is required before taking GEOL 304 or 308.

**Minimum Requirements for the B.A. in Geology**

<table>
<thead>
<tr>
<th>Course Description</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Geology/geography</td>
<td>38</td>
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<tr>
<td>Concentration</td>
<td>9</td>
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<tr>
<td>MATH 110, 111, or 113</td>
<td>3</td>
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<tr>
<td>CHEM 211 and 212</td>
<td>8</td>
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<tr>
<td>GEOL 316 or computer science</td>
<td>3</td>
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<tr>
<td>ENGL 101, 302</td>
<td>6</td>
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<tr>
<td>COMM 100, 101, 102</td>
<td>3</td>
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<td>Social science</td>
<td>12</td>
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<tr>
<td>Non-Western culture</td>
<td>12</td>
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<tr>
<td>General electives</td>
<td>8-20</td>
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<tr>
<td><strong>Total</strong></td>
<td><strong>120</strong></td>
</tr>
</tbody>
</table>

**Minor in Geology**

A minor in geology requires 18 credits, including GEOG 101, 102, and 302, plus two of the following courses: GEOL 304*, 308*, 312, 317, or 401.

* A grade of C or better in GEOL 302 is required before taking GEOL 304 or 308.

**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 geography fulfill this requirement by successfully completing GEOG 415. 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 (Certification)**

Students interested in becoming elementary or secondary school teachers should consult the appropriate concentrations in the earth systems science degree program and the requirements for teacher licensure (certification) listed in this catalog in the "Graduate School of Education" chapter.

**GRADUATE PROGRAM**

**Geographic and Cartographic Sciences, M.S.**

The Master of Science 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 for 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, students should have a bachelor’s degree in geography, cartography, or equivalent. An applicant without an undergraduate degree in geography or cartography may be required to take one course in each of the following: physical geography, human geography, regional geography, and cartography. 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**

In general, students must complete a program consisting of four required core courses and a number of optional electives that are selected in consultation with an advisor. The required core courses are as follows:

- GEOG 553 Geographic Information Systems
- GEOG 579 Remote Sensing
- GEOG 585 Quantitative Methods
- GEOG 680 Seminar in Thought and Methodology

In addition to these core courses, students select from a number of GEOG courses to complete their programs. With departmental approval, up to nine credits from closely related disciplines may also be applied to the degree. A thesis is optional. Students may complete a 30-credit program that includes 3 to 6 credits of thesis, or they may complete a 36-credit program without a thesis. If the nonthesis option is selected, students are required to pass a comprehensive exam.

**History and Art History**

**History Faculty**

*Professors:* Bakhash (Robinson Professor), J.R. Censer (chair), L. Levine, Rosenzweig, Wade, Wilkins (Robinson Professor), Zagarri

*Associate professors:* J.T. Censer, Copelman, Deshmukh, Harsh, Henriques, Holt, Jensen, Lytton, O'Malley, J. Stewart

*Assistant professors:* Carton, Cheng, Cohen, Hamdani, Hawkes, Karush, Meyer-Fong, Platt, Smith

*Visiting assistant professors:* Herman, Orens

*Adjuncts:* Butowsky, Errico, Gillette, McCord, O’Neill, Sutton

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 the general requirements for the B.A., candidates must complete 36 credits of history, with at least 21 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 six credits with a grade of D may be used for the major. The 36 credits are distributed as follows:

1. Six credits of U.S. history
2. Six credits of European history (may include Russian history)
3. Six credits of global, Latin American, African, Asian, or Middle Eastern history
4. HIST 300 Introduction to Historical Method (three credits), with a minimum grade of C or better
5. HIST 499 Senior Seminar in History (three credits)
6. Twelve 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 through 3.

Honors Program in History

Eligibility
- History major
- Seventy-five credits completed (a minimum of 15 in history; 6 taken at George Mason)
- HIST 300 is a prerequisite (it may be in progress at time of application)
- 3.500 overall GPA and 3.500 GPA in history at time of application

Application Process
- Two George Mason history faculty members must be cited as references on the statement of application.
- If a major part of the student's work includes transfer credit, transcripts may be required because the number of students is limited. Not all applicants who meet the minimum requirements may be accepted into the program.

Program Requirements
- HIST 490 Honors Directed Readings (3:0:0)
- HIST 491 Honors Directed Research (3:0:0)

These are linked, individualized courses, normally given by the same instructor. HIST 490 involves directed readings, and 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 Senior Seminar.

- These six 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 six credits may be counted toward the 36-credit major requirement in history, but they do not replace HIST 499 Senior Seminar.

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 history may fulfill this requirement by successfully completing HIST 300 and 499.

- Minor in History
A minor in history requires 18 credits in history, including 12 credits at the 300 and 400 levels and 9 credits in a region or topic related to the student's major. The nine credits related to the student's major must be approved by the undergraduate coordinator before graduation. A GPA in history courses of at least 2.000 is required.

- Interdisciplinary Minors
The department coordinates the interdisciplinary minors in African American studies and in contemporary Europe. See the "University Academic Programs and Resources" chapter for descriptions.

Advising
The undergraduate coordinator advises majors and minors. History majors are urged to discuss their programs periodically with the coordinator.

Teacher Licensure (Certification)
History majors who wish to become secondary school teachers in history or in history and social science should consult the secondary education advisor in the Department of History and Art History. The professional preparation component of the state-approved teacher education programs for elementary and secondary school teachers is offered in the Graduate School of Education. See the sections on licensure (certification) under that school's listing in the catalog.

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 (1) satisfactory scores on the GRE, and (2) 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.

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 either 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. Three credits of HIST 610 The Study and Writing of History, taken within the first nine credits
3. Except in the teaching concentration, a comprehensive readings course (HIST 790, 791, 792), designed individually by the student and a professor, taken during the last semester of course work and used to round out the student's general historical knowledge and to prepare him or her for the comprehensive exam
4. A written comprehensive exam

To remedy possible deficiencies in a student's undergraduate preparation, up to 21 additional credits of foundation courses (e.g., HIST 550 Interpretations of History; 601 and 602 Themes in U.S. History I and II; and 605 and 606 Themes in Modern European History I and II) may be required, particularly for students who did not major in history as undergraduates. These courses do not count toward the degree.

◆ Concentration I—Predoctoral or Predoctoral with Cultural History Emphasis

This concentration is for students planning to continue into doctoral studies. In addition to HIST 610, it requires the following:

1. Fifteen 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 will generally require reading beyond what is required in the other concentrations.
2. Six credits outside the area of specialization, not including applied history courses (HIST 690, 691, 692, 693).
3. Six credits in HIST 799 Thesis or three credits in HIST 798 Directed Research and Writing in History. HIST 798 requires the completion of a major paper that is 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 three 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. Fifteen 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 focus generally requires additional reading similar to that in the predoctoral concentration.
2. CULT 702/802 Ideas and Methods in Cultural Studies I.
3. An "approaches to cultural history" course.
4. Three credits in HIST 798 Directed Research and Writing in History on a topic in cultural history.
5. One 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 II—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. Fifteen 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. Six credits of applied history courses (historic preservation, museum studies, archives, or historical editing)
3. Three or six credits of internship (if the three-credit internship is selected, then the other three credits would be 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 III—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. Fifteen 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. Twelve credits of electives

Six credits of thesis work are optional. If a thesis is elected, three credits in the major and three credits in electives are assigned to it.

◆ Concentration IV—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. Though 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. (For licensure information, please contact the Office of Teacher Education in the Graduate School of Education.) In addition to the general M.A. in History requirements, this concentration requires the following:

1. Twenty-four credits in history, including three credits in HIST 610 The Study and Writing of History; at least three credits each from U.S., European, and non-Western history course offerings; and one research seminar
2. Twelve credits in graduate education courses, including EDCI 567

http://catalog.gmu.edu
Art History Faculty

Professors: ffolliot (coordinator), Mattusch (Mathy Professor of the History of Art)
Associate professors: Butler, Todd
Adjuncts: Mason, Poole, Simons, Thayer

UNDERGRADUATE PROGRAMS

Art History, B.A.
As a liberal arts discipline, art history emphasizes the analysis of visual data in historical context. The major program prepares students for graduate study in art history, as well as for professional work.

In addition to the general degree requirements for the B.A., students majoring in art history must complete 39-40 credits as follows:

1. Studio art elective (3-4 credits): ARTS 200, 202, 351, 392, or others with permission of the Division of Art Studio in the Institute of the Arts
2. Three to six credits in art history (ARTH) at the 100 or 200 level, including three credits from ARTH 200 or 201
3. ARTH 394 or 594
   a. If taking ARTH 394, 21-24 credits of ARTH at the 300 level
   b. If taking ARTH 594, 24-27 credits of ARTH at the 300 level
4. Six credits of ARTH at the 400 level or above, including three credits from ARTH 400, 420, 430, 440, or 471
Up to six credits at the 300 level or above in related fields and up to six credits in art history internships may be applied toward requirements for the major with prior written approval of the departmental advisor.

It is strongly recommended that students 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, and are strongly encouraged to complete an art history internship (ARTH 393 or 593).

Forty-five credits at the 300 level or above are required for graduation. These may be taken in art history; up to six credits at the 300 level may be taken in other programs and substituted for ARTH credit, with prior approval of the advisor or art history coordinator.

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 art history fulfill the university’s writing-intensive requirement by successfully completing any 400-level ARTH course.

Honors Program in Art History

Eligibility
- Art history major
- Seventy-five credits completed by the end of the semester of application (a minimum of 15 in art history, 6 taken at George Mason)

- 3.500 GPA overall and in art history
- Limited to 20 percent of the graduating class, i.e., about two students per year

Application Process
- Eligible students apply to the art history coordinator.
- Students must submit a statement and provide the names of two George Mason faculty members to act as references; they may also submit their transfer transcripts.
- Selection of students admitted to the program is made by the Art History Committee.

Program Requirements
- Three credits of ARTH 492 Honors Directed Readings
- Three credits of ARTH 493 Honors Directed Research

ARTH 492 and 493 are two linked, individualized courses. ARTH 492 involves directed readings and ARTH 493 culminates in a research paper related to the subject of the readings. The student 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, although they may be taken concurrently.

These courses must be passed with a minimum average GPA of 3.500, and the overall art history GPA presented for graduation must be a minimum of 3.500.

These six credits of honors courses may be counted toward the 39-40 credit major requirement in art history, but they do not replace the requirement that students take three credits in ARTH 400, 420, 430, 440, 460, 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.

1. 100- or 200-level ARTH courses (3-6 credits)
2. 300-level ARTH courses (9-12 credits)
3. 400-level or above ARTH course (3 credits)

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 “University Academic Programs and Resources” chapter in this catalog 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
Ailes, Albanese, Bakhash, Bergmann, Bergoffen, Broome, Burr, J.R. Censer, J.T. Censer, Deshmukh, Dick, Dumont, Ehrlich, Francescato, Gifford, Gilbert, Guagnano, Harbour, Hazen, Hodges (associate director), Holt (director), Horton, Irvine, Jacobs, Jann, D. Kaplan, Kaufmann, Kelso, Kuebrich, Kulesza, Lancaster, Landsberg, Lankford, Mattusch, H. Nguyen, O'Malley, Peterson, Platt, Ricouart, Rutledge, Tangney, Todd, Trafton, Trebil, Weitzman, Wilkins, Young, Zoltek

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. It consists of a challenging interdisciplinary curriculum that satisfies 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 to 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, to develop new skills in addressing complex issues, and to 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 rigor of their high school curricula, GPA, standardized test scores, and leadership qualities as identified through their application portfolios. Admission is by invitation only; there is no formal application in addition to the general application to George Mason University.

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 of the departments. Students in the program must earn a minimum GPA of 3.000 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. Upon 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 offices of the Honors Program.
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 Studies

Faculty
Executive Committee
Bergmann, Button, Muir, Vail, Zagarri (chair)

Course Work
This program offers courses designated MAIS in the "Course Descriptions" chapter of this catalog.

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: individualized studies and liberal studies.

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 gerontology, video-based production, regional economic development and technology, communication, recreation resources management, and peace operations.
In addition to faculty-sponsored concentrations, students may, with the help of their 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 M.A.I.S. 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, apply also to the project.

**Admission Requirements**

Students admitted to the M.A.I.S. program must show a capacity for original thought in cross-disciplinary research. In addition to fulfilling admission requirements for graduate study, applicants must submit transcripts from all colleges attended, three letters of reference, and scores from either the Graduate Record Examination (GRE) or the Miller Analogies Test (MAT). The Graduate Management Admission Test (GMAT) or Law School Admission Test (LSAT), if taken within the past five years, may be substituted.

Students admitted provisionally must achieve a 3.250 GPA in the first 12 credits of graduate course work to advance to degree status. If they fail to do so, they will be terminated.

**Degree Requirements**

Candidates for the degree must successfully complete 36 credits of graduate course work, including the following:

1. Twelve to 18 credits in a single discipline
2. At least three credits of research methodology (approved by the student's faculty advisor)
3. Three or six credits of MAIS 798 (project) or six credits of MAIS 799 (thesis)

At least 18 credits of classroom course work must be completed at George Mason University with a grade point average of 3.000, not including credit awarded for independent study, directed readings, practicum, project, or thesis. With the approval of the faculty advisor and the chair of the Executive Committee, the 36 credits may include up to six credits taken through the Consortium of Universities of the Washington Metropolitan Area, and up to six credits taken at other accredited institutions.

**Concentration in Gerontology**

There is a growing need for professionals who plan and provide services to the elderly. For nonprofessionals, there is a need to increase understanding of our own aging and that of our loved ones. The program’s gerontology concentration is designed for students interested in doing research on aging, shaping public policy on the aging society, providing services to the elderly, or increasing their own awareness of human development in the later years. The program provides training in the basic physiological and social-scientific theories of aging, the impact of the physical and cultural environment on the aging process, and policy issues and ethical concerns pertaining to old age.

In addition to pursuing the M.A.I.S. degree, students may pursue a certificate in gerontology. For information on the undergraduate or graduate gerontology certificates, contact Frieda Butler, College of Nursing and Health Science, at (703) 993-1911.

**Concentration in Video-Based Production**

The concentration in video-based production has an emphasis on video production encompassing various components such as teleconferencing, interactive video, and computer-controlled editing. As low-end, high-quality video equipment becomes more affordable, more organizations (profit and nonprofit) invest in “in-house” production studios and staff. Their video needs include traditional videography, teleconferencing, interactive video techniques, computer-controlled video editing, and multimedia, to name a few.

Four units—the Department of Communication, Department of English, the Graduate School of Education, and the Visual Information Technologies (VIT) program—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 VIT program focuses on computer-mediated visual applications, including the study of multimedia tools and design, digital and electronic art, animation, and virtual reality.

**Admission Requirements**

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 nine credits of the program. Students with video experience who wish to waive this requirement must provide a videotape of their past work and consult with Cindy Lont at (703) 993-1100.

**Concentration in Regional Economic Development and Technology**

The concentration in regional economic development and technology is designed as a terminal master’s degree program for those who intend to become practicing professionals and those who already are employed in this field and wish to enhance their knowledge, skills, and credentials. This program introduces the student to the basic theory and current practice of economic development. Course work is drawn from public policy, economics, public administration, international commerce and policy, management, and sociology.

**Admission Requirements**

GRE or GMAT test scores are required for the regional economic development and technology concentration. Neither an MAT nor an LSAT test score is accepted. In addition, two of the three letters of reference must be from academic sources. Applicants with no background in economics or statistical analysis are required to take background work in courses such as INFT 500, DESC 201, or MATH 108 to raise the skill level necessary for completion of the program.
Mathematical Sciences

Faculty

Professors: Fischer, Levy, Polyak, Sachs (chair), Saperstone, Sauer, Shapiro, Struppa

Associate professors: Alligood, Colonna, Gabel, Kan, Kiley, Kulesza, B. Lawrence, J. Lawrence, Lim, Lin, Morris, Singman, Walnut, Zoltek

Assistant professors: Hosten, Lamba, Peterson

Adjuncts: Ailes, Erb, Frazier, Keller, Krasnov, Lieberman, Lightbourne, Nanry, Pitley, Senus, Sklar, Sohtan, Wallace, Zampedro

Visiting instructors: Dick, O’Beirne, O’Brien, Orlova-Shokry

Affiliate associate professor: Loustaunau

The degree programs in mathematics serve the needs of students with various interests and career goals from business/industry/research to graduate and professional school. Students may pursue the standard program, or they may pursue a program focused either on actuarial mathematics or on 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 to 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 the general requirements for the B.A., students must complete the following: MATH 113, 114, 125, 203, 213 or 215, 216, 290, and 322, plus 12 additional credits numbered above 300, for a total of 38 credits in mathematics. CS 112 is recommended.

Students who are pursuing licensure for secondary school mathematics teaching must complete at least 34 credits in mathematics and computer science as prescribed on the mathematics endorsement form available in either the Mathematical Sciences Department or the Office of Teacher Education, Graduate School of Education.

Mathematics, B.S.

In addition to the general requirements for the B.S., students must complete the course work described in the four groups below. Students may pursue the traditional mathematics program, or a concentration in actuarial mathematics or applied mathematics.

Mathematics Core Curriculum

All mathematics students must complete 23 credits of the following courses: MATH 113, 114, 203, 213 or 215, 216, 290, and 322.
Science, Accounting, and Economics Requirements

1. All mathematics students must complete one year of laboratory science selected from one of the following sequences: BIOL 213 and either 303 or 304 CHEM 211, 212 GEOL 101, 102 PHYS 160, 260, 261

2. Students in the traditional mathematics program and the applied mathematics concentration must complete a second year of science selected from one of the following three options:
   a. A second course sequence from the list in (1)
   b. Credits from more advanced courses in one of the natural sciences listed in (a) (but only courses acceptable for credit toward a natural science major)
   c. PHYS 262, 263

3. Students in the concentration in actuarial mathematics must take three credits of ACCT 202 (special arrangements may be made to waive the prerequisite of ACCT 201) and six credits of economics including ECON 102 (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.)

Computational Requirement

1. All mathematics students must complete CS 112 (four credits).

2. Students in the actuarial concentration must complete STAT 362 (three credits).

Specific Requirements

1. Traditional mathematics (24 credits): MATH 125, 315, 316; MATH 321 or 431; and 12 credits numbered above MATH 300

2. Actuarial mathematics concentration (24 credits): MATH 351, 352, 551, 554, 555, 556, and six credits from MATH 441, 442, 446, 447, 449, 559

3. Applied mathematics concentration (24 credits): MATH 125, 315, 351, 413, 414, 416, and six credits numbered above MATH 300

The department recommends that a two-year proficiency in either French, German, or Russian be demonstrated.

MATH 214 is not recommended for mathematics majors. In special circumstances, a student may substitute both MATH 203 and 214 for MATH 216. MATH 105, 106, 108, 110, 111, 271, and 272 do not count toward satisfying the requirements for a major in mathematics.

For All Students:

1. Students may not receive credit for both MATH 214 and MATH 216; both MATH 213 and MATH 215; both MATH 351 and STAT 344; and both MATH 352 and STAT 354.

2. After receiving a grade of C or better in one of the courses listed below in the left column, students may not receive credit for the corresponding course in the right column.

   MATH 113
   MATH 105 or 108

   MATH 351 or STAT 344
   MATH 110

   MATH 441
   MATH 111

3. General elective credit awarded by the Office of Admissions for mathematics courses does not fulfill the College of Arts and Sciences analytical reasoning requirement unless explicitly approved by the Department of Mathematical Sciences.

For Nonmajors:

MATH 108, 110, and 111 are designed for students in the social and behavioral sciences. Liberal arts majors are advised to take either MATH 106 or MATH 110 and 111. (MATH 105 does not fulfill the College of Arts and Sciences analytical reasoning requirement.) 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.

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 mathematics fulfill this requirement by successfully completing MATH 290.

Minor in Mathematics for Undergraduates in the School of Management

A minor requires 20 credits based on the following courses: MATH 113, 114, 213, 203, 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 done by faculty and mathematics majors and is available on a drop-in basis throughout the term with daytime and evening hours.

The Math Literacy Center

For a small fee, the Math Literacy Center offers a self-paced, noncredit tutorial program in high school algebra for those students who need to review such material. Special tutors and tutorial software are available to those enrolled in the program. Successful completion of this program makes the student eligible to enroll in either MATH 105 or MATH 108.

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 two emphases: one in computational and applied mathematics and one in actuarial mathematics.

The emphasis in computational and applied mathematics provides the student 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 metropolitan area gives the student an opportunity to gain practical experience and to secure employment after graduation. The emphasis in computational and applied mathematics also provides the necessary background for advanced graduate work, in particular for the Ph.D. in Computational Sciences and Informatics.
The actuarial mathematics emphasis prepares the student for a career as an actuary. Actuaries are highly paid certified professionals who manage, evaluate, and price risks for insurance companies, pension funds, accounting houses, financial institutions, governmental agencies, and consulting firms. The courses offered in this program cover the material included in some of the exams required for certification as an associate in the Society of Actuaries.

The standard mathematics program allows the student some flexibility in designing his or her own program of study. This must be done with the approval of the student's faculty advisor.

Assistantships/Internships
The Department of Mathematical Sciences offers a limited number of merit-based teaching assistantships to students taking at least six graduate credits each semester. Research assistantships are also available as funding permits. Graduate students also have the opportunity to work in the Math Tutoring Center and the Math Literacy Center.

Co-op and internship opportunities are available to all students. Co-ops provide qualified students with professional, paid work positions related to their interests. Co-ops are available with both private- and public-sector employers. Internships are employment situations (paid or unpaid) that help students learn more about and gain experience in their areas of interest. Frequently, internships are project oriented and part time, and last for one semester and/or summer.

Admission Requirements
In addition to fulfilling the admission requirements for graduate study, applicants must submit three letters of recommendation. Students intending to go into the actuarial mathematics emphasis must have three semesters of calculus, a course in linear algebra (equivalent to MATH 322), and a calculus-based course in probability (equivalent to MATH 351). The material in the course MATH 554 Mathematics of Compound Interest is fundamental to later courses and will be offered in the summer. Entering students should begin with this.

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. GRE exams are recommended but not required.

Degree Requirements

Emphasis in Computational and Applied Mathematics
In addition to fulfilling the degree requirements for graduate study, the candidate must complete 30 credits including the following:

1. The four core courses for this emphasis, MATH 621 Algebra I, MATH 675 Linear Analysis I, MATH 677 Ordinary Differential Equations or MATH 678 Partial Differential Equations, and MATH 685/CSI 717 Numerical Analysis.
2. Four approved graduate courses, at least two of which are listed as 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).
4. Students are required to become familiar with different computing environments and languages. This computer requirement is integrated into many courses. Students are encouraged to use the varied computing hardware and software available.

Emphasis in Actuarial Mathematics
In addition to fulfilling the degree requirements for graduate study, the candidate must complete 30 credits including the following:

1. The four core courses for this emphasis: MATH 551 Regression and Time Series, MATH 554 Mathematics of Compound Interest, MATH 555 Actuarial Mathematics I, and MATH 556 Actuarial Mathematics II.
2. Four approved graduate courses, at least two of which are actuarial 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).
4. Credit for an actuarial course may be granted if the corresponding Society of Actuaries, Casualty Actuary Society, or Enrolled Actuary exam has been passed in the preceding five years.

Standard Mathematics Program (No Emphasis)
In addition to fulfilling the degree requirements for graduate study, the candidate must complete 30 credits including the following:

1. The two core courses for this program: MATH 621 (Algebra I) and MATH 675 (Linear Analysis I).
2. Six approved graduate courses, at least four of which are listed as MATH courses. 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).

Research/Creative Component
Students are required to write a thesis or present a paper. In preparation for this work, they form a committee consisting of 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 will complete a thesis under the direction of the committee chair. The thesis work is typically completed while students are registered for six credits of MATH 799. A thesis proposal and thesis are submitted in accordance with university rules. In addition, students must give an oral thesis defense.

For the paper presentation, the student and committee agree on a paper (or series of papers, or book chapter), and the student gives an oral presentation of the paper. The chosen material must be distinct from work done in fulfillment of course requirements. Students choosing this option will take six additional credits of electives.

The format of both thesis defenses and paper presentations is as follows: The student gives an oral defense/presentation of the thesis/paper to the student's committee. (The defense/presentation is also open to the George Mason community.) Students will be expected to respond to questions on the thesis/paper and related material. The committee shall determine if the defense/presentation is satisfactory.
Modern and Classical Languages

Faculty
Professors: Aguera, Aksyonov (Robinson Professor), Elstun, Francescato, Gerdes (chair), Gilbert, Hecht, Wagner, Warner, Winkler
Associate professors: Berroa, Chamberlain, Christensen, Cordero, Goldin, LePage, Levine, Ricouart
Assistant professors: Rabin, Roman-Mendoza, Wekerle
Visiting assistant professors: Kurlat-Ares, Mothion
Visiting instructors: Klien-Samanze, Mellander, Widmayer

Course Work
This department offers all course work designated CLAS, CHIN, FREN, FRLN, GERM, LATN, RUSS, and SPAN in the "Course Descriptions" chapter of this catalog.

The following courses are offered in English (the knowledge of a foreign language is not required):

- CLAS 250, 260, 390; FREN 325, 329; GERM 301, 325; RUSS 300, 326, 327, 353, 354; SPAN 321, 322, 325, 329; and all courses designated 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 general education requirement in foreign languages for the B.A.
2. Literature courses offered by the Department of Modern and Classical Languages can be used to fulfill the general education requirement in literature for the B.A. and B.S.
3. The following courses fulfill the non-Western culture requirement for the B.A.: FREN 451, RUSS 353, RUSS 354.

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, for graduate study in languages, and for research 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 352 or 452.

Concentration in French
In addition to meeting the general requirements for the B.A., students 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. One advanced language course (FREN 350, 351, 352, 355, 357, 460, 461, or 462)
2. One course in French civilization (FREN 375 or 376)
3. One survey course in French literature (FREN 377 or 378)
4. Four courses at the 400 level or above

No more than one course (three 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 meeting the general requirements for the B.A., students must complete 30 credits in Spanish courses 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 30 credits required in the concentration must include the following:

1. Four language skill courses (SPAN 300, 301, 352, 452)
2. One course in Hispanic civilization (SPAN 461 or 466)
3. Three literature courses (SPAN 390 and two of the following: SPAN 483, 484, 485, 486)

No more than one course (three credits) conducted in English may be taken for credit for the concentration in Spanish.

Comparative Literature Emphasis
The Department of Modern and Classical Languages and the Department of English offer a B.A. with an emphasis in comparative literature. This program permits the student to combine the study of a language with cross-cultural literary study. It requires 10 courses above the 200 level, distributed as follows:

1. Two courses in a foreign literature with selected readings in the original language.
2. Two courses in English and/or American literature.
3. Three courses designated as comparative or world literature courses by the Comparative Literature Committee.
4. CL 300 Introduction to Comparative Literature.
5. One course in literary criticism: ENGL 494, ENGL 551, FREN 381, or SPAN 311, 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 (Certification)
Students interested in becoming elementary or secondary school teachers should consult the requirements for teacher licensure (certification) listed in this catalog in the "Graduate School of Education" chapter. See the secondary education advisor in the Department of Modern and Classical Languages for more information.
Minor in French, German, Russian, Spanish, or Latin

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 (nine credits):
- FREN 350 French Conversation
- FREN 351 Advanced French Grammar
- FREN 352 French Composition
- FREN 357 Introduction to Translation
- FREN 391 French for the Business World

Two of the following (six credits):
- FREN 375 French Civilization:
  - From Ancient Gaul to the French Revolution
  - From the Revolution to Contemporary France
- FREN 377 Survey of French Literature:
  - Middle Ages to 1800
  - Survey of French Literature: 1800 to Present

One French elective at the 300 level or higher (three credits)

Requirements for the Minor in German
Three of the following (nine 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

One of the following (three credits):
- Genre courses at the 300 level
- Period courses at the 400 level

One of the following (three credits):
- GERM 301 Culture and Civilization
- GERM 340 Survey of German Literature

One German elective at the 300 level or higher (three credits)

Requirements for the Minor in Russian
Three of the following (nine credits):
- RUSS 302 Russian Conversation and Composition
  - or RUSS 303 Russian Advanced Conversation
- RUSS 380 Advanced Russian I
- RUSS 381 Advanced Russian II

One of the following (three credits):
- RUSS 310 Readings in Russian Literature
- RUSS 311 Contemporary Russian Short Fiction

One of the following (three credits):
- RUSS 353 Russian Civilization
- RUSS 354 Contemporary Post-Soviet Life

One Russian elective at the 300 level or higher (three credits)

Requirements for the Minor in Spanish
The following three courses (nine credits):
- SPAN 300 Reading Skills Development
- SPAN 301 Grammar and Syntax
- SPAN 352 Spanish Composition

Two of the following (six 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 485, 486 The Literature of Spanish America I, II

One Spanish elective at the 300 level or higher (three 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.

Minor in Classical Studies

The minor is intended for students who wish to become familiar with the classical cultures and to broaden their existing 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. Six credits in classics, including CLAS 250
2. Three credits in classical history (HIST 301, 302, 303, 388 (with approval), 480)
3. Three credits in classical art history or classical philosophy, and religious studies
4. Six 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 in languages at other institutions. The program offers three concentrations: (1) French or Spanish; (2) French and Spanish; and (3) 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 grade point average (on a 4.000 scale) in the field; and submit two letters of recommendation from persons familiar with their 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 to take
the appropriate part(s) of the Graduate Record Examination. 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 of study. 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, six 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 must pass an oral comprehensive examination.

Concentration in French or Spanish
Thirty credits, including at least 18 (FREN or SPAN) with the following distribution: at least 6 credits in literature courses covering two different periods 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 (798) and thesis (799).

Concentration in French and Spanish
Forty-two credits, including 18 in each of the two languages (FREN and SPAN), with the following distribution: at least 6 credits in literature courses covering two different periods and at least 6 credits in language/linguistics courses. The remaining six credits are electives, which may be used for directed reading (798) and thesis (799).

Concentration in Spanish/ Bilingual Multicultural Education
Thirty-six credits, including 18 (SPAN) with the following distribution: at least 6 credits in literature courses covering two different periods and at least 6 credits in language/linguistics courses; 6 credits of bilingual education seminars, selected from among EDUC 517, 518, 519. The remaining 12 credits are electives, of which up to 6 may be used for directed reading (SPAN 798) and thesis (SPAN 799).

Music
Faculty
Professors: Burton (Heritage Chair in Music), Maiello, Shirk (chair), G. Smith
Associate professors: Brawley, Engebretson, Kanyan (associate chair), Miller
Assistant professors: Neill, Orman
Visiting assistant professor: Carroll
Adjuncts: Beckwith, Berkshire-Brown, Casagrande, Hearden, Holmes, Little, Maley, Mann, McCarthy, Otwell, Rendler, Schultz

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.
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.
Joseph M. Kanyan, Associate Professor. B.S., Indiana University of Pennsylvania; M.M., D.M.A., The Catholic University of America; principal clarinetist, McLean (Va.) Orchestra; former clarinetist, U.S. Army Band of Washington, D.C.
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, Adjunct 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.
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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.
Guitar (Classical). Jeffrey Meyerrieck, Adjunct Associate Professor. B.M., North Carolina School of the Arts; former student of Andres Segovia; attended the Academia Musica Chigiana (Siena, Italy); first American prize winner in the Palestrina International Guitar Competition (1978); concert tours in the United States, Europe, South America, and the Caribbean; former guitarist, U.S. Navy Band of Washington, D.C.
Larry Snitzler, Adjunct Professor. Former student of Andres Segovia (guitar) and Nadia Boulanger (theory); international concert tours; former freelance music producer, National Public Radio.
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; principal hornist, National Symphony Orchestra.

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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 Kii (Koto School).

Oboe. Lorrie Berksire, Adjunct Assistant Professor. B.M., Arizona State University; M.M., Manhattan School of Music; oboist, U.S. Army Band of Washington, D.C.; substitute oboist, New York Philharmonic Orchestra.

Ada Saunders, Adjunct Assistant Professor. B.M., Cleveland Institute of Music; J.D., George Mason University; soloist and principal oboist, U.S. Army Band of Washington, D.C.; former member, Kennedy Center Opera House Orchestra, National Gallery Orchestra, and Filene Center (Wolf Trap) Orchestra.

Joseph D. Shirk, Professor of Music. B.S.M.E., University of Illinois; M.M., New England Conservatory; D.M.A., University of Missouri-Kansas City Conservatory of Music; former oboist, Kansas City Chamber Orchestra.

Organ. Celia Amstutz, Adjunct Assistant Professor. B.A., Oberlin Conservatory; M.M., University of Maryland; D.M.A., Peabody Conservatory; recitalist; Director of Music, Fairfax United Methodist Church; Spivey International Competition winner.

Percussion. Kenneth Harbison, Adjunct Associate Professor. B.M., Eastman School; M.M., The Catholic University of America; assistant principal percussionist, National Symphony Orchestra.

Piano. 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.

Edward Newman, Adjunct Associate Professor. B.M.M., Juilliard School of Music; international concert artist.

Margaret Otwell, Adjunct Assistant Professor. B.M., The Catholic University of America; M.M., D.M.A., University of Maryland; concert/recording artist, chamber musician; director, Chamber Artists of Washington.

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.


George Vance, Adjunct Associate Professor. B.A., Arizona State University; M.F.A., Carnegie-Mellon University; director, The Bass Project; former bassist, Birmingham Symphony and U.S. Army Field Band, 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; trumpeter, National Symphony Orchestra.

Tuba. Roger Behrend (see listing under Euphonium).

Michael Murray Bunn, Adjunct Assistant Professor. B.M., M.M., Peabody Conservatory; tubist, Kennedy Center Opera House Orchestra, Filene Center (Wolf Trap) Orchestra, and National Gallery Orchestra.

Viola. Steven Day, Adjunct Assistant Professor. B.M., Brigham Young University; enlisted leader and principal violist, United States Army Strings.

Ramon Scavelli, Adjunct Associate Professor. Philadelphia Musical Academy; violist, National Symphony Orchestra.

Viola Da Gamba. Kenneth Slowik, Adjunct Associate Professor. B.M., M.M., Roosevelt University; principal viola da gambist and cellist, Smithsonian String Quartet, Smithsonian Chamber Orchestra, and Smithsonian Chamber Players.

Violin. Peter Haase, Adjunct Associate Professor. M.M., State Conservatory of Music, Katowice, Poland; postgraduate studies, Moscow Conservatory and The Juilliard School; violinist, National Symphony Orchestra.

Pavel Pekarsky, Adjunct Associate Professor. Moscow Conservatory; Mannes College of Music; Artist Diploma, Indiana University; violinist, National Symphony Orchestra.

Voice. Stanley Engebretson (see listing under Conducting).

Kathryn Hearden, Adjunct Professor. B.M., St. Norbert College; M.M., Performers Certificate, D.M.A., Eastman School of Music; nationally known soloist and concert artist with opera companies and orchestras.

Laura Mann, Adjunct Associate Professor. B.M., M.M., Eastman School of Music; D.M.A., University of Maryland; international opera, concert, and recording artist with European and North American opera companies and orchestras.

Patricia Miller, Associate Professor. B.M., Boston University; M.M., New England Conservatory; Artist Diploma, Accademia di Santa Cecilia (Rome); international opera, concert, and recording artist with North American, South American, and European opera companies and orchestras.

Steven Rainbolt, Adjunct Assistant Professor. B.M., Millikin University; M.A., University of Iowa; Artist Diploma, Peabody Conservatory; opera and concert artist with North American opera companies and orchestras.

Anastasios Vrenios, Adjunct Associate Professor. B.M., University of the Pacific; M.M., Indiana University; soloist and recording artist, U.S. and European orchestras and opera companies.

Course Work

This department offers all course work designated MUSI in the “Course Descriptions” chapter of this catalog.

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UNDERGRADUATE PROGRAMS

The two undergraduate degree programs offered through the Department of Music—the Bachelor of Arts in Music and the Bachelor of Music—prepare students for graduate work in music and music literature, for research and professional 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. It also seeks to educate our 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 nonmusic 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). The test must be passed to continue in MUSI 115.

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 (includes keyboard harmony).

Music, B.A.

In addition to the general requirements for the B.A., music majors must complete a minimum of 44-45 credits in music. A total of 120 credits is required for the B.A. in Music.

Required Courses ........................................ 44-45

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Theory I, II, III</td>
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<tr>
<td>Form and Analysis</td>
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<tr>
<td>Sight Singing and Ear Training I, II</td>
<td>4</td>
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<tr>
<td>Keyboard Skills I, II, III</td>
<td>3</td>
</tr>
<tr>
<td>Music Literature in History I, II</td>
<td>6</td>
</tr>
</tbody>
</table>

Major Instrument or Voice

(Private Music Instruction) ............... 8
2Ensemble .................................. 4
The Art of Teaching Music .................. 3
Pedagogy ................................... 2-3
Teaching Internship ....................... 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 III or earn credit-by-examination by successfully passing the appropriate competency placement examination.

Students whose major instrument is voice must earn four credits in University Chorale, Symphonic Chorus, and/or Chamber Singers. Students whose major instrument is an orchestral string instrument must earn four credits in Symphony Orchestra, and students whose major instrument is a wind or percussion instrument must earn four credits in Symphony Orchestra, Symphonic Band, and/or Wind Ensemble. Students whose major instrument is the piano, harpsichord, organ, or guitar must earn four 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.

Music, B.M.

A total of 120 credits is required for the Bachelor of Music degree. To earn the B.M., a music concentration must be selected from performance or music education. Admission to the concentration normally occurs at the end of the sophomore year.

Concentration in Performance

General Education ..................................... 30

(At least 30 credits must be earned in General Education.)

ENGL 101 and 302 ............................... 6
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, 101, 302 fulfill degree requirements.

Arts .................................................. 6
The six credits must be in two of the following areas: ARIN, ARTH or ARTS, communication, dance, film (ENGL 332), foreign language, literature, theater.

Social sciences ................................... 6
1Must include at least one non-Western course.
Courses to be chosen from anthropology, economics, geography (except GEOG 102 and 309), government, history, psychology, sociology.

Natural science .................................. 3
Chosen from astronomy, biology, chemistry, GEOG 102, GEOG 309, geology, physics, UNIV 301.

Mathematics, Logic ............................. 3
(PHIL 173, 376), STAT 250, or DESC 200 (except MATH 105, 271, 272)

Foreign Language or Nonmusic Electives .... 6

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3 Students in the voice emphasis must earn nine credits in foreign language.


<table>
<thead>
<tr>
<th>Musicianship Courses</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Theory I, II, III</td>
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<tr>
<td>Form and Analysis</td>
<td>3</td>
</tr>
<tr>
<td>Sight Singing and Ear Training I, II</td>
<td>4</td>
</tr>
<tr>
<td>Keyboard Skills I, II, III</td>
<td>3</td>
</tr>
<tr>
<td>Non-Western Music Course or ARIN 308</td>
<td>3</td>
</tr>
<tr>
<td>Music Literature in History I, II</td>
<td>6</td>
</tr>
<tr>
<td>Music History Elective (MUSI 492H)</td>
<td>3</td>
</tr>
<tr>
<td>Class Composition and Arranging</td>
<td>5</td>
</tr>
<tr>
<td>Music in Computer Technology</td>
<td>3</td>
</tr>
<tr>
<td>Conducting I</td>
<td>2</td>
</tr>
<tr>
<td>Major Instrument or Voice (Private Music Instruction)</td>
<td>20</td>
</tr>
<tr>
<td>Junior Recital</td>
<td>1</td>
</tr>
<tr>
<td>Senior Recital</td>
<td>1</td>
</tr>
<tr>
<td>Improvisation</td>
<td>1</td>
</tr>
<tr>
<td>Ensembles</td>
<td>8</td>
</tr>
</tbody>
</table>

5 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 competence placement examination.

6 Survey of World Music, or American Indian Music as Derived in Dance and Culture

7 Students whose major instrument is voice must earn eight credits in University Chorale, Symphonic Chorus, and/or Chamber Singers. Students whose major instrument is an orchestral string instrument must earn eight credits in Symphony Orchestra, and students whose major instrument is a wind or percussion instrument must earn eight credits in Symphony Orchestra, Symphonic Band, and/or Wind Ensemble. Students whose major instrument is the piano, harpsichord, organ, or guitar must earn at least four 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.

Emphases and Teaching Sequences .......... 15

(Wind/Strings/Percussion Emphasis and Teaching Sequence)

| Orchestration | 3 |
| Conducting II | 2 |
| The Art of Teaching Music | 3 |
| Instrumental Pedagogy and Literature | 3 |
| Teaching Internship | 4 |

Free Electives .......... 5

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:

1. 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. the following have been completed with a grade of C or better: Sight Singing and Ear Training II, Keyboard Skills III, and Theory III; and
   c. acceptable scores have been earned on the Praxis I (Reading, Writing, Mathematics) tests. 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.

2. 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.

3. Earn no grade lower than a C in music and in professional education courses needed for graduation.

4. Successfully pass sight-singing and keyboard proficiency examinations during the first music methods course (MUSI 461, 463, 464, or 466). Students in the vocal/choral specialization must also pass a voice proficiency examination, and students in the instrumental specialization must pass a musical instrument fingering proficiency examination during the first music methods course.

5. Complete all course work in the program sequence.

6. 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.

7. Pass the Praxis II (Music) test during the internship semester (student teaching).
General Education .................................. 30
(At least 30 credits must be earned in General Education.)

ENGL 101 and 302 ........................................ 6
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, 101, 302 fulfill degree requirements.

Literature ................................................. 3
Any course in literature at the 200 level in English, the 300 level or above in foreign languages, or PHIL 253.

Arts ....................................................... 6
The six credits must be in two of the following areas: ARIN, art history or art studio, communication, dance, film (ENGL 332), foreign language, theater.

American culture ...................................... 3

Social science (non-Western course) .................. 3

Natural science ........................................... 3
Chosen from astronomy, biology, chemistry, GEOG 102, GEOG 309, geology, physics, UNIV 301

Mathematics, logic ..................................... 3
(PHIL 173, 376), STAT 250, or DESC 200 (except MATH 105, 271, 272)

Dance activity ........................................... 3

Students in the vocal/choral specialization must choose one foreign language course and earn at least two credits in the following theater courses: THR 200, 201, 203, 230.

ARTH 372, 373, 374; HIST 121, 122; MUSI 105; STAM 303, 304, 310, 320, 330, 401


Musicianship Courses ................................. 59

Theory I, II, III ......................................... 9
Form and Analysis ...................................... 3
Sight Singing and Ear Training I, II .................. 4
Keyboard Skills I, II, III ............................... 3
Non-Western music course or ARIN 308 ........... 3
Music Literature in History I, II .................... 6
Music history elective (MUSI 492H) ................ 3
Class Composition and Arranging ................. 3
Music in Computer Technology ................... 3
Conducting I, II ....................................... 4
Major instrument or voice ......................... 12
(private music instruction)
Music education recital .............................. 0
Ensembles .............................................. 6

Students desiring to concentrate in music education must successfully pass sight-singing and keyboard proficiency examinations during their first music methods course (MUSI 461, 463, 464, or 466). Students in the vocal/choral specialization must also pass a voice proficiency examination during their first music methods course, and students in the instrumental specialization must pass a musical instrument fingering proficiency examination.

10 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.

11 Survey of World Music, or American Indian Music as Derived in Dance and Culture.

12 Students in the instrumental specialization whose major instrument is something other than a band or orchestral instrument must earn a minimum of six additional credits of undergraduate private music instruction (or the equivalent) on such an instrument, the actual number to be determined by an audition committee.

13 Students whose major instrument is voice, piano, harpsichord, organ, or guitar must earn six credits in University Chorale, Symphonic Chorus, and/or Chamber Singers. Students whose major instrument is an orchestral string instrument must earn six credits in Symphony Orchestra, and students whose major instrument is a wind or percussion instrument must earn six credits in Symphony Orchestra, Symphonic Band, and/or Wind Ensemble. For students in the instrumental specialization whose major instrument is something other than a band or orchestral instrument, four of the six required ensemble credits must be earned in Symphony Orchestra, Symphonic Band, and/or Wind Ensemble. For students in the vocal/choral specialization whose major instrument is a band or orchestral instrument, four of the six 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 .................................. 31
(One of the following must be chosen)

Instrumental Teaching Sequence
The Art of Teaching Music ............................. 3
Music Administration and Management ............ 2
Secondary instruments ................................ 8
Class Strings: Violin/Viola
Class Strings: Cello/String Bass
Class Woodwinds: Flute/Clarinet
Class Woodwinds: Oboe/Bassoon
Class Brass
Class Percussion
Class Guitar
Class Voice

Instrumental Music Methods I, II ...................... 6
Human Growth and Development .................... 3
(EDUC 302) or Psychological Foundations of Adolescent Learning and Development (EDUC 539)
Educationally Diverse Populations: Handicapped, Gifted, Multicultural .................. 3
(EDUC 301) or Pluralism and Exceptionality in U.S. Education (EDUC 529)
Internship in music education (student teaching) .. 6

Students whose major instrument is an orchestral string instrument may substitute Instrumental Pedagogy and Literature for Instrumental Music Methods I.
Vocal/Choral Specialization Teaching Sequence

The Art of Teaching Music ........................................... 3
Music Administration and Management ...................... 2
1 X Secondary instruments ...................................... 6
Vocal Pedagogy and Diction ....................................... 2
The Teaching of General Music in the Elementary and Middle School ........................................... 3
The Teaching of Vocal Music in the Secondary School ..... 3
Human Growth and Development ............................... 3
(EDUC 302) or Psychological Foundations of Adolescent Learning and Development (EDUC 539)
Educationally Diverse Populations:
Handicapped, Gifted, Multicultural ............................. 3
(EDUC 301) or Pluralism and Exceptionality in U.S. Education (EDUC 529)
Internship in music education (student teaching) .......... 6

In addition, students whose major instrument is voice must take Class Guitar (1 credit) and earn 2 credits in UPMI-Functional Piano; if major instrument is piano, Class Guitar (1 credit) and 2 credits in UPMI-Voice; if major instrument is guitar, 2 credits in UPMI-Voice and 1 credit in UPMI-Functional Piano.

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 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.

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, or 492H. Students who transfer all three of these courses into George Mason must take MUSI 492H (a variable-topic course) at George Mason to fulfill the writing-intensive requirement.

◆ Minor in Music
All music minors must pass a music audition. Music minors in the keyboard area use the Keyboard Skills 1 credit as a music elective.

<table>
<thead>
<tr>
<th>Total Required</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Music Appreciation</td>
<td>3</td>
</tr>
<tr>
<td>Keyboard Skills I</td>
<td>1</td>
</tr>
<tr>
<td>Theory I and II</td>
<td>6</td>
</tr>
<tr>
<td>Sight Singing and Ear Training I</td>
<td>2</td>
</tr>
<tr>
<td>Undergraduate private music instruction (major instrument or voice)</td>
<td>6</td>
</tr>
<tr>
<td>Ensembles</td>
<td>3</td>
</tr>
</tbody>
</table>

GRADUATE PROGRAM

Music, M.A.
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 Arts in 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.A. with an emphasis in music education does not provide licensure to teach music in the public/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 this university.

The following concentration admission requirements must also be met:

Performance (single or multiple instruments): Audition
Conducting: Audition
Composition: Submission of a portfolio of compositions
Music education: Submission of a paper on the applicant's philosophy of music education and professional goals

Diagnostic Entrance Examination
All entering graduate students are required to take a diagnostic entrance examination in music history and theory for advising purposes. The examination is offered during a three-hour period around the first day of classes of the fall and spring semesters.

Comprehensive Exit Examination
All students completing the M.A. 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, three nonmusic graduate credits may be taken.
The student must satisfy the following requirements:

**General Requirements** ........................................... 11
- Introduction to Research in Music ................................ 3
- Analytical Techniques ............................................. 3
- Advanced Topics in Music History and Literature ............ 3
- Ensemble .............................................................. 2

**Additional Requirements for the Concentration in Performance—Single Instrument** .................... 19
- Graduate Private Music Instruction—Instrumental/Vocal ... 9
- Advanced Orchestration ........................................... 3
- Advanced Topics in Music History and Literature .......... 3
- Graduate Recital ................................................... 1
- Electives ............................................................. 3

**Additional Requirements for the Concentration in Performance—Multiple Instruments** ............ 19
- Graduate Private Music Instruction—Major Instrument ... 4
- Graduate Private Music Instruction—Secondary Instrument #1 4
- Graduate Private Music Instruction—Secondary Instrument #2 4
- Instrumental Pedagogy and Literature ......................... 3
- Graduate Recital—Multiple Instruments ........................ 1
- Electives ............................................................. 3

**Additional Requirements for the Concentration in Music Education** ................................. 19
- Psychology of Music Teaching and Learning ................... 3
- Aesthetics of Music Education ................................... 3
- Thesis ...................................................................... 6
- or Orff Schulwerk Certification .................................. 9
- Electives ................................................................. 4-7

**Additional Requirements for the Concentration in Composition** ....................................... 19
- Graduate Private Music Instruction—Composition .......... 9
- Advanced Orchestration ........................................... 3
- Advanced Topics in Music History and Literature .......... 3
- Graduate Recital ....................................................... 1
- Electives ................................................................. 3

**Additional Requirements for the Concentration in Conducting** ............................................ 19
- Graduate Private Music Instruction—Conducting ............ 6
- Advanced Topics in Conducting .................................. 3
- Advanced Orchestration ........................................... 3
- Graduate Recital ....................................................... 1
- Electives ................................................................. 6

The number of students accepted in the graduate conducting concentration is limited by the extent to which it is possible to provide students with practical experience in conducting. In most cases, each student accepted is offered an opportunity to gain conducting experience by serving as assistant conductor of a George Mason University ensemble.

**Philosophy and Religious Studies**

**Faculty**
- **Professor:** Bergoffen
- **Associate professors:** Burns, De Nys, Fletcher, Froman (chair), Holman, McDermott, Nguyen, Paden, Ro, Rothbart, S.M. Skougaard, Yance (associate professor emeritus)
- **Assistant professors:** Cherubin, Gopin, Kinnaman, Shiner
- **Adjuncts:** Caudill, D. Gregory, M. Gregory, Oberoi, San Juan, S.A. Skougaard, Sojka, Steenhuisen

**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 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; emphasize philosophy in acquiring a broad liberal arts education; prepare for certain professions, such as law, the ministry, or government service; or complement other interests by taking a double major in philosophy and a related field of study.

The department offers a traditional philosophy major and a specially designed religious studies track within the philosophy major. Both programs lead to a B.A. in Philosophy.

- **Traditional Philosophy Major**
In addition to the general requirements for the bachelor of arts, philosophy majors must complete at least 33 credits in philosophy (with grades of C or better). At least 21 credits must be courses at the 300 level or above, including 6 credits at the 400 level or above. These credits must be distributed as follows:

1. All majors must take the following:
   - PHIL 173 Introduction to Logic
   - or PHIL 376 Symbolic Logic
   - PHIL 301 History of Western Philosophy: Ancient
   - PHIL 303 History of Western Philosophy: Modern

2. All majors take a minimum of three credits each from Category A and Category B:
   - **Category A: The Analytic Tradition**
     - PHIL 332 20th-Century Analytic Philosophy
     - PHIL 355 Contemporary Ethical Theory
     - PHIL 371 Philosophy of Natural Sciences
     - PHIL 373 Theory of Knowledge
     - PHIL 374 Philosophy of Mind
     - PHIL 520 Current Issues in Philosophy of Science
     - PHIL 573 Current Issues in Theory of Knowledge
     - PHIL 574 Current Issues in Philosophy of Psychology

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Category B: The Continental Tradition
PHIL 325 Karl Marx's Social and Political Thought
PHIL 335 19th-Century Philosophy
PHIL 336 Contemporary Continental Thought: Existentialism
PHIL 337 20th-Century Continental Thought: Phenomenology
PHIL 340 Hermeneutic Philosophy
PHIL 531 Freud and Philosophy

When the subject matter is appropriate, and at the discretion of the professor, PHIL 391, 392, 421, 422, 423, 424, 425, or 426 may count as Category A or Category B courses.

3. Majors may apply no more than three credits from the following toward the major. (No credits from this list are required for the major.)

Category C: Ethics
PHIL 305 Business Ethics
PHIL 306 Criminal Justice Ethics
PHIL 309 Medical and Human Values
PHIL 510 Seminar in Ethics of Health Care
PHIL 555 Environmental Ethics

For students who plan to pursue graduate studies in philosophy, the following courses are recommended:

- A course in ethics or social and political philosophy
- PHIL 375 Metaphysics
- PHIL 374 Philosophy of Mind or PHIL 373 Theory of Knowledge
- PHIL 332 20th-Century Analytic Philosophy
- PHIL 336, 337 Contemporary Continental Thought (Existentialism and Phenomenology)
- PHIL 335 19th-Century Philosophy
- PHIL 357 Philosophy of the Social Sciences

Track in Religious Studies
This program offers students the opportunity to reflect on reciprocal relations, past and present, between philosophy and religion, and to approach contemporary questions and issues in religion, both substantive and methodological, through philosophical ideas pertinent to them. Students who plan to pursue a program in philosophy and religious studies must complete at least 33 credits in philosophy and religious studies.

All students pursuing this track must take the following:

PHIL 173 Introduction to Logic or PHIL 376 Symbolic Logic
PHIL 301 History of Western Philosophy: Ancient
PHIL 303 History of Western Philosophy: Modern
PHIL 313 Philosophy of Religion
RELI 420-423 Seminar in Religious Studies or RELI 490 Comparative Study of Religions

Students must also submit a minimum of 12 credits from among the following courses (at least three credits must be in an Eastern tradition and at least three credits must be in a Western tradition):

- RELI 313 Hindu Religion and Philosophy
- RELI 314 Chinese Philosophies and Religious Traditions
- RELI 315 The Buddhist Tradition
- RELI 337 Mysticism: East and West
- RELI 352 Judaism between the Old and New Testaments
- RELI 370 Judaism: Life and Thought
- RELI 371 History of Western Christian Thought I
- RELI 372 History of Western Christian Thought II
- RELI 374 Islamic Thought
- RELI 376/377 Special Topics in Religious Thought

Students must take six additional credits in religious studies or philosophy.

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. Traditional philosophy majors may fulfill this requirement by successfully completing PHIL 421 or 425. Students in the religious studies track of the philosophy major may fulfill this requirement by successfully completing RELI 490.

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 taken at the upper level. Three credits must be taken from RELI 100 The Human Religious Experience, RELI 211 Religions of the Near East, or RELI 212 Religions of the Orient.

Minor in Philosophy
The minor in philosophy introduces students to the major traditions and issues that define philosophical thought. The minor also permits students the flexibility to pursue individual interests. A grade of C or better is required for the course to count toward the minor. The minor consists of 18 credits distributed as follows:

1. PHIL 173 Introduction to Logic or PHIL 376 Symbolic Logic (three credits)
2. Any course at the 100 level or above, excluding PHIL 105 Critical Reasoning (three credits)
3. PHIL 301 History of Western Philosophy: Ancient (three credits)
4. One course from the following (three credits): PHIL 302 History of Philosophy: Medieval PHIL 303 History of Philosophy: Modern PHIL 335 19th-Century Philosophy
5. Any course at the 300 level or above (three credits)
6. Any course at the 400 level or above (three credits)

(No single course can be used to fulfill two or more requirements above.)
GRADUATE PROGRAM

Track in Liberal Studies, M.A.I.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. It 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 for 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 grade point average of 3.000, three letters of reference, and an essay detailing interest in the 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.

Prospective students are encouraged to contact Young-Chan Ro, liberal studies coordinator, (703) 993-1292.

Degree Requirements
Students must complete 30 credits and take a comprehensive essay/exam. In consultation with an advisor, students select 12 credits of core courses and 6 credits in philosophy and/or religious studies. They take an additional 12 credits in a liberal studies emphasis of their choice. Examples of possible emphases are listed below. Students may complete all 30 credits through course work or may combine course work with either a 3-credit project or a 6-credit project.

• 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
Assistant professors: Gluckman, McIntyre, So
Visiting assistant professors: Kowalski, Oerter
Visiting instructor: Ewell

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

Physics, B.S.
In addition to the general requirements for the B.S., candidates must complete a total of 45 credits in the major and 20 in mathematics, divided as follows:

1. Required (21 credits): PHYS 160, 260, 261, 262, 263, 305, 308, and 407 (Engineering-physics double majors may substitute PHYS 305 for PHYS 308 and ECE 333, 334 for 407.)
2. Twelve credits chosen from PHYS 251, 303, 306, 307, 402, 408 or 409, 416, and ASTR 328 or 428
3. Twelve credits chosen from PHYS 121, 122, 123, 124, CS 112, or any approved upper-level physics, astronomy, chemistry, electrical engineering, or mathematics courses
4. Required (20 credits): MATH 113, 114, 203, 213, 214, and 313 or 413 or STAT 344

The requirements for the B.S. in Physics prepare students for graduate school or for one of the many careers in business or industry in which physics graduates are employed. In meeting the requirement for 12 credits outside the core, students have the option of electing an area of emphasis. The courses required for each emphasis are listed below. Students who wish to complete an emphasis should plan a program of study in consultation with their advisor.

Emphasis in Graduate School Preparatory
Although any of the options listed here provide the successful student with a fully adequate background to enter graduate school, this emphasis is for the student whose career goals definitely include graduate work in physics. To complete this emphasis, the student should take at least nine credits from the following courses: PHYS 510, 512, 540, and ASTR 530. In addition, the student should complete a senior project (PHYS 408) in the specialty that he or she intends to pursue in graduate school.

Emphasis in Computational Physics
This emphasis is for the student who wishes to pursue a career that applies computers to the solution of physical problems and data analysis. To complete this emphasis, the student should take at least nine credits from the following courses: PHYS 510, ECE 442, MATH 446 and 447. In addition, the student should complete a senior project (PHYS 408) on a problem that involves the use of the computer for the solution of a physical problem.

Emphasis in Astrophysics
This emphasis is for the student who is planning to attend graduate school in astrophysics or pursue a career in industry. To complete this emphasis, the student should select four courses from the following: PHYS 428, ASTR 328, 530, 532, 535, and MATH 446. In addition, the student should complete a senior project (PHYS 408) on an astrophysics problem.

Emphasis in Electronics
This emphasis is for the student who wishes to pursue a career in industry applying a strong background in electronics to physical problems. To complete this emphasis, the student should take at least nine credits from the following courses: ECE 301, 333, 430, 431, and 433. In addition, the student should complete a senior project (PHYS 408) on an electronics problem.

http://catalog.gmu.edu
Emphasis in Applied Solid State Physics
This emphasis is for the student who wishes to pursue a career in the semiconductor industry. To complete this emphasis, the student 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) 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.

Teacher Licensure (Certification)
Students who want to become elementary or secondary school teachers should consult the sections on licensure (certification) found in the catalog in the “Graduate School of Education” chapter. Those planning to become secondary school teachers should consult with the secondary education advisor in their departments.

◆ 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 111, 112, 113, 114; PHYS 416; and two astronomy courses chosen from ASTR 228, 328, 428, and 530.

Premedical, Predental, and Preveterinary Students
Students planning to enter medical, dental, or veterinary schools may choose to major in physics. Such students should consult with the premedical advisor for physics. Requirements for admission to schools in the health sciences vary, but one year of biology and organic chemistry (CHEM 313, 314, 315, and 318 or 320) is required in addition to a B.S. in Physics.

Honors Students
The general education requirements for the B.S. may be satisfied by the successful completion of the Honors Program in General Education. See the Honors Program section of this chapter and see the Honors office for sample schedules for majors in physics.

Physics for Majors
Students who intend to major in physics should take the physics introductory sequence (PHYS 160, 260, 261 or 265, 262, 263). However, 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. Such students are required to take at least four 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 106 and 107 are also recommended for biology majors. 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 pursue a bachelor of science degree. Students may receive credit for only one of the following three sequences: 243, 244, 245, 246; or 103, 104; or 160, 260, 261, 262, 263.

GRADUATE PROGRAM

Applied and Engineering Physics, M.S.
The Master of Science 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 fraction 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 three-credit research project or an optional six-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 recipient may wish to 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. For both emphases within the program, a nine-credit core consisting of PHYS 510, 513, and 732 or 736.
2. 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.
3. For the engineering physics emphasis, PHYS 533 and any six credits in electrical engineering (ECE) courses.
4. Electives amounting to 12 credits may be chosen from courses in physics, chemistry, mathematics, engineering, information technology, and computational sciences and informatics. However, no more than six credits may be chosen from areas outside PHYS, ASTR, CSI, and ECE. No more than six credits of PHYS 799 may be applied to satisfy degree requirements.
5. Credit may be received for either ECE/PHYS 798 Research Project (three credits) or ECE/PHYS 799 Master’s Thesis (six credits), but not both. The research project may be performed 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.

Areas of concentration in computational physics and in space sciences and computational astrophysics exist as part of the doctoral program in computational sciences and informatics (see the “Institute for Computational Sciences and Informatics” chapter for degree and admission requirements).

Psychology

Faculty
Professors: Barocas (director of clinical training), Boehm-Davis, Denham, Klimoski (director of the Applied Experimental Program and the Center for Behavioral and Cognitive Studies), Lehman, Maddux (associate chair for graduate studies), Mandes (director of academic affairs, Institute of the Arts), Pasnak, Riskind, Schiff, R. Smith (chair), Tangey, Tyer (associate dean), Wahl
Visiting professor: Fedio
Research professors: Butler, Olds
Associate professors: Allen, Blaha, Buffardi, Erdwins, Flinn, Gerton, Gessner, Gray, Holt, Katz, Merydith, Moretz, Rugel, Sanford (associate chair for undergraduate studies), Short, Zaccaro
Research associate professors: Emory, Ikomi, Mahach
Assistant professors: Cortina, Schunn, Winsler
Visiting assistant professors: Chrostv, Hurley, Littleton, Wanschura
Affiliates: Claiborn, DeMulder, Eby, Hunt, Kurke, Trafton, Vekker, Weisman, Wiggs


More information about the department, its faculty, and its programs can be found at its website 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 general requirements for a B.A., students must complete 36 credits of course work in psychology, 24 of which must have been at the 300 and 400 levels. These credits must include PSYC 100, 211, 231, 300, 305, 325, 372, and 465. It is strongly recommended that students fulfill the natural science requirement by completing BIOL 103 and 104 (these courses are prerequisites to PSYC 372) and the analytical reasoning requirement by completing a mathematics course (PSYC 300 has a math prerequisite).

Psychology, B.S.
In addition to the general requirements for a B.S., candidates must complete the following:
1. Thirty-eight credits of psychology (24 of which must be upper level), including PSYC 100, 211, 231, 300, 305, 325, 372, and 465; and one of the following: 304, 309, 323, or 373.
2. BIOL 103 and 104, plus six additional credits of natural science from ASTR, BIOL, CHEM, GEOI, PHYS, GEOG 102 and 309, and UNIV 301.
4. CS 103.
5. Twelve 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.
6. ENGL 101, 302, and either ENGL 410 or a third laboratory course in psychology selected from PSYC 304, 309, 323, and 373.
7. Six credits of literature.

Information for All Majors in Psychology
A grade of D in any of the eight (nine for B.S. students) required psychology courses may not be used toward graduation. Students intending to major in psychology should note that a grade of C or better in PSYC 300 is a prerequisite to required 300-level laboratory courses and that a grade of C or better in PSYC 305 is a prerequisite to PSYC 465.

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:
1. A maximum of six credits may be counted from PSYC 327, 328, 421, 422, 548, and 549.
2. A maximum of six credits may be counted from PSYC 260, 350, and 460.
3. No more than nine 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.

Honors Program
Beginning spring semester of the year 2000, the Psychology Department will implement an honors program for selected students. The program will consist of a three-course sequence, PSYC 490, 491, and 492 (see "Course Descriptions" chapter of this catalog), to be taken during the spring semester of the students' junior year and fall and spring semesters of the students' senior year. For more information, please contact the Undergraduate Psychology Office after Oct. 1, 1999.

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 304, 305, 309, or 323.

Teacher Licensure (Certification)
Students who want to become elementary or secondary school teachers should consult the sections on licensure (certification) found in this catalog in the "Graduate School of Education" chapter. Those planning to become secondary school teachers should consult with the secondary education advisor in the department.

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.

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 experimental neuropsychology concentration emphasizes training in the neurobiological bases of behavior. Students are prepared for doctoral work or employment in government or industry research laboratories.

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. Generally, an overall GPA of 3.00 for the last 60 undergraduate credits, a minimum of 3.250 in undergraduate psychology courses, and combined GRE scores of 1,000 or above are required. Work experience, publications, or special recommendations may compensate for deficiencies in other qualifications. The deadline for receipt of all application materials is March 15. 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, or employment.

Concentration in Industrial/Organizational Psychology
Students must complete 32 graduate credits including the following:

- Three credits of core: PSYC 701, 703, or 667
- Eight credits of quantitative and research methods: PSYC 611, 612
- Twelve 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: six credits of practicum requires permission of advisor)
- Thesis (optional: six credits of thesis requires permission of chair)
- Electives: No more than six credits of advisor-approved electives from outside the department.
Concentration in Human Factors/Applied Cognition
Students must complete 32 graduate credits including the following:
- Three credits of core: PSYC 701
- Eight credits of quantitative and research methods: PSYC 611, 612
- Six credits of specialized content: PSYC 530, 645
- Nine credits of PSYC 734, 766, 768, or 737 (these may be repeated)
- Practicum (optional: six credits of practicum requires permission of advisor)
- Thesis (optional: six 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
Students must complete specific course requirements as listed in the school psychology brochure, which is available from the Graduate Psychology Office. Students must pass core courses with a grade of B or better. These courses must be passed before the internship and the awarding of the master's degree. School psychology students are required to enroll full time.

A one-credit practicum during the first year and a three-credit practicum during the second year are required at the Psychological Clinic of the university. Students must be screened and approved by the department before they may conduct testing in the Psychological Clinic.

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:
- Six credits of core: from cognitive (701, 766, 768), biological (702, 558, 559), or social (703, 667 or 668)
- Eight credits of quantitative methods: PSYC 611, 612
- Nine credits of specialized content: from 592, 666, 669, 704, or 780
- Nine credits of electives
- Six credits of practicum or thesis optional (practica contingent on availability; thesis only with permission of chair)

Concentration in Experimental Neuropsychology
Students must complete 32 graduate credits including the following:
- Eight credits of quantitative methods: PSYC 611, 612
- Six credits of specialized content: 558, 559
- Three credits of methods or statistics: 646, 652, 693, 754, 755, or 756
- Nine credits of electives to be selected from relevant courses including the following:
  - PSYC 531 Mammalian Neurobiology
  - 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
- Six credits of practicum or thesis: 792, 798, 799 (unlike other concentrations, practicum or thesis is required)

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 to be used 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 Status Students
Students may be admitted to provisional status and must take 12 credits in psychology before applying for degree status. A minimum GPA of 3.250 must be earned in those courses. The GPA is a major (but not sole) factor in determining acceptance to the degree program. 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, and developmental psychology.

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 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. The primary goal is to train students to teach and do research on basic processes and problems of development, and for employment in such settings as universities and teaching hospitals. Another goal is to train students to do applied work in developmental psychology (i.e., assessment and evaluation in schools and health care settings). Students accepted in this concentration are required to complete all the courses in the school psychology concentration of the M.A. program. The program emphasizes infant, child, and adolescent development, and students may focus on cognitive, social/emotional, or physiological aspects of development.
Admission

Criteria
Entering students are accepted only for fall semesters. The deadline for receipt of all application materials is Jan. 15. Space in the program is normally limited to 24 new students each year—10 in industrial/organizational and human factors/applied cognition; 10 in clinical; and 4 in developmental. The department does not normally consider applications that fail to meet the minimum criteria of 3,000 undergraduate GPA, 3.250 in psychology course work, and combined GRE scores of 1100. Applicants who meet this minimum receive continued consideration for the final candidate pool on the basis of experience, letters of recommendation, objective test scores, and an interview. No specific set of qualifications guarantees admission.

Documents
Each applicant must provide the graduate program with the following materials by Jan. 15 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 capabilities and/or work experience.
6. A two- to three-page typewritten personal statement describing professional goals, past training history, and reasons for seeking the Ph.D.
7. Graduate Record Examination (GRE) taken within the last five years and before the Jan. 15 deadline (applicants should take the GRE by October because applications 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, publications, or professional reports.
9. Applicants in the final candidate pool are required to participate in an interview.

All materials should be sent directly to the Graduate Admissions Processing Center, College of Arts and Sciences, George Mason University, Fairfax, VA 22030-4444. Applicants are responsible for ensuring that all materials arrive before the Jan. 15 deadline.

Requirements
In addition to fulfilling the admission requirements, applicants in the program are expected to have the following:

For the Ph.D. with a concentration in industrial/organizational 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 courses in personality and abnormal psychology, are required. Courses in developmental psychology, physiological psychology, and tests and measurements are desirable.

For the Ph.D. with a concentration in developmental psychology, at least 15 credits in psychology, including statistics and a laboratory course in experimental psychology, are required. Courses in personality, abnormal psychology, developmental psychology, and tests and measurements are also required for applicants to the school psychology concentration within the M.A. program.

Financial Assistance
Financial assistance is available through graduate assistantships; doctoral fellowships; and various forms of grants, loans, or employment.

Reduction of Credits
For students entering the doctoral program with a master’s degree or other graduate course work, the number of credits required may be reduced by a maximum of 30 credits subject to the approval of the program faculty. 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
Various areas have core course requirements. These courses cover the basic subject matter identified by the profession as essential to doctoral training: biological bases of behavior, social bases of behavior, cognitive bases of behavior, individual behavior, and history of psychology. After successful completion of 30 credits (including core courses), a student is awarded an M.A. in Psychology.

Specialty Courses
The 700-, 800-, and 900-level courses provide doctoral candidates with greater depth of study in specific content areas.

Practica
All psychology students are expected to perform at a satisfactory level in all practicum placements. The purpose of these 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 take at least 3 credits of proposal (998) and 3 of research (999) and must have 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, and communication skills. In doctoral courses, A and B are the only acceptable grades. In addition to satisfactory course performance, students in the doctoral program must successfully complete comprehensive examinations after they have completed the core requirements. These exams are administered each year in August and January. A student who successfully completes the comprehensive examinations is admitted to doctoral degree candidacy and is then permitted to begin work on a dissertation.
The applied concentrations within this program require the development of communication skills. Written and oral communication skills are assessed by faculty continuously throughout the program in the form of papers and reports. Students judged deficient in either communication area are informed of the deficiency and may be required to leave the program if the deficiency cannot be remedied.

Highly qualified students interested in other than the traditional concentrations listed below may be admitted to work with an individual faculty member.

**Concentration in Industrial/Organizational Psychology**

Students must complete 88 graduate credits taken from the following:

- Nine credits from cognitive (701, 766, or 768), social (703, 667, or 668), and historical (705) core (one from each cluster)
- Eight credits of quantitative and research methods: PSYC 611 and 612
- Twelve credits of advanced quantitative and research methods: PSYC 754 and 756, and nine credits from PSYC 541, 557, 633, 652, 654, 755.
- Eighteen credits of specialized content: PSYC 636, 639; six credits from PSYC 631, 638, 733, 736, 592/892; and six credits from PSYC 735, 739, 741, 592/892
- Three credits of special topics in professional issues: PSYC 890
- Zero to 12 credits of electives, 9 credits allowed outside the department with advisor approval
- Twelve to 15 credits of practicum (PSYC 730 and 897) (at least one semester)
- Twelve credits of dissertation: PSYC 998 and 999

**Concentration in Human Factors/Applied Cognition**

Students must complete 88 graduate credits to include the following requirements:

- Three credits of cognitive core: PSYC 701.
- Six credits of core from biological (702, 558, or 559), social (703, 667, or 668), developmental (704, 666, or 669), or historical (705).
- Eight credits of quantitative and research methods: PSYC 611 and 612.
- Nine credits of advanced statistics or qualitative methods.
- Six credits of specialized content: PSYC 530 and 645.
- Nine credits of additional specialized content to include PSYC 734, 737, 766, or 768.
- Three 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.
- Six 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.)
- Twelve credits of dissertation: PSYC 998 and 999.

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 Psychology Department is 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 90 graduate credits. Clinical students are required to enroll full time.

- Fifteen credits of core: PSYC 701, 702, 703, 704, 705
- Eight credits of quantitative and methods courses: PSYC 611 and 612
- Two credits of professional seminar: PSYC 890
- Six credits of psychopathology: PSYC 822, 823
- Eleven credits of assessment and basic clinical skills: PSYC 810, 811, and 880
- Fourteen credits of assessment and psychotherapy supervision: PSYC 881
- Nine credits of theory and techniques of psychotherapy: PSYC 830, 831, 832
- Six credits of community psychology: PSYC 840, 841
- Three credits of elective
- Clinical internship
- Clinical externship
- Twelve credits of dissertation: PSYC 998 and 999

**Concentration in Applied Developmental Psychology**

Students must complete the following requirements:

- Fifteen credits of core from cognitive (701, 766, or 768), biological (702, 558, or 559), social (703, 667, or 668), developmental (704, 666, or 669), and historical (705)
- Eight credits of quantitative methods: PSYC 611 and 612
• Twelve credits of advanced specialized methods including the following:
  Quantitative methods: At least three credits from PSYC 652, 754, 755, or 756
  Research methods: At least three credits from PSYC 646 or 654
  Specialized methods: PSYC 673, 684, 709*, 710*, 722*, 786
• Eighteen credits of specialized content:
  Foundations: At least nine credits from PSYC 558, 559, 561, 614, 666, 669, 892
  Applications: PSYC 617, 780, EDSE 649
• Nine to fifteen credits of research/practicum
• Six to 12 credits of electives
• Three credits of professional seminar/professional ethics
• Twelve credits of dissertation: PSYC 998 and 999

Public and International Affairs

Faculty
Robinson Professors: Hecló, Paden
Professors: R. Clark, Dawisha, Gottner, Keeter (chair), Pfiffner, White
Associate professors: Brown, Cargo, Conant, Conlan, Dudley, Friedlander, Gifford, Hart-Nibbrig, Katz, Mahler, Hung Nguyen, Regan, Sacco
Assistant professors: Harbour, Hennessey, Rosenblatt, Wan
Visiting assistant professors: J. Clark, Duquette, Foraker, Harvey, Miller
Visiting instructor: Ludwig
Affiliate faculty, The Institute of Public Policy: Fukuyama, Fuller, Garreau, Haynes, Kash, Lipset, Stough, Tolchin

Course Work
The Public and International Affairs Department offers all course work designated ADJ, GOVT, LRNG, and PUAD in the “Course Descriptions” chapter of this catalog.

UNDERGRADUATE PROGRAMS

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 nine credits of GOVT 480, GOVT 490, GOVT 491, and GOVT 496 may be substituted for upper-division GOVT courses. Only three credits of a six-credit GOVT 480 and six credits of GOVT 496 may be substituted for major requirements.

3. Three credits of analytic or language competency skills from the following: GOVT 359, 400, 459; ECON 103, 104; SOCI 405, 405; any CS, MIS, INF5, or STAT course; or an upper-level foreign language course taught in the language.

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.

1. Thirty-nine credits in general education requirements, including the following:
   a. Nine credits in ENGL 101, 303, and COMM
   b. Six credits in literature
   c. Nine credits in history, with at least three credits at the 300 level or above
   d. Nine credits from any two of ANTH, PSYC, or SOCI; and six credits in analytical skills selected from the following: PHIL, DESC 210, 301; STAT 250, 350; SOCI 313; MATH 106, 108, 110, or 111
2. Eighteen credits of core requirements, including GOVT 101; 103; 132, 133, or 149; 204; 300; 351
3. Twenty-one credits of advanced government courses including GOVT 355, 356, and one course from GOVT 357, 452, or 490; one course from GOVT 320s or 420s; one course from GOVT 360s or 460s

Six credits taken outside of GOVT 350s and 450s (may include 480, 490, 491, or 496). Only three credits of a six-credit GOVT 480 may be substituted for a major requirement. The same GOVT 490 may not be substituted for more than one major requirement.

4. ECON 103, 104, and one upper-level ECON course
5. Three credits in ACCT
6. GOVT 359 or 459
7. Twelve 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, or INF5 course; STAT 362; SOCI 405; ACCT 202, 310; PHIL 105, 173, 212, 371, 372, 373, or 376 (may use only six credits from ACCT and PHIL)

**Option B**
Foreign language: One modern foreign language through the intermediate level

A total of 120 credits is 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.

http://catalog.gmu.edu
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 in public administration may fulfill this requirement by successfully completing the 300-level GOVT courses in their major programs.

Teacher Licensure (Certification)
Students who wish to become elementary or secondary school teachers should consult the sections on licensure (certification) found in the catalog in the “Graduate School of Education” chapter. Those planning to become secondary school teachers should consult the secondary education advisor in their discipline.

Administration of Justice, B.S.
The B.S. in Administration of Justice provides a sound liberal education with a substantial exposure to the criminal justice system and process. In addition to ensuring the strong background necessary for law school and/or graduate study in administration of justice or public administration, the broad range of courses available allows the student to prepare for careers in the courts, investigations, juvenile justice, law enforcement, and private security. This interinstitutional and interdisciplinary program requires a minimum of 120 credits of course work, 45 of which must be at the 300 level or above. A grade of D in any of the ADJ courses may not be used toward graduation. Prior to admission, students who major in administration of justice are expected to have completed the requirements for the major in an associate’s degree in administration of justice at either Northern Virginia Community College or its equivalent.

Program requirements are as follows:

1. Twenty credits in general education requirements: ENGL 101 and 302, six credits of literature, and eight credits (two semesters) of a laboratory science sequence in astronomy, biology, chemistry, geology, or physics (BIOL 124, 125 excluded).

2. Forty-eight credits in core requirements: 27 to 36 credits in administration of justice taken at Northern Virginia Community College or its equivalent, ADJ 377, plus 9 to 18 upper-level credits in administration of justice completed at George Mason.

3. Thirty credits in supporting requirements, including at least 15 credits in two of the following support fields: Accounting, Computer science, Government, Psychology, Sociology, Foreign language, Social work 210, 300, 301*, 323, 324, 351*, 352, 400, 423, 425, 471, 475, 499, 511, 598.

4. Three credits in computer science and three credits from the following: STAT 250; DESC 210; PSYC 300; SOCI 313.

5. Sixteen credits of general electives, which may include additional courses in the student’s support fields. It may be possible to earn a minor in certain support fields.

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 ADJ 377 Public Safety Officer and the Law.

Minors
- **Interdisciplinary Minors in Global Systems and in Urban and Suburban Studies**
The department coordinates these interdisciplinary minors. See the “University Academic Programs and Resources” chapter for descriptions.

- **Minor in American Government**
This minor develops knowledge of the principles, institutions, and behaviors of the American political system. 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:
  - GOVT 132 Introduction to International Politics
  - Any GOVT 301-309 Political Institutions
  - Any GOVT 310-319 Political Behavior
  - GOVT 344 American Foreign Policy
  - 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. A minor in public policy and management requires 18 credits of government courses, including GOVT 103 Introduction to American Government and five additional courses from the following:
  - GOVT 350-359 Public Administration
  - Any GOVT 360-369 Public Policy
  - Any GOVT 450-459 Public Administration
  - Any GOVT 460-469 Public Policy
  - Relevant GOVT 480 or 490

- **Minor in International/Comparative Studies**
This minor increases students’ awareness of the regions and current issues of the world on theoretical and practical levels. 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 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 480-490

Honors Program
Qualified students 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 leading to graduation with departmental honors.

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 nine emphases: public management, public policy, financial management, nonprofit management, international management, state and local government, environmental science and public policy, human resources management, and health 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 emphases or even from other departments and institutes within the university.

M.P.A. students at George Mason have the research and cultural resources of the Washington metropolitan 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 internships 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, 6, 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. Convenient 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 Institute of Public Policy of 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
Up to 12 graduate credits may be transferred into the M.P.A. program, pending approval by the M.P.A. Admissions Committee and the dean of the College of Arts and Sciences. Students may petition the M.P.A. Admissions Committee for approval of graduate credits taken at other accredited universities or colleges; generally, this is limited to 6 credits, though up to 12 credits may be granted in special cases at the discretion of the committee. Students may also petition to receive transfer credit taken while they were enrolled in other graduate programs at George Mason. Petitions for more than six credits taken while enrolled through Extended Studies are 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 a set of 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.
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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
(or 702)

Students may take their elective courses within one of the emphases listed below. Alternatively, with the approval of their advisor, students may create their own emphasis, or they may select their elective courses from several emphases or fields.

Emphasis in Public Management
PUAD 615 Administrative Law
PUAD 621 Principles and Practices in Government Organization and Management
PUAD 622 Program Planning and Implementation
PUAD 661 Public Budgeting Systems
PUAD 670 Personnel Administration in the Public Sector
PUAD 729 Issues in Public Management
PUAD 730 Professional Development Workshop
PUAD 742 Program Evaluation
PUAD 750 Changing Patterns of Governance
PUAD 759 Issues in Local Government Administration
PUAD 769 Issues in Public Financial Management
LRNG 720 Market-Based Management
PUAD 794 Internship

Emphasis in Public Policy
PUAD 622 Program Planning and Implementation
PUAD 643 Public Policy Research
PUAD 727 Seminar in Risk Assessment and Decision Making
PUAD 741 Policy Analysis
PUAD 742 Program Evaluation
PUAD 749 Issues in Public Policy
PUAD 750 Changing Patterns of Governance
PUAD 769 Issues in Public Financial Management
LRNG 681 Interpretive Economics
PUBP 701 Methods in Policy Analysis and Research
PUBP 704 Managerial Economics/Policy Analysis
PUAD 794 Internship

Emphasis in Financial Management
PUAD 661 Public Budgeting Systems
PUAD 664 Advanced Topics in Nonprofit and Public Financial Management
PUAD 729 Issues in Public Management (Auditing and Performance Assessment)
PUAD 769 Issues in Public Financial Management
PUAD 794 Internship

Emphasis in Nonprofit Management
PUAD 505 Introduction to Management of Nonprofits
PUAD 636 The NGO: Managing the International Nonprofit Organization
PUAD 664 Advanced Topics in Nonprofit and Public Financial Management
PUAD 681 The Community, Media Relations, and Fund Raising
PUAD 720 Performance Evaluation for Managers
PUAD 730 Professional Development Workshop
PUAD 729 and 749 (offered periodically on nonprofit issues)
PUAD 794 Internship

Emphasis in International Management
PUAD 504 Managing in the International Arena: Theory and Practice
PUAD 634 Management of International Security
PUAD 731 International Political Economy
PUAD 738 Issues in International Security
PUAD 739 Issues in International Management
CONF courses offered by George Mason's Institute for Conflict Analysis and Resolution
ITRN courses offered by George Mason's International Commerce and Policy program
PUAD 794 Internship

Emphasis in State and Local Government
PUAD 615 Administrative Law
PUAD 661 Public Budgeting Systems
PUAD 651 Administration in the Commonwealth of Virginia
PUAD 681 The Community, Media Relations, and Fund Raising
PUAD 729 Issues in Public Management
PUAD 730 Professional Development Workshop
PUAD 750 Changing Patterns of Governance
PUAD 759 Issues in Local Government Administration
PUAD 794 Internship

Emphasis 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, the department recommends one of the following ecology courses in the place of 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.

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 (both should be taken after BIOL 607)

Emphasis in Human Resources Management
PUAD 670 Personnel Administration in the Public Sector
PUAD 729 Issues in Public Management
MGMT 721 Seminar in Personnel Administration
PSYC 635 Topics in Organizational Psychology
PSYC 631 Industrial and Personnel Testing and Evaluation
PSYC 638 Training: Psychological Contributions to Theory, Design, and Evaluation
PSYC 640 Techniques in Industrial/Organizational Psychology
PSYC 667 Behavior in Small Groups and Teams

Emphasis in Health Policy and Administration
PUAD 741 Policy Analysis
HSCI 578 Introduction to the U.S. Health Care System
HSCI 542 Health Care and the Political Process
HSCI 866 Health Care and Public Policy
HSCI 704 Contemporary Issues in Health Policy and Management
HSCI 710 Health Practicum
PUAD 794 Internship

Certificate in Nonprofit Management
The certificate in nonprofit management is a 15-credit graduate program. Students may enter this program at the beginning of any semester. Applications are made to the certificate in nonprofit management program through the Graduate Admissions Processing Center of the College of Arts and Sciences. Students may transfer credits earned to the M.P.A. degree pending admission to the M.P.A. program.

Admission Requirements
Admission requirements are the same as they are for the M.P.A. degree program.

Certificate Requirements
This certificate may be obtained through standard three-credit courses or through online courses. It requires the following:

- PUAD 505 Introduction to Management of Nonprofits
- PUAD 660 Public and Nonprofit Accounting and Finance
- PUAD 681 The Community, Media Relations, and Fund Raising
- PUAD 702 Nonprofit Law, Governance, and Ethics
- One elective

Program on Social and Organizational Learning
The Program on Social and Organizational Learning is an interdisciplinary program. The program's courses are designed to serve graduate students and advanced undergraduates in a variety of fields. These fields include organizational behavior, economics, telecommunications, management, nursing administration, education, software systems engineering, English, psychology, international commerce and policy, public affairs, and sociology.

Faculty
Professor: Lavoie
Associate professors: Addleson (director), Cox, Foreman, Thatchenkery
Assistant professor: Baker

New Professional Studies:
Organizational Learning, M.S.
The organizational learning track of the New Professional Studies M.S. program is an innovative program offered by the Program on Social and Organizational Learning. An integrated, 21-month program, it is designed for working professionals with several years of work experience. It provides the conceptual tools and practical guidance to foster organizational change. A feature of the track is its 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.

The track focuses on three related areas:
1. Creating and leveraging knowledge through networks of people who communicate and collaborate
2. Understanding and managing change by integrating the conceptual tools and practical guidance to foster organizational change
3. Enhancing and facilitating collaboration by building effective relationships in technology-rich environments

The organizational learning track has the following objectives:
1. Meeting the needs of the working professional in rapidly changing organizations
2. Linking theory and practice through action-oriented group learning
3. Building a learning community of collaborative colleagues
4. Integrating technologies by using groupware skills to enable a high degree of collaboration and interaction between students and faculty

Admission Requirements
Admission is based on a departmental admissions committee's evaluation of the applicant's suitability. The committee's assessment will be based on the applicant's transcripts of academic accomplishment, work experience, letters of recommendation, a statement of goals, and, when possible, an interview with members of the department. Applicants are requested to submit curricula vitae with applications.

http://catalog.gmu.edu
Degree Requirements

The M.S. in New Professional Studies: Organizational Learning begins each year in the fall. It is a 33-credit, part-time program, which runs over five consecutive semesters. The participants work in teams and complete most of the courses in sequence. Elective choices are available in the fourth and fifth semesters. During the final semester, participants complete an integrative project and receive feedback from organizational leaders. Throughout the program, the faculty members address such issues as how learning processes work in human society. The methodological slant is interpretive, emphasizing ethnographic and archival approaches to empirical work. Theory is grounded in application in organizations. The courses examine the role of knowledge, communication, interpersonal and group dynamics, markets, and information technology in social institutions and organizations. Further information can be obtained from the executive secretary, Program on Social and Organizational Learning, by calling (703) 993-1142, by faxing (703) 993-3788, or by sending e-mail to psol@gmu.edu.

Russian Studies

Faculty

Aksonov (Robinson Professor, Modern and Classical Languages), Christensen (Modern and Classical Languages), Hecht (Modern and Classical Languages, Jensen (History and Art History), Katz (Public and International Affairs), Lavoie, 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 in graduate school, who are interested in careers as translators, or who are studying for self-enrichment.

All degree students must present a minimum of 120 credits of course work for graduation, including the general requirements for the B.A. and the requirements for the major. Students majoring in Russian Studies must complete the following requirements:

1. Russian language through the intermediate level through course work or testing
2. RUSS 380 and 381
3. RUSS 480 or 481 (preferably both)
4. Six credits of Russian literature (may simultaneously satisfy the literature requirement for the B.A.)
5. Three additional upper-level courses bearing the RUSS subject code, two of which must be selected from the following: 302, 303, 310, 311, 401, 410, and 480 or 481 (whichever is not applied to the basic requirement)
6. RUSS 353 or HIST 328 (may simultaneously satisfy the non-Western culture requirement for the B.A.)
7. RUSS 354 or HIST 329 (may simultaneously satisfy the non-Western culture requirement for the B.A.)
8. GEOG 330 or GOVT 338

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 advisors.

Approved Courses

Department of Modern and Classical Languages: RUSS 101, 102, 109, 201, 202, 209 (subject to language proficiency examination), 300, 302, 303, 310, 311, 325, 326, 327, 353, 354, 380, 381, 401, 402, 407, 410, 415, 470, 480, 481, 490, 491

Department of Geography and Earth Science: GEOG 330

Department of History: HIST 328, 329

Department of Public and International Affairs: GOVT 338

Cognate courses: ANTH 114; ARTH 360, 362; ECON 380; GEOG 103; GOVT 132; MKTG 307; 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.

Sociology and Anthropology

Faculty

Robinson Professors: Bateson (Anthropology), Dumont (Anthropology), Weitzman (Sociology)

Professors: Avruch (Anthropology), Black (Anthropology), Borkman (Sociology), Dennis (Sociology), Dietz (Sociology), Horton (Sociology), Kolker (Sociology), Scimecca (Sociology, chair), Stone (Sociology), Williams (Anthropology)

Associate Professors: Colvin (Sociology), Golomb (Anthropology), Guagnano (Sociology), Haines (Anthropology), Jacobs (Sociology), Kalof (Sociology), Lancaster (Anthropology), Palkovich (Anthropology), Potter (Anthropology, provost), Rader (Sociology), Rosenblum (Sociology, vice president, University Life), Seligmann (Anthropology), Tavani (Sociology)

Assistant Professors: Hanrahan (Sociology), Trencher (Anthropology)

Affiliate professor: Goode (Sociology)

Course Work

This department offers all course work designated ANTH 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 meeting the general requirements for the B.A., students majoring in anthropology must complete the 36-credit program of study indicated below. No more than three credits with a grade of D in the required courses in the anthropology major may be applied toward the degree.

1. A nine-credit core in anthropology:
   ANTH 114 Introduction to Cultural Anthropology
   ANTH 390 Theories, Methods, and Issues I
   ANTH 490 Theories, Methods, and Issues II

2. A nine-credit four-field requirement:
   Archaeology: ANTH 120 or ANTH 420
   Biological Anthropology: ANTH 135 or ANTH 365
   Linguistic Anthropology: ANTH 380

3. Eighteen 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.

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.

◆ Minor in Anthropology

A minor in anthropology requires 21 credits. All emphases require ANTH 114, 332, 130, and/or 135, and 430 or 450. See an advisor in the department for more information.

Sociology, B.A.

In addition to the general requirements for the B.A., students 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 six 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.

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. Students majoring in sociology may fulfill this requirement by successfully completing SOCI 412.

◆ Minor in Sociology

Students can select one of five emphases in sociology offered by the department. A minor in sociology requires 21 credits in one emphasis. All emphases require SOCI 101 and 311. See an advisor in the department for more information.
Secondary Teacher Licensure (Certification)
Students who want to become secondary school teachers should consult the sections on licensure (certification) found in the catalog under the "Graduate School of Education" chapter. Those planning to become secondary school teachers should consult with the secondary education advisors in their departments.

GRADUATE PROGRAMS

Sociology, M.A.
A student may choose an emphasis in general sociology; applied sociology; sex and gender; crime, delinquency, and corrections; race and ethnicity; cultural studies; or conflict analysis and management. The general sociology emphasis allows maximum flexibility in the application of sociological knowledge to the analysis of social processes and systems. The applied emphasis serves as a professional degree for the practitioner. All emphases are appropriate for those anticipating further graduate study leading to the Ph.D. in Sociology.

The department provides opportunities for students to develop expertise in a variety of areas, including applied methods, community, conflict analysis and management, development and social change, deviance, environmental sociology, gerontology, medical sociology, occupations and professions, policy analysis, race and ethnicity, sociology of science and technology, cultural studies, and survey research.

Admission Requirements
In addition to meeting the general admissions requirements for graduate study, applicants must present the following:
1. A minimum of three credits each in undergraduate sociological theory, statistics, and research methods. Equivalent courses in other disciplines may be substituted for some of these requirements with permission.
2. Three letters of recommendation from people who have supervised the student's work. If possible, at least one should be from an academic setting.
3. A written statement (approximately 200 words) explaining the student's interest in sociology.
4. Graduate Record Examination (GRE) scores.
5. An undergraduate GPA of 3.000.

Acceptance of applicants to the program depends upon assessment by the departmental graduate committee.

Nondegree Status
Students who do not wish to pursue a degree or who have not supplied all required documents may enroll in nondegree status through Extended Studies. Nondegree students may apply later for degree status. With approval, a maximum of 12 graduate credits earned in nondegree status may be applied to a master's degree.

Emphasis Requirements
All students are required to complete 33 credits including a master's thesis (SOCl 799).

Emphasis in General Sociology
A degree with this emphasis requires 33 credits, including a core of 6 credits of social theory (SOCl 611 and 612), 9 credits of research methods (SOCl 530, 531, and a 600-level sociology methods course), and 9 credits in the sex and gender emphasis (SOCl 505, 525, and 696).

Emphasis in Sex and Gender
A degree with this emphasis requires 33 credits, including a core of 6 credits of social theory (SOCl 611 and 612), 9 credits of research methods (SOCl 530, 531, and a 600-level sociology methods course), and 9 credits in the sex and gender emphasis (SOCl 505, 525, and 696).

Emphasis in Conflict Analysis and Management
A degree with this emphasis requires 33 credits, including a core of 6 credits of social theory (SOCl 611 and 612), 9 credits of research methods (SOCl 530, 531, and a 600-level sociology methods course), and 9 credits in the sociology of conflict and conflict management.

Emphasis in Race and Ethnicity
A degree with this emphasis requires 33 credits, including a core of 6 credits of social theory (SOCl 611 and 612), 9 credits of research methods (SOCl 530, 531, and a 600-level sociology methods course), and 9 credits in the race and ethnicity emphasis.

Emphasis in Crime, Delinquency, and Corrections
A degree with this emphasis requires 33 credits, including a core of 6 credits of social theory (SOCl 611 and 612), 9 credits of research methods (SOCl 530, 531, and a 600-level sociology methods course), and 9 credits in the crime, delinquency, and corrections emphasis (SOCl 607, 608, and 609).

Emphasis in Sociology of Culture
A degree with this emphasis prepares students for the doctoral program in cultural studies. It requires 33 credits, including a core of 6 credits of social theory (SOCl 611 and 612), 9 credits of research methods (SOCl 530, 531, and a 600-level sociology methods course); SOCl 614 Sociology of Culture; a 3-credit, master's-level course that also serves as an introduction to a cultural studies "feeder" program in a department other than Sociology and Anthropology; and CULT 802 Histories of Cultural Studies I.

Master's Thesis
A master's thesis is required for the M.A. in Sociology to demonstrate a candidate's capacity to carry out independent research. The thesis consists of a substantial sociological research or theoretical project that will contribute to sociological knowledge.

Financial Aid
The Department of Sociology and Anthropology offers a limited number of graduate assistantships. For information, please contact the department at (703) 993-1440.

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.

http://catalog.gmu.edu
Telecommunications

Faculty
Akwule, Dede, Drury, Finn, Jabbari, Kelley, Lont (director), Ruth, Smith, 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 take 18 credits distributed as follows. A grade of C or better is required in courses applied to the minor. See the program director for a current list of electives and for further information.

Required Courses
- CAS 101 Presenting and Processing Information Using Technology
- COMM 202 Mass Media and Communications Technology
- TELE 350 Telecommunications Systems
- TELE 450 Telecommunications Senior Seminar

Elective Courses
- CS 103 Introduction to Computing
- CS 105 Computer Ethics and Society
- COMM 450 Internship (telecommunications-related organization)
- COMM 554 Telecommunications Policy and Regulation
- COMM 556 Global Telecommunications
- ENGL 410 Technical and Report Writing
- ENGL 513 The Virtual Organization
- GOVT 359 Computers in Public Management
- MGMT 302 Organizational Behavior and Administration
- MGMT 312 Principles of Management
- MIS 301 Introduction to Computer Management

GRADUATE PROGRAM

◆ Telecommunications, M.A.
Since telecommunications is both a technological and a humanistic endeavor, the Master of Arts 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 into a telecommunications-related field, and others whose interests, talents, or curiosity bring them into contact with the world of telecommunications.

Admission Requirements
Applicants should present the following minimum requirements:
1. A baccalaureate degree from an accredited institution
2. A GPA of 3.000 or better in the last 60 credits
3. The appropriate application form with three letters of recommendation from persons directly knowledgeable of the applicant’s professional and academic competence (one from an academic source)
4. 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 emphasis 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.

Degree Requirements
Students must complete a minimum of 33 credits (11 courses) of approved graduate course work, including 15 credits of core courses and 18 credits in an emphasis. Students may choose one of six emphases: educational technology; information systems; international telecommunications; management, organization, and policy; production theory and practice; and telecommunications systems engineering.

Core Courses
Students must complete four of the following courses:
- COMM 555 Theories of Visual Communication
- ECE 540 Modern Telecommunications
- LAW 181 Telecommunications Law and Regulations
- ITRN 701 Telecommunications Policy
- MGMT 791 Seminar in Current Management Problems: Telecommunications

All students must complete TELE 750 Coordinating Seminar.

Emphases
Students must complete 18 credits in an emphasis. Following are the required and elective courses for each emphasis:

Educational Technology
Required course (three credits): EDIT 611 Distance Learning via Networks and Telecommunications
Recommended electives: EDCI 705; EDIT 530, 571, 572, 573, 574, 575, 593, 704, 730, 732, 750, 752, 771, 772

Information Systems
Required courses (nine credits): INFS 501 Discrete and Logical Structures for Information Systems; INFS 515 Computer Organization; INFS 590 Program Design and Data Structures
Recommended electives: ECE 542; INFS 601, 612, 614, 680; SWSE 619, 632

http://catalog.gmu.edu
International Telecommunications

Required course (three credits): COMM 556 Global Communication

Recommended electives: COMM 505, 506, 554; ITRN 500, 603, 604, 605, 612, 701, 710, 711, 713, 715, 716, 750, 754, 757, 768, 769, 772, 730, 733, 735, 737, 773; MKTG 775, 777; PUAD 504, 634, 635, 636, 701, 731, 732, 733, 739

Management, Organization, and Policy

Required course (three credits): LRNG 601 Organizational Learning

Recommended electives: ACCT 600; BULE 700; COMM 501, 506, 535; ECON 600, 602; FNAN 601; LRNG 583, 610, 612, 672, 681, 720, 731, 792, 868; MGMT 721, 722, 750, 751, 791; MIS 720, 740, 792; MKTG 775, 777; PUAD 505, 610, 620, 621, 634, 636, 672, 732, 739; PSYC 532, 635, 636, 640

Production Theory and Practice

Required course (three credits): COMM 556 Global Communication

Recommended electives: COMM 502, 535, 536, 554, 590 (Multimedia), 590 (Scriptwriting), 596, 597, 694; EDCI 705; EDIT 563, 564, 611, 704, 750; ENGL 505, 670; VIT 616, 676

Telecommunications Systems Engineering

Required course (three credits): ECE 542 Computer Network Architectures and Protocols

Recommended electives: CS 571; ECE 513, 528, 535, 630, 631, 632, 633, 636, 639, 642, 643, 667
Institute for Biosciences, Bioinformatics, & Biotechnology

The Institute for Biosciences, Bioinformatics, and Biotechnology (IB3) is a consortium of George Mason University, the Commonwealth of Virginia, Prince William County, and the American Type Culture Collection (ATCC), the world’s largest collection of living biological cultures.

IB3 represents a model approach to integrate basic and applied research in the setting of a modern university, with an expanded scope of interactions in the surrounding community. This unique environment comprises four floors of approximately 100,000 square feet, for the joint research and teaching efforts of the institute and the American Type Culture Collection. The first floor of IB3 opened with the first Prince William Campus building (Prince William I) in September 1997, and houses molecular biology and biochemistry labs, computer labs, cold rooms, and instrument rooms, as well as faculty offices. The second building (Prince William II) opened in October 1998.

Laboratory facilities at IB3 provide an excellent environment for teaching, training, and research. The IB3 computer facilities include more than 60 SGI workstations, including a four-processor Onyx, 18 Octanes, and more than 40 O2’s. 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 IB3 computers are connected via a high-speed (100 MB/ sec) Ethernet LAN. Teaching facilities include three computer classrooms equipped with SGI workstations and support classes in which students and instructors have access to high-end computational resources, including advanced bioinformatics, visualization, and data-mining software. High-speed Internet connections permit interactive distance learning and access to remote databases. Three wet labs for teaching and training are supported by adjacent computer labs, lecture rooms, prep labs, and equipment labs, including four ABI 377 and two ABI 310 automated DNA analyzers.

IB3 serves as a state-of-the-art, multiuser organization for education, research, and development in molecular biosciences and bioinformatics; fosters advancement of the biosciences-based industry through scientific collaborations; offers expertise and technical service to the scientific community; and contributes to Northern Virginia’s economic strength through educational programs at the undergraduate, graduate, postgraduate, and professional levels.

Up-to-date education and training program information can obtained through the World Wide Web at www.gmu.edu or by contacting Debbie Grippaudo at (703) 993-8449 or by e-mail at debbieg@ib3.gmu.edu.

Administration
Clark Tibbetts, Ph.D., Director
Tony Centodocati, Executive Associate
Debbie Grippaudo, Education Program Coordinator
Cathy Hubbs, Systems Administrator
Kate Oakes, Administrative Manager
Jill Kelly, Administrative Assistant
Faculty
Professors: Tibbetts, Willett
Associate professor: McKenney
Research professor: Barnes
Research associate professors: Gillevet, Grefenstette, Kinser, D. Seto
Research assistant professors: Emerson, McCormack
Research staff: Crews, Krasnov, Rasmussen, J. Seto, Strzelecka

Course Work
IB3 offers all course work designated IB3 in the “Course Descriptions” chapter of this catalog.

GRADUATE PROGRAMS
IB3 offers three master’s degree tracks in the New Professional Studies program in forensic biosciences, bioinformatics, and biotechnology.

Each of the tracks requires a minimum of 30 credit hours. Five core courses (MNPS 700, 702, 703, 704, and IB3 550) are required of all tracks. In addition to the minimum 30 credit hours, all students are required to take or have met the requirements of CHEM 663-664 Advanced Biochemistry (6 credits). The course titles and credit distributions follow.

- **New Professional Studies: Forensic Biosciences, M.S.**

  **Required Courses**
  - MNPS 700 The New Professionalism: Theory and Practice ........................................ 3
  - MNPS 702 The New Professional as a Reflective Practitioner ..................................... 3
  - MNPS 703 Technology and Learning in the New Professions ................................... 3
  - MNPS 704 Research Methodologies in the New Professionalism ................................ 3
  - IB3 550 Introduction to Bioinformatics ................................................................. 3
  - IB3 552 DNA Sequence Analysis ............................................................................. 3
  - IB3 655 Datamining for Bioinformatics ................................................................. 3

  **Elective Courses**
  - IB3 551 Laboratory Information Management Systems .......................................... 3
  - IB3 653 Data mining for Bioinformatics ................................................................. 3
  - IB3 655 Datamining for Bioinformatics ................................................................. 3

- **New Professional Studies: Bioinformatics, M.S.**

  **Required Courses**
  - MNPS 700 The New Professionalism: Theory and Practice ........................................ 3
  - MNPS 702 The New Professional as a Reflective Practitioner ..................................... 3
  - MNPS 703 Technology and Learning in the New Professions ................................... 3
  - MNPS 704 Research Methodologies in the New Professionalism ................................ 3
  - IB3 550 Introduction to Bioinformatics ................................................................. 3
  - IB3 552 DNA Sequence Analysis ............................................................................. 3
  - IB3 655 Datamining for Bioinformatics ................................................................. 3

  **Elective Courses**
  - IB3 551 Laboratory Information Management Systems .......................................... 3
  - IB3 653 Data mining for Bioinformatics ................................................................. 3
  - IB3 655 Datamining for Bioinformatics ................................................................. 3

- **New Professional Studies: Biotechnology, M.S.**

  **Required Courses**
  - MNPS 700 The New Professionalism: Theory and Practice ........................................ 3
  - MNPS 702 The New Professional as a Reflective Practitioner ..................................... 3
  - MNPS 703 Technology and Learning in the New Professions ................................... 3
  - MNPS 704 Research Methodologies in the New Professionalism ................................ 3
  - IB3 550 Introduction to Bioinformatics ................................................................. 3
  - IB3 552 DNA Sequence Analysis ............................................................................. 3
  - IB3 655 Datamining for Bioinformatics ................................................................. 3

  **Elective Courses**
  - IB3 551 Laboratory Information Management Systems .......................................... 3
  - IB3 653 Data mining for Bioinformatics ................................................................. 3
  - IB3 655 Datamining for Bioinformatics ................................................................. 3
Faculty

Course Work
The Institute for Computational Sciences and Informatics (CSI) offers all course work designated CSI in the "Course Descriptions" chapter of this catalog.

GRADUATE PROGRAMS

Computational Sciences and Informatics, Ph.D.
The Institute for Computational Sciences and Informatics addresses the role of computation in science, mathematics, and engineering. CSI was founded in 1991 to provide a doctoral program (instituted in 1992) dedicated to scientific research and designed around a core of advanced computer technology. CSI provides scientific and applications content to George Mason's information technology focus.

“Computational sciences” is defined as the systematic development and application of computing systems and computational solution techniques to models of scientific and engineering phenomena. “Informatics” is defined as the systematic development and application of computing systems and computational solution techniques for analyzing data obtained by experiments, modeling, database search, and instrumentation. Computing is now part of a triad, along with theory and experimentation, that serves as a means of investigation, and it provides insight and leads to understanding that, in many cases, theory or experimentation cannot. The multidisciplinary activities of CSI respond to this new role for computation, and CSI seeks to integrate computation in the sciences, mathematics, and engineering to produce new knowledge to develop new approaches to the solution of complex problems.

Certificate in Computational Techniques and Applications
CSI offers a graduate certificate program in computational techniques and applications, which provides students an opportunity to improve their basic computational skills. The certificate is independent of the doctoral program and is designed primarily for professionals in technical fields who may wish to upgrade their computer expertise, but it is also available as an option for prospective and currently enrolled doctoral 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.

http://catalog.gmu.edu
Nondegree status is available for professionals who are interested in taking a limited number of courses.

Admission Requirements
Students interested in applying to either the doctoral program in computational sciences and informatics or the certificate program in computational techniques and applications should have an academic background in material sciences, engineering, mathematics, computer science, or natural science. The undergraduate degree should be from an accredited institution, and applicants should have earned a GPA of at least 3.00 in their last 60 credits of study.

Applicants should forward a completed George Mason graduate application, two transcripts from each college and graduate institution attended, and an expanded goals statement to the Graduate Admissions Processing Center. Applicants to the doctoral program should also include three letters of recommendation and scores from the GRE-GEN (the GRE-SUB is recommended if it is given in the student's undergraduate major subject area). If the undergraduate degree was earned more than five years ago, students should submit a resume or statement of work experience. TOEFL scores are required for all foreign applicants to either the doctoral or certificate programs.* Those who are also applying for fellowships must submit completed applications by Feb. 1; all other applications for fall admission are due by March 1. Applications for spring admission are due by Nov. 1.

*Transcript evaluation by a U.S.-recognized agency is required for transcripts coming from foreign countries.

Degree Requirements
The doctoral program provides interdisciplinary research opportunities spanning, but not limited to, such specialty areas as atmospheric transport and dispersion; bioinformatics and computational biology; climate dynamics and global change; computational chemistry; computational fluid dynamics; computational mathematics; computational neuroscience; computational physics; computational statistics; computer design of materials; earth observing and remote sensing; and space sciences and computational astrophysics.

The program emphasizes three intellectual elements: common computational science topics; computationally intensive courses in specific areas of scientific interest; and doctoral research. Interested individuals should have a bachelor's degree in science, mathematics, engineering, or computer science. The program requires 72 credits beyond the baccalaureate degree, with a minimum of 48 credits in course work, and 24 credits of dissertation research. The course work is in the following areas:

- The common computational core courses: CSI 700, 801, 803, and 810
- 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

For those holding a master's degree, the 72 required credits may be reduced by up to 24 credits, depending on graduate courses completed. Scheduled courses and sequences accommodate part-time students, with courses offered in the late afternoon or early evening four nights per week.

Applicants are encouraged to apply their knowledge to a broad range of natural science problems using extensive computational knowledge and techniques missing from the more traditional degree programs in science and mathematics. The close relationship of the doctoral program to the research and development activities in federal laboratories, scientific institutions, and high-technology firms affords students opportunities for continuing or new employment. In addition to the common core of CSI 700, 801, 803, and 810, courses for the specific areas of concentration are required.

Requirements for the Areas of Concentration
For each of the areas of concentration, detailed information on the curriculum requirements is available at the CSI website through the university's main page at www.gmu.edu. Note that research opportunities are not limited to the listed areas. Students are presented with the opportunity 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.

A summary of the scientific core courses for each area of concentration follows.

**Atmospheric Transport and Dispersion**: CSI 655 and 755, Bioinformatics and Computational Biology: CSI 650, 651, and 652.

**Climate Dynamics and Global Change**: CSI 652, 655, 750, 751, and 753.

**Computational Chemistry**: CSI 711, 713, 782, and 783.

**Computational Fluid Dynamics**: CSI 720, 721, and 722.

**Computational Mathematics**: CSI 740; MATH 677 or 678.

**Computational Neuroscience**: CSI 650, 651, 734, and 735.

**Computational Physics**: CSI 780; PHYS 513 or CSI 785; CSI 783 or 784; one of CSI 781, 782, 783, 784, 888, or PHYS 705.

**Computational Statistics**: CSI 778, 877, 972, 973; CSI 771 or 773.

**Computer Design of Materials**: CSI 687, 780, 782, 783, and 786. Students are to take at least one of the two simulation courses CSI 787 or 986.

**Earth Observing and Remote Sensing**: CSI 750 and 753.

**Space Sciences and Computational Astrophysics**: ASTR 530 and CSI 780; CSI 783 or 784; PHYS 513 or CSI 785. Students are advised to take at least one of the three simulation courses, CSI 721, 761, or 788.

Facilities
Computation is recognized as a central feature of the instructional and research program of CSI. The institute, therefore, seeks to establish world-class computational facilities consistent with funding available through the university and through other sources in cooperation with George Mason's University Computing and Information Systems office.

The CSI Graduate Instructional Computational Facility houses Silicon Graphics workstations as well as other platforms. CSI has two massively parallel computers, the Intel Paragon and a MasPar, which are used for teaching as well as for research. Other advanced computing platforms within CSI include an SGI Origin 2000 workstation with 16 processors, an SGI Origin 200, an SGI Onyx II with infinite reality graphics engine, and an Octane visualization workstation. CSI students are issued accounts and access to the CSI instructional facilities. Other computing platforms are available for research by graduate students.

http://catalog.gmu.edu
Institute for Conflict Analysis & Resolution

Faculty
Cheldelin (director), Blechman, Clements, Druckman, Jeong, LeBaron, Lyons, Mitchell, Pearson d'Estree, Rubenstein, Sandole, Warfield

Other Faculty
Assefa, Avruch, Black, Broome, Brown, Gortner, Katz, Looney, McFerson, Paden, Scimecca, Stone, Taylor, Wilkins

Administrative Faculty
Drake

Course Work
The Institute for Conflict Analysis and Resolution offers all course work designated CONF in the "Course Descriptions" chapter of this catalog.

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 through the integration of conflict theory and such conflict resolution processes as negotiation, mediation, third-party consultation, and analytical problem solving. Students study the theory, methods, and ethical perspectives of the field and apply this knowledge in laboratory simulations and workshops, and in field internships. The internships are contracted with agencies in the Washington, D.C., area and elsewhere, including abroad. 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, and conflict resolution consulting firms.

Admission Requirements
In addition to meeting all admission requirements for graduate study, an applicant to the M.S. program must have a GPA of no less than 3.000 in all undergraduate work and 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 is no longer required but represents valuable support for admissions decisions.
Background courses in the social sciences, as well as prior work experience, are desirable. A personal interview may be required by the admissions committee. Prior graduate-level 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 are required: 18 credits are required core courses, 12 credits are electives (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 significantly vary according to each student's individual goals or needs. Therefore, each student should develop a Program of Study plan that should be discussed once each semester with his/her advisor and updated as appropriate.

Required Courses
Usually offered in the fall:
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

Usually offered in the spring:
Conf 601 Theory of Sources of Conflict
Conf 642 Integration of Theory and Practice
Conf 720, 730, or 740 Introduction to Specialization

Selective Courses
Students must select at least two courses from the following list:
Conf 701, 709, 802, 803 Advanced Theory
Conf 703, 714, 715 Advanced Practice
Conf 611 Advanced Research

Students must complete six credits (two courses) of integrative work:
Conf 690 Practicum in Conflict Analysis and Resolution
Conf 694 Internship
Conf 799 Master's Thesis

Elective Courses
ICAR supports three primary emphases:

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 fields that cross these emphases and may choose approved master's-level 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. The internship is intended to provide students with opportunities to use and further develop applied conflict resolution skills; integrate theory and practice of conflict analysis and resolution; apply theory through practice; and network with professionals in the field to enhance employment opportunities. Experience does not necessarily have to be explicitly "hands on": interns need not actually be intervenors, because such opportunities may not be readily available; rather, the goal is to get as close to analysis and resolution practice as possible. It is George Mason policy that internships for which academic credit is received cannot be paid.

Students taking Conf 694 are required to register and pay for three credits of Conf 694 during the summer session. Internships consist of at least 160 hours of supervised work on a project involving the analysis and/or resolution of conflict. Such work must be spelled out in a Memorandum of Agreement to be signed by the student, the site supervisor, and the internship coordinator, Dr. Dennis Sandole, before the internship begins. At the conclusion of the internship, the student must submit a 25- to 40-page paper on the experience, analyzing it in light of conflict and conflict resolution theories. In effect, the internship is an opportunity to apply theory or to test models, hypotheses, or processes; the internship paper is an opportunity to integrate the field experience with corresponding theory and research in the field. Also, upon completion of the internship, the site supervisor submits to Dr. Sandole a report describing what the intern did, how well he/she did it, and a grade for the student's work.

Students are encouraged to arrange their own internships; however, Dr. Sandole is available to discuss internship possibilities and requirements. Additionally, an internship binder is kept in the Student Resource Room. Students are also encouraged to contact ICAR alumni for internship possibilities. Students will meet with Dr. Sandole as required.

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.

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 through the two-semester APT program (see M.S. program) required for doctoral students. 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 four 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 accepted as of fall 1998 and later, a total of 57 credits are required. The semester in which courses are usually offered is indicated in parentheses.

Required Core Doctoral Courses
- CONF 713 Interpersonal and Intergroup Conflict (3)
- CONF 801 Introduction to Conflict Analysis and Resolution (3)
- CONF 802 Micro Theories (fall) (3)
- CONF 803 Macro Theories (spring) (3)
- CONF 810 Philosophy of the Social Sciences (spring) (3)
- CONF 811 Advanced Research Methods (fall)* (3)
- CONF 812 Advanced Research Methods II (spring) (3)
- CONF 900 Integrating Theory, Practice, and Method in Conflict Analysis (spring) (3)

Total: 24

Selective Courses
Students must take two (six credits) of the following:
- CONF 601, 701, 709, 901 Advanced Theory
- CONF 703, 714, 715 Advanced Practice
- CONF 795 Advanced Methods

Total: 6

Elective Courses
A total of 15 credits of electives from among any appropriate graduate courses, provided that one is in the diversity, cultural, and regional emphasis (72X series), one is in the structural or institutional conflict emphasis (73X series), and one is in the conflict analysis and resolution emphasis (74X series). The intent is for students to build a specialization and skills that will be needed in their dissertation work. These courses are to be completed before "comps."

CONF 695, 795, and 895 can be repeated for credit as electives.

Total: 15

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***

Total: 12

Total: 57 (24+6+15+12)

* 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 will not, however, be counted toward the total credits needed for the degree.

** All CONF 998 courses will be graded In Progress (IP) until completion of the proposal. At that time an appropriate grade will be issued.

*** All CONF 999 courses will be graded In Progress (IP) until the dissertation defense is successfully completed. At that time an appropriate grade will be issued.

Credit for a Master's Degree
Students with an M.S. in Conflict Analysis and Resolution from George Mason University may be forgiven up to 18 credits toward the doctoral degree. The actual number of forgiven credits is determined in consultation with the student advisor and the program coordinator, after a review of courses taken.

Students entering with an M.S. in a related field or a J.D. are forgiven up to 15 credits of electives. The actual number of forgiven credits is determined in consultation with the student advisor and the program coordinator, after a review of courses taken.

Entering the Doctoral Program without a Master's Degree
In some cases, 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 will be required to take the following 21 credits at the beginning of their doctoral course of study: CONF 501, 601, 610, 713, 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 will dissertations be 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.
The Graduate School of Education (GSE) prepares scholars and practitioners in education through programs of study that have become increasingly multidisciplinary in response to the richness and complexity of a pluralistic society. In addition to providing the framework for the integration and application of knowledge from a variety of disciplines, the curricula of the school provide the opportunity for students to develop, examine, evaluate, and practice professional knowledge and skills. Teaching in GSE goes beyond imparting knowledge to include content mastery, critical thinking, research, analysis, and problem-solving activities. GSE also encompasses degree programs under the Department of Health, Fitness, and Recreation Resources.

Administration
Gary R. Galluzzo, Dean
Martin E. Ford, Associate Dean
Mark B. Goor, Assistant Dean
Mary Anne Lecos, Director of Teacher Education
Bonnie Anderson, Director of Student Services

Faculty
Professors: Behrmann, Bowen (dean emeritus), Collier, Dede, Ford, Galluzzo, Isenberg, Jacob, Levy, Martin, Mastropieri, Mellander (dean emeritus), Scruggs, Seligman, Spikell, Wallace, Williams
Associate professors: Bonfadini, Chu, DeMulder, Duck, Dunklee, Dzama, Given, Goor, Maxwell, Norton, Murray, Pierce, Razeghi, Rigsby, Sanchez, Sturtevant, Sterling, C. Thomas, W. Thomas, Thorp, White
Assistant professors: Bannan-Ritland, Dabbagh, Davison, Aviles, Dunlap, Fader, Hicks, LePage-Lees, Mankus, Morgan, Osterling, Phipps, Porter, Sprague, Varrella, D. Wood
Administrative faculty: Gangloff, Johnson, Jones, Neuber, Spurlock, Yamamoto

Course Work
GSE programs offer all course work designated COMC, EDCC, EDCD, EDCl, EDIT, EDLE, EDRD, EDRS, EDSE, EDUC, and IETT.

Admission
Instructions about the admission process and specific program requirements are available in the Graduate Application and in program handbooks available in the GSE Office of Teacher Education (Robinson Hall, Room A307) or from the program information specialist at (703) 993-4648. Consult website www.gse.gmu.edu.

Information about undergraduate initial teacher licensure for the music education programs in instrumental or vocal/choral emphasis is available in the Music Department at (703) 993-1380; and for the health/physical education program in the Department of Health, Fitness, and Recreation Resources at (703) 993-2060.

http://catalog.gmu.edu
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 Graduate Application and in program handbooks available in the GSE Office of Teacher Education (Robinson Hall, Room A307). More specific information is available at monthly information sessions, "Think You Want to be a Teacher?" Call (703) 993-2079 for dates and times. Distributed at these sessions are Graduate Applications, Praxis registration brochures, program handbooks, program requirements, and other essential information.

Information about master of education degree programs (M.Ed. in Counseling and Development, Curriculum and Instruction, Education Leadership, Instructional Technology, and Special Education) and graduate certificate programs is obtained from the program information specialist in Robinson Hall, Room A339 at (703) 993-4648. Information about the M.A. in New Professional Studies: Teaching can be obtained from the Initiatives in Educational Transformation office at (703) 993-8820. For information about the adult education track in the M.Ed. in Curriculum and Instruction, contact the Office of Adult Learning and Professional Development at (703) 993-3675.

Information about doctoral programs is available in the Ph.D. Office at (703) 993-2011 and in the National Center for Community College Education at (703) 993-3210. Generally, the application deadlines are April 1 for fall, November 1 for spring, and March 1 for summer. Some programs may have different application deadlines. Contact the GSE Admissions Office in Robinson Hall, Room A308 or at (703) 993-2144 for specifics.

General Admission Requirements
1. Baccalaureate degree from an accredited institution of higher education.
2. A 3.000 GPA (on a 4.000 scale) or better in the last 60 credits of undergraduate study or compensating postbaccalaureate coursework. Some programs may offer provisional admission with a GPA of at least 2.750, 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 Graduate Application, page 10.
4. A goals statement. (Refer to page 8 in the Graduate Application.)
5. Two official copies of transcripts from each institution attended. (Transcript Request forms are on page 9 in the Graduate Application.)
6. Completed application form including a Virginia Domicile Classification form. (Refer to pages 5-8 in the Graduate Application.)
7. Nonrefundable application fee of $30, payable by check, money order, or credit card. (Refer to page 16 in the Graduate Application.)
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.

Professional Licensure
The Graduate School of Education is responsible for professional courses, special standards, and licensure recommendation for students desiring to complete requirements for licensure in state-approved and National Council for the Accreditation of Teacher Education (NCATE)-accredited programs preparing teachers, administrators, counselors, and related instructional personnel. The Virginia Board of Education has changed licensure regulations for school personnel, which has caused restructuring of many programs. Implementation of new programs in elementary education, education leadership, English as a second language (ESL), foreign languages, school counseling, and secondary education is anticipated in the spring of 2000.

Undergraduate Initial Licensure Programs

Music Education (PK-12)
Teacher licensure programs are available in instrumental or vocal/choral music education within the Department of Music in the College of Arts and Sciences. For information, call (703) 993-1380.

Physical Education/Health (PK-12)
A teacher licensure program is available within the Department of Health, Fitness, and Recreation Resources. For information, refer to the department's section in this chapter or call (703) 993-2060.

Graduate Initial Licensure Programs

Elementary Education (PK-6)
This licensure program with an M.Ed. in Curriculum and Instruction option is anticipated in the spring of 2000. It will prepare professionals to teach children in grades prekindergarten through six. There will be full-time and part-time program options; both require internship/student teaching. Students will be admitted for spring of each year. For updated information, attend an information session. Call (703) 993-2079 for dates and time or consult website www.gse.gmu.edu.

English as a Second Language (ESL)
This licensure program with an M.Ed. in Curriculum and Instruction option is anticipated in the spring of 2000. It will prepare professionals to teach English as a Second Language (ESL) in grades prekindergarten through twelve. The program will require internships/student teaching experiences at the elementary and middle or secondary levels. Students planning to teach ESL will be required to pass an oral proficiency interview and a writing sample in English. For updated information, attend an information session. Call (703) 993-2079 for dates and time or consult website www.gse.gmu.edu.

Fast-Train (Elementary K-8)
Fast-Train is an alternative teacher licensure program that prepares teachers for international assignments. The curriculum consists of six required education courses offered over a one-year period. Upon successful completion of course work and passing scores on the Praxis exams, participants receive a Statement of Eligibility. Upon completion of an internship requirement overseas—either one semester of student teaching or one year of teaching in an international school abroad—graduates can receive the K-8 Virginia license.
All courses have an international, multicultural emphasis reflecting the student populations abroad. The program can be completed on a part-time or full-time basis, though either schedule requires a year of enrollment. Each course includes a 20-hour field experience requirement. Fast-Train courses are applicable to an M.Ed. in Curriculum and Instruction: Bilingual/Multicultural Education.

For information about admission and program requirements, contact the coordinator of Fast-Train, in Robinson Hall, Room A451, or call (703) 993-3689.

**Foreign Languages (PK-12)**
This licensure program with an anticipated M.Ed. in Curriculum and Instruction option is planned for the spring of 2000. It will prepare professionals to teach specific foreign languages (Spanish, German, French, Latin, Russian, and Japanese) to students in grades prekindergarten through twelve. The program will require internship/student teaching experiences at the elementary and middle or secondary levels. For updated information, attend an information session. Call (703) 993-2079 for dates and time or consult website www.gse.gmu.edu.

**Secondary Education (6-12)**
This licensure program with an M.Ed. in Curriculum and Instruction option is anticipated for the spring of 2000. It will prepare professionals to teach adolescents in grades six through twelve. There will be full-time and part-time program options; both require internship/student teaching. Specific licensure areas will include biology, chemistry, earth science, English, history/social science, mathematics, and physics. Add-on endorsements will be available in speech communication and Algebra I. Students will be admitted for the spring of each year. For updated information, attend an information session. Call (703) 993-2079 for dates and time or consult website www.gse.gmu.edu.

**Special Education**
This licensure program with an M.Ed. in Special Education prepares professionals to teach children with special needs in three concentration areas: emotional disturbance/learning disabilities (K-12), severe disabilities (K-12), and special education early childhood (birth to age 5). All programs require internship/student teaching. Students can be admitted to the program in spring, summer, and fall. Course requirements vary from 33 to 54 credits depending on the program and prior course work. For updated information, attend an information session. Call (703) 993-2079 for dates and time or consult website www.gse.gmu.edu.

**Unified Transformative Early Education Model (UTEEM)**
This three-licensure program leads to an M.Ed. in Curriculum and Instruction and prepares professionals to work with culturally, linguistically, and ability-diverse young children and their families. Students completing this program are licensed in early childhood education, English as a second language, and special education early childhood. Participation in UTEEM requires a full-time, primarily daytime commitment for one summer and two academic years of integrated study and on-going practice as an intern in diverse school and community settings. Students are admitted to begin each fall semester. For updated information, attend an information session. Call (703) 993-2079 for dates and time or consult website www.gse.gmu.edu.

Graduate Add-On Endorsement Programs
Any teacher licensure category may be added to an existing license after completion of appropriate course work. In addition, students may pursue more than one licensure area at the same time by declaring one category as an initial endorsement and additional categories as add-on endorsements.

**GRADUATE DEGREE PROGRAMS**

1. **Counseling and Development, M.Ed.**
   This 37-credit program prepares students for careers as school counselors or as human development professionals in institutions of higher education. Two tracks are available: school counseling and development, and higher education counseling and development. 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. Persons with a master's degree in education or in a helping profession may apply to the program as a nondegree student leading to licensure as a school counselor. Applications are accepted for spring (deadline Oct. 1) and fall (deadline March 1) sessions. For updated information, call (703) 993-4648 or consult website www.gse.gmu.edu.

2. **Curriculum and Instruction, M.Ed.**
   The Master of Education in Curriculum and Instruction is offered as an option for persons preparing for initial teacher licensure (see descriptions above), and also in four tracks (one proposed) for persons who are licensed or experienced educators. The tracks are as follows:

   a. **Adult Education**
      This 30-hour 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 a 10-month period (Sept.-June). Students may enter the cohort in either September or February. The remaining course requirements, including a 12-hour individual specialization, 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 updated information, call the Office of Adult Learning and Professional Development at (703) 993-3675 or consult website www.gse.gmu.edu.

   b. **Advanced Studies in Teaching and Learning**
      This proposed track is based on the propositions of the National Board for Professional Teaching Standards (NBPTS) and Virginia's Standards of Learning (SOL). The program 1) develops teacher leaders who practice reflection through action research, problem-based learning, and self-inquiry; and 2) develops teacher expertise in a specialization 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 specialization courses including restricted electives.
The program has three alternatives:
1. Educators who do not have a master's degree may apply for the entire 30-credit degree program.
2. Educators who have a master's degree but would like advanced preparation in a particular specialization may apply only for an 18-credit certificate in early childhood, history/social science, mathematics, science, or literacy (which leads to a Virginia reading specialist license).
3. Educators who have a master's degree but would like advanced preparation in teacher leadership or who are interested in sitting for national board certification may apply only for the 12-credit core.

For updated information, contact the program information specialist at (703) 993-4648 or consult website www.gse.gmu.edu.

**Bilingual/Multicultural Education**

This interdepartmental program prepares professionals to work with a diverse population of individuals. This is not a teacher licensure program. Students take 30 credits, which may include elective courses from English, foreign languages, or other appropriate disciplines. Applications are accepted for spring, summer, and fall semesters. For updated program information, contact the program information specialist at (703) 993-4648 or consult website www.gse.gmu.edu.

**English as a Second Language (ESL)**

This interdepartmental program prepares professionals to work with a diverse population of individuals who are learning to speak English. This is not a teacher licensure program. However, ESL (PK-12) may be added to an existing teacher license. Students take 30 credits, which include an elective course from English or education programs. Applications are accepted for spring, summer, and fall sessions. For updated program information, contact the program information specialist at (703) 993-4648 or consult website www.gse.gmu.edu.

**Education Leadership, M.Ed.**

This program prepares educators interested in administrative and supervisory roles such as principal, assistant principal, department chairperson, team leader, supervisor, or director of instruction. This program requires 39 credits, including a culminating 6-credit internship. Graduates are eligible for licensure. Applications are accepted for each semester. For updated information, call (703) 993-3636 or consult website www.gse.gmu.edu.

**Instructional Technology, M.Ed.**

This 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/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 programs include internships, practica, or relevant projects. Required course work varies from 36 to 40 credits. In addition, three 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. For updated information, attend an information session. Call (703) 993-2079 for dates and time or consult website www.gse.gmu.edu.

**New Professional Studies: Teaching, M.A.**

A teaching track of the New Professional Studies program is offered only to teams of experienced teachers from school divisions that contract with Initiatives in Educational Transformation (IET). Participants follow a two-year, three-summer integrated program of school-based research linked to a subject specialization.

The degree is dedicated to the examination of four central questions: How do we understand ourselves as people and as teachers? How do we create knowledge of our world through the forms and genres of language? How do we seek knowledge and understanding of our world, students, classrooms, and schools? How do we build learning communities and reflective practice?

The degree program is grounded in seven seminal features: curriculum and pedagogy as primary intellectual and practical interests; work in teams; reflective practice; school-based inquiry; intensive scheduling; integrated technology; and continuous improvement.

Students develop ways to use "information highways" for research and curriculum development and to confer with other educators about research, curriculum development, and theory nationally and internationally. Students are expected to have easy access to a computer that runs Netscape Navigator or Microsoft Internet Explorer. Applicants to the M.A. in New Professional Studies: Teaching, must do the following:

1. Meet the university’s general graduation admission requirement (GPA of 3.000 or better in last 60 credits of undergraduate study).
2. Be certified as teachers or have several years of successful experience as a teacher/trainer or educational administrator.
3. Be a member of a teacher team.
4. Submit a letter from the school principal endorsing the team.
5. Submit a team goals statement.
6. Be recommended for acceptance.

Students complete 30 credits of course work. During the first year, they complete a research project in their own classroom. In the second year, they complete a team research project that spans classrooms. Teams are expected to meet weekly and teachers are asked to journal and participate in web-based discussions tied to classroom work.

The specific information about required course work is available from the IET administrative office at the Prince William Campus, Manassas, VA 20110. Call (703) 993-8320, fax: (703) 993-8321, or e-mail: iet@gmu.edu.

**Special Education, M.Ed.**

Persons with a current teaching license may complete a master's degree leading to an endorsement in a concentration of special education: emotional disturbance/learning disabilities (K-12), severe disabilities (K-12), and special education early childhood (birth to age 5). All programs require internship/student teaching. Students can be admitted to the program in the spring, summer, and fall. Course requirements vary from 33 to 54 credits depending on the program and prior course work. For most updated informa-
tion, attend an information session. Call (703) 993-2079 for dates and time or consult website www.gse.gmu.edu.

Education, Ph.D.
The Ph.D. in Education provides advanced professional education for experienced educational practitioners pursuing or planning careers in nontraditional and traditional 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 hours taken previously may be applied to the program. However, an individual's total program may require more credits than these minimum requirements depending on the individual'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, educational 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 15 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.

The purposes of residency are achieved in the Ph.D. program through a combination of core courses and seminars, and through continuous enrollment. These requirements include successful completion of the Leadership seminar and the Ways of Knowing seminar.

Candidates must enroll in a minimum of one three-credit internship designed to broaden their professional expertise. Internships may occur in a variety of settings. One three-credit internship must be taken in a setting that differs from the student's work setting. In all internships, the student works with university and on-site supervisors.

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. Graduate Record Examination test scores
7. A written goals statement relating study in the Ph.D. program to his or her educational and career plans

For further information about admission and program requirements, contact the Ph.D. Office at (703) 993-2011. Completed applications must be submitted to the GSE Graduate Admission Processing Center by February 1 for admission for the following summer or fall, or by September 1 for admission for the following January.

Community College Education, D.A.
The Doctor of Arts in Community College Education is administered by the National Center for Community College Education. Course work educates prospective community college professionals, teachers, and administrators and helps current community college faculty members become more effective teachers. The program emphasizes a broad knowledge base in the student's teaching field or in college administration. Students select courses from designated departments in the university to develop a program of study. Knowledge areas include academic administration, chemistry, communication, computer science, economics, electrical and computer engineering, English, health and physical education, higher education, history, information systems, mathematics, nursing, operations research, applied statistics, and sociology. Applications for other fields are considered where appropriate course work is available. Under the guidance of faculty advisors and the National Center's staff, entering students develop programs of study.

Admission Requirements
In addition to meeting the general admission requirements for graduate study, an applicant must do the following:

1. Visit the website at www.gse.gmu.edu/deparr/ncce to determine appropriateness of the program to academic goals.
2. Have experience teaching or in an administrative capacity at the community college level, or desire to be a community college professional.
3. Submit a completed application (applications are available from the National Center for Community College Education or from GSE's Graduate Admission Processing Center).
4. Submit a short statement (750 to 1,000 words) describing interest in the program and how it will help achieve career objectives.
5. Submit two writing samples if English is the knowledge area.
6. Submit GRE scores if sociology or history is the knowledge area.
7. Schedule an interview with the staff of the National Center for Community College Education when application is complete.
8. Submit three letters of recommendation.
9. Submit official transcripts of all college work.
10. Submit current resume.
11. Additional material may be required, depending on the applicant's background.

The program requires a minimum of 55 credits beyond the master's degree. Minimum requirements include:

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<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
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<tbody>
<tr>
<td>Knowledge area</td>
<td>24</td>
</tr>
<tr>
<td>Core curriculum</td>
<td>15</td>
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<tr>
<td>Internship</td>
<td>3</td>
</tr>
<tr>
<td>Doctoral dissertation</td>
<td>10</td>
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The remaining credits are completed in one or more of the above areas or in a field related to the student's knowledge area. The designation of these credits is determined by the National Center for Community College Education in consultation with the student. These credits may not be used to meet the minimum requirements in the knowledge area. For example, if a student is required to take more than 24 credits in the knowledge area, the credits are in addition to the 55 credits normally required in the program. The number of credits assigned to the knowledge area, core curriculum, internship, and doctoral dissertation may vary within the above guidelines. Departments may require additional course work in the knowledge area when the student has completed the master's degree in a field other than the designated knowledge area or when prior academic preparation is considered inadequate.

The knowledge area consists of courses in the student's teaching discipline or administration and may contain courses in related fields when appropriate and when approved by the knowledge area advisor. Each knowledge area department, working with the National Center for Community College Education, sets its own requirement, specifying a core set of courses and working with the student to develop a program of study consisting of advanced course work, directed reading, and independent study.

Students must complete a minimum of 15 credits in the core curriculum including the following:
- COMC 998 Doctoral Project/Research Preparation
- EDCC 892 Leadership
- EDCC 801 The Community College

Each student also chooses elective courses from the list below:
- COMC 897 Directed Reading in Community College Education
- EDCC 802 Community College Teaching through Learning Styles
- EDCC 805 Teaching Thinking
- EDCC 806 Seminar in Communication Skills for Teaching
- EDCC 892 Special Topics in Community College Education
- EDUC 840 Seminar in Adult Development and Learning
- EDUC/ENGL 695 Northern Virginia Writing Project In-service Program

Students must satisfactorily complete a minimum of three credits in an internship. A maximum of six credits may be earned through the internship. This may be in a teaching internship in a community college or a nonteaching internship, depending on the extent of the student's teaching experience. Nonteaching internships may be in community colleges, government, or business organizations.

Upon satisfactory completion of all course work and the internship, a student completes either a traditional comprehensive examination or a more nontraditional comprehensive examination demonstrating the student's mastery of the knowledge area and the core curriculum. Students must satisfactorily complete the examination or experience to be advanced to candidacy for the degree. A student must complete all degree requirements within five years following the semester of advancement to candidacy.

Upon advancement to candidacy, a student completes a written doctoral project. The amount of credit assigned to the project reflects the extent of the undertaking. However, a minimum of 10 project credits are required, of which 3 credits are earned in COMC 998 Doctoral Project/Research Preparation. The project is synthesizing in nature and must contribute new knowledge or reinterpretation of existing knowledge to the area being investigated. Doctoral projects must demonstrate high standards of scholarship and the ability to engage in independent research resulting in a substantial contribution to knowledge or practice in the field.

Students are advised by the staff of the National Center for Community College Education for the community college portion of their studies. In addition, each student is assigned an advisor in the knowledge area. Working with these advisors, students prepare a program of study and complete all program requirements.

Doctoral students are required to remain in continual registration, not including the summer session. The doctoral program of study must include a minimum of 36 graduate credits (600 or higher) taken at the university after admission to degree-seeking status.

Twelve credits beyond the master's degree may, with the permission of the student's knowledge area advisor, be applied toward the D.A. in Community College Education, provided that the course work is relevant and appropriate to the student's program of study. Credit applied toward the degree must have been earned within six years before admission to the doctoral program. Students who have not used this provision at the time of admission to the program may, with approval, complete up to 12 credits of approved course work at other institutions while enrolled in the doctoral program, and apply these credits to program requirements. The Consortium of Universities of the Washington Metropolitan Area affords students an opportunity to pursue doctoral studies at 10 area universities while paying George Mason tuition.

**GRADUATE CERTIFICATE PROGRAMS**

- **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 Multimedia Development**
  This 15-credit certificate program is offered to persons who would like to learn the technology associated with multimedia development. This program provides students with training on current and timely technology products as well as with an introduction to design and development of educational and training products.

- **Certificate in Assistive Technology**
  This 15-credit certificate program provides supplemental training to practitioners needing to use assistive technology with persons 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 persons with disabilities and need to apply assistive technology.
solutions within their specific discipline or school, work, home, or community setting.

**Certificate in Community College Education**

The graduate certificate in community college education is designed for master's degree graduates who are planning (or exploring the possibility of) a community college career. It combines course work on pedagogy and the community college with an internship under the guidance of an experienced teacher or administrator.

Completion of the certificate program does not guarantee the student a community college position. Nonetheless, those who earn the certificate will enter competition for community college positions with the advantage of having pertinent experience.

The certificate requires 18 credits beyond the master's degree; the student may complete either 9 credits of course work and 9 credits of a teaching or an administrative internship or 12 credits of course work and 6 credits of an internship. Students usually select course work from a core curriculum that focuses on applied teaching techniques. With the permission of the requisite department, however, students may substitute six credits of graduate courses in their teaching field for six credits of course work on teaching-related subjects. Students following an administrative strand will pursue related courses. Core curriculum offerings include the following:

EDCC 801 The Community College
EDCC 802 Community College Teaching through Learning Styles
EDCC 805 Teaching Thinking
EDCC 806 Seminar in Communication Skills for Teaching
EDCC 892 Special Topics in Community College Education
EDCC 892 Leadership

A maximum of three credits may, with the permission of the National Center for Community College Education, be transferred from another institution. At least six credits of George Mason course work must be completed before the student may enroll in an internship. The internship is an independent study course listed as COMC 885 Internship in Community College Education (1-6 credits).

Students admitted to the certificate program must hold a master's degree from an accredited institution in a subject area that is taught at the community college level. (These subject areas include most arts and sciences disciplines. Please check website www.gse.gmu.edu to be sure that the master's degree is applicable.)

**Health, Fitness, and Recreation Resources**

The Department of Health, Fitness, and Recreation Resources in the Graduate School of Education prepares students for careers in health-related education or services. The B.S.Ed. in Physical Education prepares students for a career in teaching (K-12) in either public or private schools. The B.S. in Health, Fitness, and Recreation Resources prepares students for supervisory and management careers in private and public recreation, health education, park systems, and fitness and health promotion agencies. The M.S. in Exercise, Fitness, and Health Promotion prepares professionals for advanced work in the field.

**Faculty**

Anderson, Bever, Goodale, Hamilton, Johnson, Kozlowski, Malloy, Miller, Norden, Rikard, Ruhling, Schack, Shaffer, B. Wiggins, D. Wiggins, Woodland, Wright

**Course Work**

The department offers all course work designated HEAL, PHED, and PRLS in the “Course Descriptions” chapter of this catalog. Lifelong fitness courses are offered for elective credit to George Mason students. These courses include PHED 108, 118, 140, 150, and 255.

**UNDERGRADUATE PROGRAMS**

**Physical Education, B.S.Ed.**

This degree prepares students for a career in teaching.

**Teacher Licensure (Certification) in Physical Education with Endorsement in Health Education**

**Degree Requirements**

The degree requires a minimum of 123 credits with the final semester devoted to student teaching. To enroll in student teaching, students must have a minimum 2.500 GPA.

<table>
<thead>
<tr>
<th>Language arts and culture</th>
<th>15</th>
</tr>
</thead>
<tbody>
<tr>
<td>English: ENGL 101 and 302</td>
<td>6</td>
</tr>
<tr>
<td>Oral communication: COMM 100</td>
<td>3</td>
</tr>
<tr>
<td>Literature (200-level)</td>
<td>3</td>
</tr>
<tr>
<td>Humanities:</td>
<td>3</td>
</tr>
<tr>
<td>art, music, theater, philosophy (except logic), religious studies, foreign language</td>
<td></td>
</tr>
</tbody>
</table>

**Behavioral and social sciences**

| HIST 121 or 122 | 3  |
| Select from the following: anthropology, economics, geography, government, history, sociology, psychology (must be from three different fields) | 9  |

**Required courses**

| BIOL 124,125 | 8  |
| MATH or CS | 3  |
| HEAL 110 | 3  |
| HEAL 205 | 4  |
| PRLS 316 | 3  |

**Professional sequence**

| PHED 201, 202, 300, 303, 304, 306, 308, 365, 373, 375, 403, 404, 450 | 60  |
| HEAL 220, 305, 310, 325, 330 |  |
| PRLS 410, 460 | |

**Methods**

| Either EDUC 300 or 522 | 3  |
| PHED 415 | 12  |

**Total credits**

123
Teacher Licensure (Certification)
This program in teacher education is accredited and approved by the National Council for Accreditation of Teacher Education and the Virginia State Department of Education. To be considered for licensure, students must have
1. completed or be in the process of completing 60 credits, 6 of which must have been taken at the university;
2. earned a minimum GPA of 2.500 for the most recently completed 60 credits of collegiate course work;
3. completed professional course work or be in the process of completing EDUC 300 or 522; BIOL 124 and 125; PHED 201, 202, 300, 303, 304, 306, 308, 365, 373, 375, 403, 404, 415, and 450;
4. passed Praxis I and II exams by the end of student teaching; and
5. successfully completed HEAL 110, 205, 220, 305, 310, 325, 330 and PRLS 316, 410, and 460 courses.

Student Teaching Application
Student teaching applications are available from the Department of Health, Fitness, and Recreation Resources (at Prince William and Fairfax) and the Office of Teacher Education (Graduate School of Education, Robinson Hall).

Students must maintain a GPA of at least 2.500 during their last 60 credits and in all professional courses (courses with BIOL, EDUC, HEAL, PHED, or PRLS prefixes).

Application deadlines: For student teaching during the fall semester—February 1 (advisor), February 15 (Office of Teacher Education); spring semester—September 1 (advisor), September 15 (Office of Teacher Education).

Health, Fitness, and Recreation Resources, B.S.
This degree prepares students for supervisory and managerial careers in private and public recreation, health education, park systems, and fitness and health promotion agencies. Students must select one of two professional concentrations: recreation resources management (22 credits) or exercise science/health promotion (21 credits).

Students may also complete a certificate program in environmental management (27 credits, see Biology section) or in gerontology (24 credits, see "College of Nursing and Health Science" chapter). Students interested in the environmental management certificate should take BIOL 213 and either BIOL 103 or 304; students interested in the gerontology certificate should take BIOL 124 and 125.

Degree Requirements
The degree requires either a minimum of 121 credits (exercise science/health promotion concentration) or 122 credits (recreation resources management concentration) with one semester devoted to an internship (12 credits, which is graded as Pass/Fail).

Social and behavioral sciences ........................................ 19
PSYC 100 .............................................. 3
GOVT 103 .................................................................. 3
ECON 103 .............................................. 3
GOVT 241 .................................................................. 3
SOCI 101 .................................................................. 3
SOCI 313 .................................................................. 4

Science ........................................................................... 11
CS 103 ...................................................................... 3
BIOL* ...................................................................... 8-10
*Exercise science/health promotion concentration
requires BIOL 124 and 125 (8). Recreation
resources management concentration requires either BIOL 103 (4) and BIOL 104 (4) or
BIOL 213 (4) and either BIOL 303 or 304 (4).

Required courses ............................................................ 31
HEAL 205, 220, 323, 450 ........................................ 13
PHED 303 ................................................................ 3
PRLS 310, 410, 415, 450, 460 .................................. 15

Professional concentrations
Recreation resources management ................................ 22
PRLS 210, 315, 317, 402, 405, 501, 526
or
Exercise science/health promotion ............................ 21
HEAL 330, 430 ....................................................... 6
PHED 300, 304, 365, 410, 450 .................................. 15

Internship ................................................................. 12
Electives ................................................................. 15

Total ........................................................................... 121-122

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
1. submit three letters of recommendation;
2. provide transcripts of all college course work;
3. forward Graduate Record Examination (GRE) or Miller Analogies Test (MAT) scores to George Mason University;
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; and
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:

<table>
<thead>
<tr>
<th>Credits</th>
<th>Course</th>
</tr>
</thead>
<tbody>
<tr>
<td>18</td>
<td>EFHP 606 Foundations of Exercise, Fitness, and Health Promotion</td>
</tr>
<tr>
<td>3</td>
<td>EFHP 610 Advanced Exercise Physiology</td>
</tr>
<tr>
<td>3</td>
<td>EFHP 611 Fitness Assessment: Theory and Practice</td>
</tr>
<tr>
<td>3</td>
<td>EFHP 614 Advanced Exercise Nutrition</td>
</tr>
<tr>
<td>3</td>
<td>EFHP 618 Exercise and Sport Psychology</td>
</tr>
<tr>
<td>3</td>
<td>EFHP 623 Research Design and Statistical Reasoning</td>
</tr>
</tbody>
</table>

Electives

6 credits (thesis option) or 12 credits (non-thesis 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.

Non-thesis Option

1. 18 credits compose the core
2. 12 credits compose the electives

Students who choose the 12-credit electives option 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 Learning Program, USDA Forest Service

The Distance Learning Program offers correspondence courses to equip journey-level employees in national forest lands management and natural resource recreation management with technical expertise. A growing population with enhanced appreciation for the outdoors and interest in natural resource-based recreation has had a significant impact on public lands and has intensified the demands on national forests. Simultaneously, the expertise required to plan and manage lands and natural resource recreation programs has increased while the number of skilled employees has decreased. These courses are designed to help meet staff development of the Forest Service employees and other public land managers.

Interactive electronic options such as the Internet, interactive CD, and video are being developed to enhance the means of conveying this vital information. The courses are rigorously designed to give lands and recreation resource managers the latest information on philosophy, law, regulation, policy, and research results (or findings) to increase and maintain professional competencies. Courses are divided into two series, National Forest Lands Management and Natural Resource Recreation Management, with seven courses in each series. The National Forest Lands Management series combines elements of natural resource management with lands program management. The Natural Resource Recreation Management series combines elements of natural resource management with recreation planning and management. Completion of all courses in the Lands or Recreation series is recognized with a certificate from the chief of the Forest Service.

An open-enrollment policy allows registration at any time during the year. Enrollment via the Internet is available at dip.gmu.edu. Each course should be completed in six months. Submitting an extension request and payment of an extension fee ($100) entitles an additional six-month extension to complete a course. Extension fees are required for each course. Students not completing courses within 12 months will be withdrawn. The program recommends enrollment in one course at a time.

A study guide is provided for each course that is available in the correspondence format. Study guides contain instructional units that detail course objectives, identify required and optional reading assignments, and provide course material. Following each instructional unit are review questions, which must be completed and submitted to the Distance Learning Program office before taking the final exam. Answers are reviewed and returned along with suggestions about further study and review to prepare for the final exam.

Courses enhanced electronically require a computer and modem capable of accessing the Internet and the most up-to-date version of Netscape or Internet Explorer. Courses are available on the Internet contain course objectives, identify required and optional reading, and provide assignments and the necessary course material; however, they are designed with interactive elements that must be completed and submitted before completion of the course. PRLS 542 Foundations of Federal Land Management is required before taking all other Distance Learning Program courses.

Concentration in Recreation Resources Management, M.A.I.S.

The Department of Health, Fitness, and Recreation Resources Management 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 in the field of recreation and natural resource 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.

For More Information

Direct questions to William Woodland, national training coordinator, Lands and Recreation, (703) 993-8302, or send e-mail to wwoodlan@fs.fed.us or wwoodlan@gmu.edu; or to Susan Beale, administrative assistant, (703) 993-8301, or send e-mail to sbeale@fs.fed.us or to sbeale@gmu.edu, or fax to (703) 993-8300.

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The School of Information Technology and Engineering (IT&E) at George Mason University is concerned primarily with study areas that involve integrating the information basis 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 14 degree programs that concentrate on important contemporary technological issues and needs. Five bachelor’s degree programs are offered: computer engineering, computer science, electrical engineering, systems engineering, and urban systems engineering. Minors in information technology, computer science, and data analysis are also available.

Eight master’s degree programs are available: computer science, electrical engineering, information systems, operations research and management science, software systems engineering, statistical science, systems engineering, and urban systems engineering. A single cross-disciplinary doctoral program is offered in information technology. Undergraduate certificates are offered in applied statistics and operations research and engineering. For graduate students, certificate programs are offered in 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 systems engineering; and VLSI design/ manufacturing.

The undergraduate degree programs prepare graduates to enter directly into professional employment or to continue studies at the graduate level. The requirements for the bachelor’s degrees include required and elective courses in mathematics, humanities, and general education, and specialty courses in computer science, electrical engineering, systems engineering, and urban systems engineering. Each program strongly emphasizes English composition and communication.

Students also have the opportunity to develop interest areas in other fields within IT&E that offer undergraduate courses but do not now have undergraduate majors. The Bachelor of Individualized Study (B.I.S.) degree program may appeal to adult students who have completed a substantial portion of their studies at other institutions.
School of Information Technology & Engineering

Administration
Lloyd Griffiths, Dean
W. Murray Black, Associate Dean for Administration
Stephen G. Nash, Associate Dean for Research and Graduate Studies
E. Bernard White, Assistant Dean for Undergraduate Studies
Eugene M. Norris, Director of Professional Education Programs
Sandra T. Buckles, Director of Engineering Computing and Resource Management
Deborah Rosenberg Malafsky, Director of Development

Mission
The undergraduate education mission of the School of Information Technology and Engineering is to provide a quality education in support of the needs of Virginia and the nation.

The goal of the IT&E undergraduate programs is to graduate students who
1. are technically competent;
2. are prepared for ethical professional practice;
3. can communicate effectively;
4. can work as members or leaders of technical teams;
5. are prepared for a lifetime of learning; and
6. understand the global nature and impact of information technology and engineering.

Degree Requirements
The following general requirements for a Bachelor of Science degree must be completed by all undergraduate students in majors in IT&E:
1. Completion of at least 120 credits of academic work
2. Completion of at least 6 credits of English composition and 6 credits of literature
3. Completion of at least 12 additional credits in the humanities and social sciences; 6 of these credits must be chosen from the social science areas of anthropology, economics, geography, government, history, linguistics, psychology, and sociology
4. Completion of the requirements for the major as listed under the curricula for computer engineering, computer science, electrical engineering, systems engineering, or urban systems engineering
5. Completion of an acceptable plan of study formulated by the student and his or her advisor

Freshmen who are undecided about their specific majors within IT&E may select IT&E Undeclared as their major. 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, humanities, and social sciences courses.

Students should consult the Baccalaureate Degree Requirements section under the “Academic Policies” chapter in this catalog for detailed information concerning requirements for graduation, English composition, core courses for the selected major, residence, and academic quality for graduation with a major in computer engineering, computer science, electrical engineering, systems engineering, or urban systems engineering. Students should also consult the “Academic Policies” chapter of this catalog for additional university requirements for minor programs. The portion of the catalog that concerns the Office of Academic Affairs discusses the requirements for the B.I.S. degree. The requirements for the computer engineering, computer science, electrical engineering, systems engineering, and urban systems engineering undergraduate degree programs are provided in the sections associated with the academic departments offering the degrees.

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 specific writing-intensive course requirements for a degree, please refer to the major program descriptions in the following sections.

Combined B.S./M.S. Programs
Each of the B.S. degree programs offered within IT&E may be packaged with some of the M.S. degree programs below in ways that reduce the total number of credits required. Details may be found in the individual sections.

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 nine credits of core courses. Beyond these requirements, the student is free to define a technical focus area. The focus area must be composed of a cohesive set of at least two courses (six credits) that relate to a common technological theme. Elective courses selected for the technical focus area must be approved by the IT&E program advisor for the IT minor.

Core Courses

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>INFT 101</td>
<td>Introduction to Information Technology</td>
<td>3</td>
</tr>
<tr>
<td>INFT 103</td>
<td>Introduction to Computing</td>
<td>3</td>
</tr>
<tr>
<td>INFT 108</td>
<td>Programming Fundamentals</td>
<td>3</td>
</tr>
</tbody>
</table>

Master of Science

Degree Requirements
IT&E offers eight master of science programs in its six academic departments. Policies regarding admission and degree requirements are provided in the sections associated with the respective academic departments that follow.
IT&E provides multiple labs equipped with Microsoft NT workstations, Windows 95 PCs, Sun workstations, Network Computing Device workstations, and SGI graphical workstations, as well as other manufacturers. The IT&E central system computers are clustered into UNIX and NT networks that support the student labs and faculty 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 Information Technology, a program that builds on a fundamental core and emphasizes cross-disciplinary efforts between the eight master’s programs in IT&E, as well as with related units at George Mason University. Specific entrance and degree requirements of the doctoral program are found in the Information Technology section.

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 3.000 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 3.000 or those with a nonengineering background are varied, and applications are reviewed in the department on an individual basis.

Nondegree students may take up to 12 credits and are required to have an approved Course Request Form before registering each semester. Approval of a specific course does not imply that the course section will be open at the time of registration.

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) 993-1512, 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 networked time-sharing facilities. All laboratories are networked and include access to local and remote servers as well as the Internet.

Applied and Engineering Statistics

Faculty

Professors: Carr, Gantz, Gentle, Greenberg, D. Miller, Wegman (chair)
Associate professors: Bolstein, Habib, J. Miller, C. Sutton
Assistant professor: Bell
Adjunct professors: Andersen, Davis, Faxon, Martinez, Sims, Sirgany, Solka

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 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, 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 & 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 yet offer an undergraduate degree in statistics, a variety of advanced 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, urban systems engineering, or mathematics. Undergraduates majoring in other discipline areas may be admitted to the certificate program at the discretion of the department.

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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.

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, 457, 463, 498, 499, 544, 574 and OR 435, 442, 481.

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, College of Nursing and Health Science, and the College of Arts and Sciences. The minor requires 15 credit hours (five courses). The foundation of the minor is a two-course sequence, either STAT 250/350 or STAT 344/354, a course in statistical computing (STAT 362), and a course in data analysis (STAT 463). To complete the minor, an elective is chosen from a list of approved courses or with concurrence of the undergraduate program coordinator.

Program Requirements
This minor requires 15 credits, consisting of STAT 250/350 or STAT 344/354, STAT 362, STAT 463 and an elective chosen from STAT 455, 477, 544, 554, CS 450, 480, SYST 473, or USE 410.

GRADUATE PROGRAMS

Statistical Science, M.S.
Statistical science is regarded as one of the oldest and most successful information technology subjects, focusing on the conversion of raw data into information. In this graduate program, students are trained in the theory and practice of statistical methodology, particularly as they impinge upon high-technology applications.

The M.S. program can be thought of in matrix form, one dimension offering a choice of research or professional options and the other dimension offering a choice of subject emphases, including federal statistics, computational statistics, statistical signal processing, applied statistics, and engineering statistics. The research option is intended for students planning to continue for the Ph.D. degree or to begin or continue careers in statistical methodology research. The professional option provides M.S. degree qualifications to those seeking an expanded knowledge base in modern statistical theory and practice, but not wishing to pursue a research career. Such students might plan to work in applied statistics, go on to professional schools, teach statistics at a secondary level, or pursue other careers in which advanced work in statistical methodology is necessary or advantageous but in which independent research is not involved.

Admission Requirements
In addition to satisfying the general admission requirements for graduate study, all applicants to this program must do the following:

1. Hold a bachelor's degree from an accredited institution with an appropriate undergraduate major. Examples include mathematics, computer science, statistics, and electrical engineering. Applicants must have advanced preparation in mathematics, including calculus or real analysis, basic statistics and probability, and matrix theory or linear algebra.

2. Demonstrate basic computer literacy.

The GRE is not required. It is recommended particularly for those students wishing to compete for graduate teaching assistantships, fellowships, or research assistantships.

Degree Requirements
Students in both the research and professional options 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

The core course work covers the basic elements of statistics at the graduate level. Applied Probability (STAT 544) covers the major mathematical framework for statistical theory and practice. Statistical Inference (STAT 652) provides basic statistical theory. After completing this course, students have the theoretical basis from which statistical methods are derived.

Applied Statistics (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 Regression Analysis (STAT 656), which focuses on determining the relationship between two or more quantities possibly measured with error, particularly with emphasis on broad scientific and technological applications. From these basic elements, the perspective M.S. student may choose one of five defined emphases or may, with the concurrence of his or her advisor, design a customized curriculum. The defined emphases are (1) applied statistics, (2) federal statistics, (3) computational statistics, (4) statistical signal processing, and (5) engineering statistics. Other courses may be chosen from any graduate STAT courses, except STAT 510, 512 and 530. STAT 679 and STAT 798 may be repeated for credit with departmental approval. Also, many courses from other departments may be chosen with departmental approval.

Professional Option
The professional option focuses on the completion of course work in modern statistical theory and practice. The basic course work requirements include 30 credits. Twelve credits must be 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 in this program are encouraged to pursue a broad background in statistical

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science and may elect to concentrate on applications of statistical methodology to other disciplinary areas. A student would normally complete the degree by taking 10 three-credit courses with no written reports such as a thesis and no oral examination. A student would have to satisfy the general degree requirements for graduate study.

A student in the professional option may 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 will take 27 credit of in-class work and three credit of STAT 798 Master’s Essay. Students opting not to write an essay must take 30 credits of in-class 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 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 degree requirements for graduate study, candidates for 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.

**Combined B.S./M.S. in Applied Statistics**

The combined B.S./M.S. degree option provides a way for George Mason students to earn an M.S. in Statistical Science in a shorter period of time than if they had 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&EE 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 combined B.S./M.S. program consists of a minimum of 144 credits that satisfy the requirements for both the B.S. 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.

**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 who support the statistical system.

**Admission Requirements**

Potential candidates should have a bachelor's degree, including at least two courses in statistics and/or mathematics. Applicants typically have degrees in diverse fields such 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 and consist of the following:

- STAT 554 Applied Statistics
- STAT 574 Survey Sampling I
- STAT 634 Case Studies in Data Analysis
- STAT 663 Statistical Graphics and Data Exploration
- STAT 673 Statistical Methods for Longitudinal Data Analysis
- STAT 674 Survey Sampling II
- STAT 679 Topics in Survey Design and Analysis

All these courses may be used for credit toward the M.S. in Statistical Science. Students with a minimal background in mathematics or statistics should consider taking STAT 530. STAT 530 is intended to enhance a student's background and does not count toward the certificate.
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.

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 in the area of signal processing. Course work for the graduate certificate can be used for credit towards 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. Interested persons not already in a George Mason degree program should apply for admission in nondegree status.

Certificate Requirements
The certificate consists of five graduate courses (15 credits) in the area of signal processing. A cumulative GPA of 3.00 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 taken by all students and three elective courses.

Foundation Courses
- STAT 544 Applied Probability or ECE 528 Random Processes in Electrical or Computer Engineering
- ECE 535 Digital Signal Processing

Elective Courses
- ECE 638 Fast Algorithms and Architectures for Digital Signal Processing
- ECE 665 Optical Signal Processing
- ECE 728 Random Processes in Electrical Engineering, II
- ECE 734 Detection and Estimation Theory
- ECE 735 Data Compression with Applications to Speech and Image Processing
- ECE 738 Advanced Digital Signal Processing
- STAT 652 Statistical Inference
- STAT 658 Time Series Analysis and Forecasting
- STAT 662 Multivariate Statistical Methods
- INFT 746 Stochastic Calculus
- INFT 776 Real Analysis and Statistics

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. The Ph.D. in Computational Sciences and Informatics has an emphasis in computational statistics with a basic science focus. Both degrees are interdisciplinary and allow the student a broad range of course and research options. These programs are described elsewhere in this catalog. Advanced courses in statistics at the Ph.D. level are also listed under the respective Ph.D. program descriptions.

Civil, Environmental, and Infrastructure Engineering

Faculty
Professors: Bronzini, Houck (chair)
Associate professors: Arciszewski, deMonsabert, Rathbone
Adjunct professors: Chase, Freas, Gagne, Harrop-Williams, Matusik, Randall, Shacochis, Spencer, Szykman, Ward
Visiting professors: Ryan

Introduction
The Civil, Environmental, and Infrastructure Engineering (CEIE) Department administers two degree programs: the Bachelor of Science and Master of Science in Urban Systems Engineering. These degree programs complement the study of civil and environmental engineering with advances in information technology, and they focus on the physical and organizational infrastructure essential to the functioning of an urban society. The B.S. in Urban Systems Engineering is accredited by the Accreditation Board for Engineering and Technology, Inc. (ABET).

Urban systems engineering is the study of land, transportation, water, energy, and telecommunications systems from a civil engineering perspective, within a complex social, political, economic, and environmental context. The focus of the program is on how these systems are successfully conceived, developed, designed, built, operated, maintained, and renewed in the built environment such as the Washington metropolitan area.

An urban society thrives and prospers when adequate, appropriate, reliable, robust, and cost-effective infrastructure systems to support the functioning of the society are provided. The investment in existing infrastructure and other urban systems in the United States is enormous. The investment required to maintain, operate, renew, and manage the evolution of these urban systems in the future is even greater. The need for highly educated professionals to confront and solve these continuing vital problems is pressing. Examples of urban systems include water supply and distribution; streets, roads, and highways; wastewater management; transit; stormwater management; public utilities; energy supply and distribution; telecommunications; buildings, facilities, and structures; and solid waste management.
Course Work
The Civil, Environmental, and Infrastructure Engineering Department offers courses with the designator USE in the “Course Descriptions” chapter of this catalog.

UNDERGRADUATE PROGRAM

Urban Systems Engineering, B.S.
The bachelor's degree program includes a solid foundation in the theory of urban systems engineering. Students benefit from exposure to practical civil, environmental, and infrastructure engineering problems and their solutions in the classroom, lab, and field. There is also the opportunity for students to work as junior engineers each summer. Graduates of the program are expected to effectively communicate orally, in written work, and visually; to develop and apply information technology to civil engineering problems; to be motivated to a lifelong process of learning; to enter the civil engineering profession as productive junior engineers; and to solve problems in the civil engineering domain specifically including (1) integration across traditional civil engineering disciplines such as transportation, environment, structures, construction, geotechnical, etc., (2) incorporate such elements as social, political, and economic considerations, and (3) include a conscious life-cycle costing philosophy.

The urban systems 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
In addition to the general requirements for the B.S. degree, students must meet the specific requirements for this degree.

Degree requirements for the B.S. in Urban Engineering include 120 credit hours distributed in courses in three main areas:

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mathematics and basic science</td>
<td>30</td>
</tr>
<tr>
<td>CHEM 251; MATH 113, 114, 213, 214; PHYS 160, 260, 261, 266; STAT 344</td>
<td></td>
</tr>
<tr>
<td>Humanities and social sciences</td>
<td>24</td>
</tr>
<tr>
<td>COMM 100; ECON 103; ENGL 101, 302;</td>
<td></td>
</tr>
<tr>
<td>Literature electives</td>
<td>6</td>
</tr>
<tr>
<td>Social science elective (PSYC 100 is</td>
<td>3</td>
</tr>
<tr>
<td>recommended)</td>
<td></td>
</tr>
<tr>
<td>Humanities or social science elective</td>
<td>3</td>
</tr>
<tr>
<td>Civil, environmental, and infrastructure</td>
<td>66</td>
</tr>
<tr>
<td>engineering analysis and design</td>
<td></td>
</tr>
<tr>
<td>CS 112; ENGR 107, 183, 210, 310; USE 230,</td>
<td></td>
</tr>
<tr>
<td>290, 300, 301, 305, 311, 340, 365, 367, 400,</td>
<td></td>
</tr>
<tr>
<td>440, 455, 463, 490</td>
<td></td>
</tr>
<tr>
<td>Technical electives</td>
<td>9</td>
</tr>
</tbody>
</table>

The prerequisite structure for courses in any engineering curriculum is extensive and complex. 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. For a sample schedule that observes all the course prerequisites, please consult the program's website through the university's main page (www.gmu.edu) or visit one of the CEIE faculty.

All electives must be selected with the advice and approval of the academic advisor. The technical electives must include at least six credits of USE-designated courses. ECE 285 is recommended as a technical elective for those students preparing for the Fundamentals of Engineering exam.

Writing-Intensive Requirement
The university's writing-intensive requirement for urban systems engineering majors is satisfied by the successful completion of USE 400.

GRADUATE PROGRAM

Urban Systems Engineering, M.S.
The M.S. program educates students in the theory and practice of urban systems engineering. Information technology and automated tools for analyzing and solving urban systems problems are important components of the program. The urban systems 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 urban systems 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. 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 Urban Systems Engineering program includes three core courses, one methods course, electives selected by the student with the aid of a faculty advisor, and a thesis or urban systems engineering project. 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 urban systems engineering, and for introducing the application of information technology and the systems approach to analyzing and solving problems in urban systems engineering.

USE 600 Infrastructure Planning and Management
USE 601 CEIE Modeling and Problem Solving
SYST 530 System Management and Evaluation

Methods Courses
Students must complete at least one of these courses:

USE 585 Automated Support Tools for Urban Systems Engineers
USE 670 Urban Systems Decision Methods and Tools
USE 680 Spatial Decision Support Systems
USE 685 Urban Systems Engineering Information Management
or other appropriate methods courses such as SYST 510, 520; OR 541, 542; and STAT 544, 554, 574.

Areas of Emphasis
Each student must select an additional four or five electives that together constitute an area of emphasis. 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:

Transportation Systems Engineering
Construction Management
Environmental Systems Engineering
Engineering Management
Water Resource Systems Engineering
Facilities Management

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

Faculty
Professors: DeJong, Demning, Hamburger (chair), Menasce, Michalski, Rine, Sood, Tecuci, Wechsler
Associate professors: Carver, Norris, Pullen, Quammen, Richards, Setia, Wang
Assistant professors: Chen, Duric, Huang, Simon, White
Instructors: Maney, Marchant, Nordstrom
Adjunct professors: Ashton, Berlin, Bloedorn, Doughty, Erwin, Howes, Jamison, Mukherji, Nada, Shoukat

Course Work
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.

The Computer Science Department offers courses designated CS in the "Course Descriptions" chapter of this catalog.

The computer science program is accredited by the Computer Science Accreditation Board.

 UNDERGRADUATE PROGRAMS

Computer Science, B.S.
In addition to the general IT&E degree requirements for a B.S. degree, the following courses are required:

2. Senior computer science: Any four of the following: CS 440, 450, 451, 455, 471, 475, 480, 490. Total credits: 12
3. Mathematics: MATH 113, 114, 125, 203, 213; OR 481; STAT 344; and ECE 301 for a total of 26 credits.
4. Computer science-related courses: six credits chosen from STAT 354; OR 435, 441, 442; ECE 285, 431, 442, 511, 512; SYST 471; PHIL 371, 376, 422; any MATH or CS course numbered above 300. Students may need to choose electives to satisfy the prerequisites of these courses.
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: Computer science students in this course must make a technical presentation. The course counts for three credits of humanities within the humanities and social science requirement of IT&E.

Students are strongly encouraged to obtain and follow the sample schedule published by the department to ensure that course prerequisites are satisfied. Students must file a formal plan of study with the department and confer with their advisors each semester to ensure that degree requirements are met.

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 CS 103, 112, 211, or 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 for credit in that course.
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 provide feedback from the perspective of professional expository writing.

Grades

A student must earn a C or better in any course intended to satisfy a prerequisite for a computer science course.

A student may not use more than one course with a grade of D toward the requirements for a computer science major.

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.

 Combined B.S./M.S. in Computer Science

The combined B.S./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 can apply for the combined B.S./M.S. in Computer Science program if they have earned 90 undergraduate credits with an overall GPA of at least 3.000. Criteria for admission to the combined B.S./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 six credits overlap.
2. Students register for six credits of CS 500-level core courses in place of the corresponding CS 400-level courses. That is, students must register for two of the following courses: CS 540, 571, 580, or 583, in place of the corresponding 400-level courses.
3. Students in the combined B.S./M.S. program are permitted to take additional graduate core courses in their undergraduate program. In such cases, the students must satisfy the core requirements for the M.S. by taking more advanced courses from the same areas of emphasis. 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 area corresponding to CS 540 Systems, to satisfy the core requirements for the M.S.

Degree Conferal

1. Students in the combined B.S./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.
2. At the completion of the M.S. requirements, a master's degree will be 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. In addition, two computer science courses are needed, selected from CS 265, 330, 332, 362, 363, 365, 421, 440, 450, 451, 455, 471, 475, 480, and 483.

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 credit hours of courses, beyond the 120 credits required for the computer science degree, according to an approved plan of study. Details are available through the George Mason website at http://www.gmu.edu.

Graduate Program

Computer Science, M.S.

The M.S. in Computer Science is for those interested in computer software technology. The program encompasses the depth of knowledge needed to pursue more advanced work in computer science or allied areas. Graduate classes are offered in the late afternoon and evening to accommodate the professionally employed student. Financial aid in the form of graduate assistantships may be available for full-time, degree-seeking students.

The department offers courses in the core areas of computer science with optional M.S. emphases in artificial intelligence, software engineering, parallel/distributed computing, image processing/graphics, computer systems, and networks. A list of the courses in each of these emphases is obtainable in the department office. A student can specialize by taking at least 12 noncore credits, including M.S. thesis or project from one emphasis area.

A certificate in software systems engineering is also available with an M.S. in Computer Science. For information on this certificate, please refer to the software systems engineering program. Appropriate courses may be transferred, with advisor approval, into the George Mason degree program. Students may take courses through the Commonwealth Graduate Engineering Program.

The department actively participates in the program leading to the Ph.D. in Information Technology in IT&E.

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.

http://catalog.gmu.edu
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 the following:

1. Thirty credits of graduate courses, including the following:
   a. Twelve credits comprising the following core courses:
      CS 540 Language Processors
      CS 571 Operating Systems
      CS 580 Introduction to Artificial Intelligence
      CS 583 Analysis of Algorithms
   b. Twelve credits or more of computer science courses at the 600 level or above, which have at least one graduate computer science course as a prerequisite (excluding CS 798 and 799)
   c. Either three credits of CS 798, or three to six credits of CS 799, or one additional computer science course at the 600 level or above, which has at least one graduate computer science course as a prerequisite
   d. Additional graduate courses in computer science or in closely related fields, chosen with the written consent of the advisor. Three of the noncore courses should be taken from three of the five areas of emphasis. Courses listed under more than one emphasis count only once for satisfying this requirement.

2. For students electing the project or thesis option, presentation of the project or thesis at an appropriate forum approved by the department graduate committee

Ph.D. Study in Computer Science
Doctoral study in computer science 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.

Electrical and Computer Engineering

Faculty
Professors: Black, Cook, Gertler, Griffiths, Ioannou, Levis, Manitius (chair), Mulpuri, Tabak, Van Trees
Associate professors: Athale, Baraniecki, Beale, Berry, Ceperley, Chang, Ephraim, Haney, Hintz, Jabbari, Pachowicz, Paris, W. Sutton
Assistant professors: Gaj
Adjunct professors: Beatty, Finn, Gorman, Kreidl, Lyons, MacDonald, Matolak, Schumpert, Storey, Wasson, Yegenoglu

Course Work
The Electrical and Computer Engineering (ECE) Department offers all courses designated ECE in the “Course Descriptions” chapter of this catalog.

UNDERGRADUATE PROGRAMS
The undergraduate education mission of the Electrical and Computer Engineering Department is to provide a quality education for electrical engineering and computer engineering students in support of the needs of Virginia and the nation. The goals of the department are to

1. provide students with the fundamental knowledge and methodologies of electrical or computer engineering, including the opportunity to learn appropriate experimental and computational tools, essential for a successful career;
2. provide students with an awareness of, and skills in, lifelong learning and self education, and to be prepared for graduate studies in electrical or computer engineering or related areas;
3. cultivate teamwork, technical writing and oral communication skills;
4. provide students with an appreciation of engineering’s impact on society and the professional responsibilities of engineers; and
5. provide students with an opportunity to acquire an understanding of the engineering profession and to observe the use of cutting-edge technologies and advanced systems through direct interaction with industry, including internships and cooperative education experiences.

Electrical Engineering, B.S.
Electrical engineering is a major field of modern technology. Electrical engineers are involved in research, development, design, production, and operation of a wide variety of devices and systems, from integrated circuits and microwave and laser devices, to communication systems, control systems, radar, robots, large telecommunication networks, and power networks.
The bachelor's program in electrical engineering at George Mason is accredited by the Accreditation Board for Engineering and Technology and is staffed by 23 full-time professors, including five fellows of IEEE or other professional societies. The curriculum provides a strong background in the fundamentals of electrical engineering as well as senior-level courses in the important areas of electronics, communications and signal processing, computer engineering, and controls and robotics. Further, the curriculum includes nine credits of senior technical electives, two credits of advanced engineering labs, and three credits of Advanced Design Project, which may be used for further concentration in one of these areas.

Career opportunities exist in the areas of engineering research and development, system design, system integration, engineering management, engineering consultancy, technical sales, 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 ECE 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 engineering who are not declared majors also are invited to obtain advising at the ECE Department office. Students are strongly encouraged to obtain and follow a sample schedule published by the department to ensure that course prerequisites are satisfied.

Course requirements for the B.S. in Electrical Engineering are as follows:

- Computer science: CS 112, 211
- Economics: ECON 103
- Electrical and computer engineering: ECE 101, 201, 220, 280, 305, 320, 331, 332, 333, 334, 421, 433, 445, 460, 491, 492, 493
- Advanced ECE labs (2 credits)
- ECE technical electives (9 credits)
- Engineering: ENGR 107
- English: ENGL 101, 302; COMM 100
- Literature (6 credits)
- Humanities or social science (6 credits)
- Mathematics: MATH 113, 114, 203, 213, 214; STAT 344
- Physics: PHYS 160, 260, 261, 262, 263 (formerly 250, 350, 351, 352, 353)
- The two humanities/social science electives and the two literature electives should be selected from the department's list of approved courses. Three credits of humanities/social sciences electives must be in the disciplines of anthropology, economics (excluding the required ECON 103), geography, government, history, psychology, or sociology. Students must either take at least two humanities/social science courses from within the same academic area (i.e., two economics courses [ECON 103 plus another], two history courses, two psychology courses, etc.) or they must take at least one of the humanities or social science or literature electives at the 300 level or above.
- The ECE technical electives should be selected from the department's list of approved courses. The required design content must be satisfied by these electives.

Change of Major
Students who want to change their major 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.

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, and many others.

The curriculum provides a strong background in the fundamentals of computer engineering. A number of technical elective tracks 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.
Change of Major

Students who want to change their major 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.

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 one-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 17 credits of courses according to an approved plan of study. Details are available in the departmental brochures or through the university website at www.gmu.edu.

Certificate in Microelectronics Fabrication

The undergraduate certificate in microelectronics fabrication is intended for individuals working in industry who would like to acquire or broaden knowledge of semiconductor manufacturing at the college level. Credits earned as part of this certificate may be used as part of a B.S. degree.

Admission Requirements

Qualifications needed to enter the certificate program include either an associate of science degree or equivalent, or at least two years of college study with appropriate science courses.

Certificate Requirements

The certificate is awarded upon completion of five undergraduate courses (15 credits) in chemistry, physics, and electrical and computer engineering. A cumulative GPA of 2.000 is required. No D's can be submitted for the certificate. The certificate courses comprise three required core courses, and two elective courses. The latter two courses are to be chosen from a list of approved chemistry, physics, and electrical and computer engineering courses.

Core Courses

- CHEM 300 Chemistry of Semiconductor Processing
- PHYS 310 Physics of Semiconductor Materials and Processing
- ECE 437 Principles of Microelectronic Device Fabrication

After completing the core courses, students can choose two electives from a list of approved chemistry, physics, and electrical and computer engineering courses, or may request approval of other appropriate courses.
GRADUATE PROGRAMS

Graduate programs leading to the M.S. and Ph.D. degrees in engineering prepare students for careers in industry, government, or academia. The M.S. in Electrical Engineering is offered by the ECE Department, and contains several areas of emphasis, including one in computer engineering. A proposed M.S. in Computer Engineering is going through an approval process. The Ph.D. in Information Technology is offered by IT&E, and includes a number of courses with an electrical engineering emphasis. A new Ph.D. in Electrical and Computer Engineering program is going through an approval process. Details about these programs are available through the university website at [www.gmu.edu](http://www.gmu.edu).

The department is firmly committed to high standards of teaching and research in the vibrant areas of communications, signal and image processing, computer networks, computer engineering, control systems, intelligent systems, microelectronics, microwaves, optoelectronics, telecommunications, and bioacoustics. 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.

Electrical Engineering, M.S.

The courses in this program are offered during the evening or late afternoon hours to permit persons who are employed full time to enroll in the program. For those who enter the program on a full-time basis, some financial aid may be available in various forms such as teaching assistantships, research assistantships, work-study, or co-op agreements with local industry.

Students may take courses through the Commonwealth Graduate Engineering Program. Appropriate courses may be transferred, with advisor approval, into this George Mason degree program. The computer engineering emphasis is being converted to a full M.S. degree program for the 1999-2000 academic year, pending approval. Details are available in the ECE Department office or through the university website at [www.gmu.edu](http://www.gmu.edu).

Admission Requirements

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. To be considered for admission to the master's program, an applicant should have the following:

1. An earned baccalaureate 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.)

Admission Categories

Students may be admitted into one of the following categories: degree, provisional, or nondegree. Provisional admission is for students whose past performance provides reasonable, but not strong, evidence of their ability to pursue graduate work. To advance to degree status, provisional students must achieve a 3.000 GPA after 12 credits, remove all undergraduate deficiencies (by taking the corresponding courses with a grade of B or better), and receive a B or better in specific courses representing two of the four graduate core areas: ECE 521, 528, 546 or 548, and ECE 565 or 584. The nondegree category is used primarily by students who wish to take courses but not necessarily pursue a degree. Nondegree students who wish to enter the degree program must formally apply for admission.

Non-ECE Students

Students with B.S. or M.S. degrees in ECE-related disciplines (for example, computer science, mathematics, mechanical engineering, or physics) 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 previous paragraph. Such students may also be advised to take some courses from the undergraduate electrical or computer engineering curriculum, according to their intended area of specialization and specific background.

Transfer of Credit

Up to 12 credits, the maximum permitted, may be transferred from schools that are part of the Commonwealth Graduate Engineering Program. Up to six credits may be transferred from other graduate programs.

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 area of emphasis: communications and signal processing, computer engineering, control and robotics, or electronics and electromagnetics. The student then is assigned an academic advisor from that area. 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.

Degree Requirements

Course Work

Each student must complete a minimum of 30 graduate credits beyond the bachelor's degree. A minimum GPA of 3.000 is required. The plan of study for the degree includes the following:
1. A minimum of two core courses (with 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 Solid-State Device Theory or ECE 565 Introduction to Optical Electronics
2. A minimum of three courses with a grade of B or better at the 600 or 700 level (not including ECE 798 or 799) from a chosen emphasis.
3. A maximum of six credits of non-ECE courses, subject to prior departmental approval. Approved INFT courses that cover ECE topics may be taken for credit toward an M.S. in Electrical Engineering in addition to the six credits of non-ECE courses.

A maximum of two courses with a C grade may be applied toward the degree. However, all graduate courses are counted in computing the student’s GPA.

Seminar Requirement
All degree candidates must attend a minimum of 10 department seminars.

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. 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. Thesis students may not register for ECE 798 Research Project.

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 experiment, 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.

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 one of the five areas of emphasis in communications and networking—communication networks, optical communications, mobile communication systems, communication theory, and digital communications. Course work toward the graduate certificate can be used for credit toward the M.S. in Electrical 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. in Electrical Engineering. The certificate may be pursued concurrently with any of the graduate degree programs in IT&E.

Admission Requirements
The certificate program in communications and networking is open to all students who hold a B.S. degree in any scientific or engineering discipline from an accredited university.

Certificate Requirements
The certificate is awarded upon completion of five graduate courses (15 credits) in communications. 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, one core course, and two elective courses. The latter three courses are to be in the chosen emphasis.

Foundation Courses
- ECE 528 Random Processes in Electrical and Computer Engineering
- ECE 542 Computer Network Architectures and Protocols or CS 555 Computer Communications and Networking

Emphases
After completing the foundation courses, students can choose among the five emphases described below by taking three courses in that area, one of which is to be the corresponding core course. In rare cases, with prior approval from the chairman of the graduate committee, one elective course may be substituted with a course from a different emphasis.

1. Communication Networks: Core Course: ECE 642 Electives: ECE 643, 742; OR 635, 643, 647; INFT 834, 886
4. Communication Theory: Core Course: ECE 630 Electives: ECE 633, 636, 734, 735; INFT 886
5. Digital Communications: Core Course: ECE 631 Electives: ECE 535, 630, 636, 637, 639, 734, 738; INFT 886
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 can be used for credit toward the M.S. in Electrical Engineering or in 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 IT&E.

Admission Requirements
The certificate program in signal processing is open to all students who hold a B.S. degree in any scientific or engineering discipline from an accredited university, and are in graduate status (either degree or nondegree) in IT&E.

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 five 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 634 Digital Speech Processing
- ECE 635 Adaptive Signal Processing
- ECE 638 Fast Algorithms and Architectures for Digital Signal Processing
- STAT 652 Statistical Inference
- STAT 658 Time Series Analysis and Forecasting
- STAT 662 Multivariate Statistical Methods
- ECE 665 Optical Signal Processing
- ECE 728 Random Processes in Electrical and Computer Engineering II
- ECE 734 Detection and Estimation Theory
- ECE 735 Data Compression
- ECE 738 Advanced Digital Signal Processing
- INFT 746 Stochastic Calculus
- INFT 776 Real Analysis and Statistics
- INFT 841 Kalman Filtering with Applications

Certificate in VLSI Design/Manufacturing
The primary purpose of the certificate is to provide a well-targeted graduate-level continuing education possibility for people working in Northern Virginia's semiconductor and intellectual property business as well as every other interested person. This certificate is intended for the 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 proposed graduate certificate can later 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 IT&E.

Admission Requirements
The certificate program in VLSI design/manufacturing is open to all students who hold a B.S. degree in any scientific and engineering discipline and are currently holding a graduate student status (degree or nondegree) in IT&E. 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 level courses (15 credits). These five courses include a required foundation course, a compulsory core course, and three elective courses out of which at least two are in the selected concentration. A cumulative GPA of 3.000 is required, and at most, one course with a grade of C may be applied toward the certificate. At most, two courses 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) described below by taking four courses in that concentration, one of which is to 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 (pending)
- ECE 587 Design of Analog Integrated Circuits
- ECE 680 Physical VLSI Design
- ECE 645 VLSI Timing Issues (proposed)

VLSI Manufacturing Concentration

Core Course
- ECE 689 Semiconducting Materials

Electives
- ECE 586 Digital Integrated Circuits
- ECE 680 Physical VLSI Design
- ECE 745 ULSI Microelectronics
- ECE 746 ULSI Packaging (proposed)
Ph.D. Study in Electrical and Computer Engineering

Doctoral study in electrical engineering and computer engineering is currently 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 with ECE topics and research options. Students enrolled in that program may become eligible for transfer to the Ph.D. in Electrical and Computer Engineering program when it is approved. The electrical and computer engineering emphasis in the Ph.D. in Information Technology program is being converted to a Ph.D. in Electrical and Computer Engineering during the 1999-2000 academic year, pending approval. Additional information is available through the university website at www.gmu.edu.

Information and Software Engineering

Faculty
Professors: Gomaa, Jajodia (chair), Kerschberg, Motro, Rine, Sandhu, Sibley
Associate professors: Ammann, Barbara, Baum, Oftutt
Assistant professors: Bose, Brodsky, Wang
Adjunct professors: Alexander, Armour, Bechtold, Dinh, Fayad, Hanratty, Mills, Nguyen, Nidiffer

Course Work
The Department of Information and Software Engineering (ISE) offers courses designated INFS and SWSE 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 may also elect an information systems engineering emphasis in the systems engineering degree program.

GRADUATE PROGRAMS

Information Systems, M.S.
The M.S. in Information Systems is a professional degree program that focuses on the technical, managerial, and policy 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 practical aspects of specifying, designing, implementing, and managing 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 technical and management 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 office information systems, 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, network design and administration, systems integration, and the management of information systems.

The program is offered by the faculty of the ISE 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 technical and management skills. To ensure that students have an adequate background in mathematical methods, computer technology, and business knowledge, the program requires the following four foundation courses, or their equivalent:

- INFS 310 Program Structure and Design for Business Applications
- INFS 501 Discrete and Logical Structures for Information Systems
- INFS 515 Computer Organization
- INFS 590 Program Design and Data Structures

and 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

Applicants for the M.S. program should meet the following minimum entrance requirements:

1. Hold a baccalaureate degree from an accredited institution.
2. Have earned a GPA of 3.000 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). The applicable test should have been taken within five years of applying for admission.
4. Submit the appropriate application form with three letters of recommendation from persons directly knowledgeable of the applicant's professional and academic competence; and a one-page goals statement and 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 ISE Department holds an orientation meeting to advise newly admitted and continuing students. Members of the faculty are present to answer questions and to offer advice concerning programs of study.

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 five courses are required of all students:

- OR 540 Management Science
- INFS 601 Operating Systems Theory and Practice
- INFS 612 Data Communications and Distributed Processing
- 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

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 four courses. A list of approved courses is available from the department office. However, students may choose additional electives from offerings within IT&E with the consent of the faculty advisor. A thesis option is available; students may elect to complete a thesis for up to six elective credits.

Students may earn a certificate in software systems engineering by replacing the INFS 622 core course with SWSE 620, and by taking the following SWSE courses as electives:

- SWSE 619 Software Construction
- SWSE 621 Software Design

followed by two of the following as the remaining two electives:

- SWSE/CS 623 Formal Methods and Models in Software Engineering
- SWSE/CS 625 Software Project Management
- SWSE 630 Software Engineering Economics
- SWSE/CS 631 Object-Oriented Software Development
- SWSE/CS 632 User Interface Design and Development

Certificate in Information Engineering
The graduate certificate program in information engineering (INFE) has been designed for persons who are involved in the specification, design, implementation, and management of data- and knowledge-intensive information systems. The INFE 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.

Admission Requirements
Applicants to the INFE certificate program must have earned a GPA of 3.000 or better in the last 60 credits. Additionally, applicants must complete a self-assessment form, which can be obtained from the ISE 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 ISE 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 needs to complete the following:

- INFS 612 Data Communications and Distributed Processing
- INFS 614 Database Management
- SWSE 620 Software Requirements and Prototyping
- SWSE 621 Software Design

and one of the following:

- SWSE 625 Software Project Management
- INFS 770 Methods for Information Systems Engineering
Applicants may obtain more information by contacting the ISE Department, Science and Technology II, Room 330, (703) 993-1640.

**Certificate in Information Systems Security**
The graduate certificate program in information systems security (ISS) is intended for persons who are interested in science and methods for ensuring secrecy, integrity, and availability of information systems. The certificate in information systems security may be pursued concurrently with any of the graduate programs in IT&E.

**Admission Requirements**
Applicants to the ISS certificate program must have earned a GPA of 3.000 or better in the last 60 credits. Additionally, applicants must complete a self-assessment form, which can be obtained from the ISE 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 systems security 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 ISE 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 four courses (subject to satisfying equivalents of INFS 601, 612, and 614), with an average grade of B or better, for a total of 12 graduate credits. To obtain the certificate, a student needs to complete the following:

1. One compulsory course:
   - INFS 762 Information Security Principles

2. Three additional courses from the following:
   - INFS 765 Database and Distributed Systems Security
   - INFS 766 Internet Security Protocols
   - INFS 767 Secure Electronic Commerce
   - INFT 862 Formal Models for Computer Security (restricted to Ph.D. students)
   - INFT 962 Advanced Topics in Computer Security (restricted to Ph.D. students)

Applicants may obtain more information by contacting the ISE Department, Science and Technology II, Room 330, (703) 993-1640.

**Certificate in Software Systems Engineering**
The graduate certificate program in software systems 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 systems engineering. The certificate in software systems engineering may also be pursued concurrently with any of the graduate degree programs in IT&E.

**Admission Requirements**
Applicants to the software systems engineering certificate program must have earned a GPA of 3.000 or better in the last 60 credits. Additionally, applicants must complete a self-assessment form, which can be obtained from the ISE 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, discrete mathematics, and machine organization. The level of knowledge may also be achieved by taking the following George Mason University courses, which are referred to as the SWSE foundation courses:

- 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 ISE 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 needs to complete the following:

1. Three compulsory courses:
   - SWSE/CS 619 Software Construction
   - SWSE/CS 620 Software Requirements and Prototyping
   - SWSE/CS 621 Software Design

Applicants may obtain more information by contacting the ISE Department, Science and Technology II, Room 330, (703) 993-1640.
2. Two additional courses (subject to satisfying pre-requisites) from the following:

SWSE/CS 623 Formal Methods and Models in Software Engineering
SWSE/CS 625 Software Project Management
SWSE 630 Software Engineering Economics
SWSE/CS631 Object-Oriented Software Development
SWSE/CS 632 User Interface Design and Development
SWSE 637 Software Testing and Quality Assurance
SWSE/CS 706 Concurrent Software Systems
SWSE/CS 720 Advanced Software Requirements
SWSE/CS 721 Advanced Software Design Methods
SWSE/CS 735 Concurrency
SWSE 763 Software Engineering Experimentation

Computer science master's students who wish to obtain the certificate in software systems engineering should contact the ISE Department for special instructions. Applicants may obtain more information by contacting the ISE Department, Science and Technology II, Room 330, (703) 993-1640.

Software Systems Engineering, M.S.
The M.S. in Software Systems 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 a young and emerging 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 companies 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.

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 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 George Mason University courses, which are referred to as the SWSE foundation courses:

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, applicants 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 3.000 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. The applicable test should have been taken within five years of applying for admission.
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 potential 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 ISE Department holds an orientation meeting to advise incoming and continuing students. Members of the faculty are present to answer questions and to offer advice concerning programs of study.
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 Systems Engineering requires a minimum of 30 graduate credits. The following six core courses (18 credits) are required:

- SWSE 619 Software Construction
- SWSE 620 Software Requirements and Prototyping
- SWSE 621 Software Design
- SWSE 623 Formal Methods and Models
- SWSE 625 Software Project Management
- SWSE 626 Software Project Laboratory

and either the professional option, consisting of four electives, or the research option, consisting of two electives and a six-credit thesis, which is primarily intended for students planning to pursue a Ph.D. with an emphasis on 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 electives is available from the department office. However, students may choose other electives from offerings within IT&E with the consent of the faculty advisor.

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 Doctoral Program section.

Information Technology Doctoral Program

Course Work
The information technology doctoral program offers courses designated INFT in the "Course Descriptions" chapter 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. Students without an appropriate master's degree who otherwise satisfy admission requirements usually are encouraged to first seek such a degree in one of the eight master's programs offered through this school. Application packets are available from the Office of Admissions and from the Office of the Dean of IT&E.

An undergraduate grade point average of B (3.000 on a 4.000 scale) and a graduate grade point average of 3.500 on a 4.000 scale are basic requirements for applicants to the program. The admission process includes submission of 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. 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 core curriculum and in-depth study and research in the student's field of interest, 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 contains many of the doctoral core courses.

Under the guidance of the doctoral supervisory committee, the student prepares a plan of study. The plan lists the intended courses and their expected timing in both the breadth and advanced specialty parts of doctoral study. The plan also should contain the intended date of the comprehensive examinations and the tentative subject of the dissertation research.

http://catalog.gmu.edu
Core Curriculum
The core curriculum comprises six courses that are to be completed from the several M.S. programs of IT&E and, as such, forms a significant part of the coherent Ph.D. plan of study that is required for each student. These courses should be carefully planned and, with the exception of courses necessary for the distribution requirement, are to be selected from the prerequisite courses for INFT 800- and 900-level courses.

The minimum requirements for the core curriculum are as follows:

1. All students must take one course from OR 541 or OR 542 or STAT 544 or 554 or a course with a higher number from the offerings of the systems Engineering and Operations Research Department or the Applied and Engineering Statistics Department. This requirement may not be waived except for extraordinary circumstances (e.g., the student has all but a dissertation from another institution in a highly technical field).

2. A total of six courses are to be taken by all students from the six IT&E departments. For the core curriculum, no more than two courses may be taken from one M.S. program. The M.S. programs are listed below:
   a. Computer Science
   b. Electrical Engineering
   c. Information Systems
   d. Operations Research and Management Science
   e. Software Systems Engineering
   f. Statistical Science
   g. Systems Engineering
   h. Urban Systems Engineering

3. A GPA of 3.500 is required in core courses taken at George Mason.

4. Waivers must be approved by the departmental doctoral coordinator and the Office of the Dean based on a review of student-provided supporting material to ensure that the course waived was equivalent to the appropriate George Mason course.

5. Waiver candidate courses must have been taken within five years of acceptance to the Ph.D. program or the student must attest to using the material from the course during the most recent five-year period (Honor Code invoked). A GPA of 3.500 is required for waived courses. Final examinations may be taken to obtain waivers for up to four core courses.

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 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. Other committee members are selected to form a committee of at least four people from the regular (teaching) full-time George Mason faculty. At least three of these faculty will be from IT&E. 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 to take each of these, except the proposal presentation, is requested from the IT&E dean on the basis of a written request and plan that has been approved by the supervisory committee.

Advanced Area of Emphasis Requirement
Students must include in the plan of study a well-defined advanced area of emphasis. Successful completion of this requirement should enable the student to do basic or applied research in a significant contemporary area in information technology.

Comprehensive Course Requirements
1. Six INFT 800- and/or 900-level courses that represent a coherent plan of study that support the student’s research area (three approved 700-level courses may be used in place of INFT courses). One directed reading course, INFT 796 or 797, may be included as one of the two approved 700-level courses. (If the student’s research area does not have adequate course selection at the INFT level, alternate proposals may be made.)

2. A plan of study must be approved by the Ph.D. advisory committee and the IT&E dean. These approvals must occur before a student completes the comprehensive courses. There is no guarantee that the courses taken before this approval will be accepted.

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 Office of the Dean requesting the comprehensive examination and the appointment of an examination committee. The requesting memorandum lists all courses taken by the student that form the program of study for the Ph.D. degree and proposes a suggested structure for the comprehensive examination. The exam is generally structured to include all comprehensive courses taken. The memo describes an advanced area or areas of emphasis and briefly comments on the courses that the student has taken in the area(s) and on the independent study taken under the direction of a faculty member. The objective of the comprehensive examination is to allow the examining committee to assess a student’s readiness for and ability to complete doctoral research in an area of emphasis.

After satisfactorily completing the written portions of the comprehensive examinations, the student arranges the oral portion. The entire examination committee meets with the student and asks questions concerning basic and advanced

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areas of study. The result of the comprehensive examination is a grade of pass or fail with recommendations for removing any deficiencies.

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 INFT 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 INFT 990 Dissertation Topic Presentations. After successfully completing this requirement, the student is formally admitted as a candidate for the Ph.D. degree. The application for candidacy is submitted to the Office of the 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 continuously enroll in INFT 999 Doctoral Dissertation. The student must complete a minimum of 24 credits from among INFT 990, 998, and 999, with a minimum of 12 credits of INFT 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 defense to the committee. The defense 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.

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 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 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.

Residence Requirement and Research in Industrial Laboratories
The term "residence" indicates that the student is "at home" intellectually with the faculty community. The student is expected to associate with the George Mason faculty for at least two full academic years. The advisory committee determines the equivalent of two academic years of effort at George Mason. The basis for residency is an effort to complete the basic or core study area requirements of the comprehensive examinations, to complete the advanced areas of study and the associated advanced emphasis portions of the comprehensive examinations, and to prepare a dissertation proposal that defines a definitive research contribution.

Student research in industrial and government laboratories is encouraged to the extent that these facilities support quality independent research by the doctoral student. The greater Washington area is home for the largest group of information technology professionals in the world, many of whom have made definitive contributions to research. Area professionals with outstanding credentials and interests in information technology are solicited as visiting industrial professors. They may serve on doctoral advisory committees and, where permitted by available time and interests, direct doctoral dissertations.

Systems Engineering and Operations Research

Faculty
Professors: Adelman, Friesz, Greenberg, Harris, Hoffman (chair), Michalski, Miller, Nash, Polyak, Sage, Schum, Sofer
Associate professors: Brouse, Buede, Chang, Laskey, White
Affiliated faculty: Gulledge, Houck, Vantrees
Research and visiting professors: Donohue, Gross, Wagner, Wolman
Associate research professors: Buys, Pepin
Adjunct professors: Fischer, Loerch

Introduction
The Systems Engineering and Operations Research Department offers a bachelor's degree in systems engineering, a certificate for undergraduates (the equivalent of a minor) in operations research and engineering, and master's degrees in systems engineering and in operations research and management science. In addition, the department offers certificate programs at the master's level in 1) military operations research, 2) computational modeling, 3) command, control, communications, and intelligence (C3I), and 4) systems engineering for computer, information, and software intensive systems. Students interested in pursuing doctoral-level education in operations research or systems engineering are encouraged to examine the description of the interdisciplinary Ph.D. in Information Technology program.

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 that assure performance, safety, reliability, and maintainability at reasonable cost and that are delivered on time. Some examples of systems include computer networks, 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.

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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, in order to explain and predict the effects of actions taken on these systems. Much of this work is done using analytical and numerical techniques, 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, 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 through the George Mason main website at www.gmu.edu.

Course Work

Systems engineering courses are designated SYST in the “Course Descriptions” chapter of this catalog.

Operations research courses are designated OR in the “Course Descriptions” chapter of this catalog.

UNDERGRADUATE PROGRAMS

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 entire 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 (computer-based systems, network-based systems engineering, systems engineering management, and systems engineering methods). Students construct their own emphases with the help of their advisors. A yearlong 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 Accreditation Board for Engineering and Technology. 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 490 and 495.

Degree Requirements

In addition to the general 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, 213, 203, 214; STAT 344
Natural sciences: PHYS 160, 260, 261; CHEM 251 or EVSC 205
Computer science: CS 112, 211, 421
Humanities and social sciences: ENGL 101, 302; two literature electives; ECON 103; PSYC 100; two humanities or social science electives

Engineering: ENGR 107

Systems engineering: SYST 101, SYST 201, 202, 203, 301, 302, 417, 470, 471, 490, 495; OR 435, and five technical electives at level 300 or above. (Some exceptions are accepted for lower-level courses that are prerequisites to other technical electives)

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.

Students are strongly encouraged to obtain and follow the sample schedule published by the Systems Engineering and Operations Research Department to ensure that course prerequisites are satisfied.

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, as well as from approved courses in psychology and business administration. Technical electives are normally composed of 300- and 400-level courses for IT&E; 100- and 200-level courses may 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 satisfies a grade point average requirement of 3.00 and obtains 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.

Example elective sequences include systems engineering of software intensive systems, of telecommunications systems, of environmental and infrastructure systems, and of 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 (required as prerequisite for CS 330)
- CS 330 Formal Methods and Models
- CS 332 Object Oriented Specification and Implementation
- CS 450 Data Base Concepts
- CS 480 Introduction to Artificial Intelligence
- CS 483 Data Structure and Analysis of Algorithms
- INF 312 Computer Architecture and Operating Systems
- SYST 442 Decision Support Systems Design

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 445 Computer Organization
- ECE 460 Communication and Information Theory
- ECE 462 Data and Computer Engineering
- ECE 463 Digital Communication Systems
- ECE 540 Modern Telecommunications
- ECE 542 Computer Network Architecture and Protocols
- SYST 430 Integration of Hardware and Software

Systems Engineering of Environmental and Infrastructure Systems

Students must take USE 301 Engineering and Economic Models in Urban Systems Engineering; SYST 473 Decision and Risk Analysis; and 9 credits from the following:

- USE 410 Geographical Information Systems Engineering
- USE 450 Environmental Engineering Systems
- USE 455 Introduction to Environmental Engineering
- USE 460 Public Transportation Systems
- USE 465 Transportation Systems
- USE 530 Water Resource Systems Analysis

Systems Modeling and Performance

Students must take USE 301 Engineering and Economic Models of Urban Systems Engineering; SYST 473 Decision and Risk Analysis; and 9 credits from the following:

- SYST 419 Engineering of Large-Scale Systems
- SYST 442 Decision Support System Design
- SYST 510 System Definition and Cost Modeling
- OR 441 Deterministic OR Models
- OR 442 Stochastic OR Models
- OR 481 Numerical Methods in Engineering
- STAT 455 Experimental Design
- STAT 463 Introduction to Exploratory Data Analysis

In addition to receiving their B.S. degree, students may wish to select a concentration that contributes toward either of the following certificate programs.
Certificate in Operations Research and Engineering

The operations research program offers a certificate program to students enrolled in the computer science, decision sciences, mathematics, or 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 Applied Probability for Engineers and Scientists; STAT 362 Introduction to Computer Statistical Packages; OR 435 Discrete Systems Simulation Modeling; OR 441 Deterministic Operations Research; OR 442 Stochastic Operations Research and either ENGR 311 Mathematical Methods in Physics and Engineering I or MATH 313 Introduction to Applied Mathematics. They must also choose two courses from the following:

- OR 481 Numerical Methods in Engineering;
- OR 498 Independent Study;
- OR 499 Special Topics;
- STAT 354 Statistical Methods for Engineers and Scientists, or any 400-level STAT class.

Students electing the certificate in operations research must apply to the Systems Engineering and Operations Research Department.

Certificate in Applied Statistics

Students must take STAT 344 Applied Probability for Engineers and Scientists; STAT 354 Statistical Methods for Engineers and Scientists or STAT 554 Applied Statistics; STAT 362 Introduction to Computer Statistical Packages. They must also choose five courses taken from STAT 455 Experimental Design; STAT 457 Applied Nonparametric Statistics; STAT 463 Introduction to Exploratory Data Analysis; STAT 474 Introduction to Survey Sampling; STAT 498 Independent Study; STAT 499 Special Topics; STAT 544 Applied Probability; STAT 574 Survey Sampling I; OR 435 Discrete-Event Simulation Modeling; OR 442 Stochastic Operations Research; and OR 481 Numerical Methods in Engineering.

The Department of Applied and Engineering Statistics manages the applied statistics certificate program. Students should apply to that department directly for admission into this certificate program.

Combined B.S./M.S. Program

Qualified undergraduate students may apply for a five-year combined B.S./M.S. program leading to a Bachelor of Science in an engineering discipline and a M.S. degree in systems engineering. The combined B.S./M.S. program can be completed in 144 credits.

Applicants to the combined B.S./M.S. program must be George Mason undergraduate students with majors in IT&E. Students may apply for the combined B.S./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 combined B.S./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 combined B.S./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 (six credits) of master's-level courses may be applied to both the undergraduate and graduate degrees. 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 combined B.S./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>
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</thead>
<tbody>
<tr>
<td>SYST 520</td>
<td>SYST 301</td>
<td>SYST 301 or SYST 520 is required for 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 530</td>
<td>SYST 471</td>
<td>Credit may not be received for both SYST 530 and SYST 471.</td>
</tr>
<tr>
<td>SYST 542</td>
<td>SYST 442</td>
<td>Credit may not be received for both SYST 542 and SYST 442.</td>
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<tr>
<td>SYST 555</td>
<td>SYST 455</td>
<td>Credit may not be received for both SYST 555 and SYST 455.</td>
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<tr>
<td>SYST 573</td>
<td>SYST 473</td>
<td>Credit may not be received for both SYST 573 and SYST 473.</td>
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<tr>
<td>Any other 500-level SYST course</td>
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GRADUATE PROGRAMS

Operations Research and Management Science, M.S.

The graduate program leading to an M.S. in Operations Research and Management Science 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 OR/MS 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.

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Admission Requirements
To be admitted to the program, a candidate must do the following:
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, 213 Calculus, 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.

A student with deficiencies in preparation 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 STAT 530. Students who believe that they need to refresh their mathematics skills should take SYST 500.

Degree Requirements
The program consists of 30 credits, divided as shown below. The core curriculum includes the following four courses (12 credits):

- OR 541 Operations Research: Deterministic Models
- OR 542 Operations Research: Stochastic Models
- OR 680 Applications Seminar
- STAT 544 Applied Probability (students with a concentration in military OR will substitute STAT 544 with OR 635 Discrete System Simulation)

Also, at least three 600-level or higher methodology courses must be taken, including at least one course in each of deterministic and stochastic OR.

Up to three additional elective courses may be chosen with the 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 their advisors, qualified students may elect to write a thesis in place of three credits of course work from the methodological or applications area.

Students whose primary interest is in optimization may complete a special concentration by choosing three courses from OR 641, 642, 643, 644, 645, 682, 741, and 750. The remaining three courses are chosen with the written concurrence of the advisor and should be tailored to the student’s interest and must include at least one stochastic OR 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 this department is available from the department.

Students concentrating in stochastic models must complete OR 635, one 600-level STAT course (but not STAT 610 or 612), and two courses from OR 647, 648, 671, 677, 681, and 682. The remaining two courses are chosen with the concurrence of the student’s advisor and must include at least one in deterministic OR.

Another concentration is available in operations engineering. For this concentration, the three required OR methodology courses must be chosen from OR 635, 641, 643, 647, 648, 677, and 681. Two of the three additional electives must be selected with advisor’s approval from the offerings of the other departments in IT&E.

Students concentrating in decision analysis must complete OR 635, 671, and 681, in addition to the required courses. The remaining electives are to be chosen from the following: SYST 510, 595; STAT 652; SYST/STAT 664 (strongly recommended); SYST 542; CS 580 and 681 from IT&E, and FNAN 650, 711; and ECON 535, 611, and 615. At least one of these must be within IT&E.

Finally, students concentrating in military operations research must complete OR 651 and 652. The remaining four courses must be chosen from the following (with at least one being a departmental offering): OR courses with numbers greater than 635; STAT 634, 656, 658; SYST 542, 611, and 683.

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 also 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. Students must work with their advisors 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 (six credits) or research project (three 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

Applicants for the M.S. program should meet the following entrance requirements:

1. A baccalaureate degree from an accredited institution in engineering, mathematics, computer science, physical sciences, economics, or a related field
2. Completion of courses in calculus (MATH 113, 114, 213), matrix algebra (MATH 203), applied probability and statistics (STAT 344), and a scientific programming language (CS 112)
3. Evidence of satisfactory prior educational achievement in at least one of the following forms: an acceptable grade point average as an undergraduate, a satisfactory score on the Graduate Record Exam (GRE), or an acceptable grade point average in graduate courses
4. Satisfactory performance 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 are required to complete courses in engineering calculus and matrix algebra before taking SYST 500. The course STAT 530 offers an intensive review of these subjects. Upon acceptance, students will be informed as to the foundation courses that they may have to take.

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

Students must complete a project (three credits) or thesis (six credits) under the direction of a systems engineering faculty member.

Under the project option, the student completes three 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 three credits of project work, only three credits will be applied toward the degree.

Under the thesis option, the student completes six 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 six credits of SYST 799. Although a student may register for more than six credits, only six credits will be applied toward the degree.

Core Courses

Students must complete the following three core courses (nine 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 may choose from one of the following four emphases: systems engineering methods; systems management; command, control, communications, and intelligence (C3I); and systems engineering of computer-based 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 Discrete Event Systems
SYST 621 Systems Architecture for Large-Scale Systems
ECE 521 Modern Systems Theory
OR 542 Operations Research: Stochastic Models
STAT 544 Applied Probability
ECE 528 Random Processes in Electrical and Computer Engineering

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 emphasis 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 Judgment and Choice Processing and Decision Making

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SYST 672 Intelligent Systems for Robots
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, or performance, and iteratively improving both product and process. The concentration 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 611 Systems Methodology and Management
- SYST 621 Systems Architecture for Large-Scale Systems
- SYST 563 Research Methods in Systems Engineering and Information Technology
- OR 542 Operations Research: Stochastic Models

Elective courses: The set of elective courses must constitute a well-defined emphasis. Basic methods courses above 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, Re-engineering, and Enterprise Integration
- SYST 571 Systems Engineering Management
- SYST 572 Introduction to Systems Integration Engineering
- SYST 664/STAT 664 Bayesian Inference and Decision Analysis
- SYST 671 Judgment and Choice Processing and Decision Making
- SYST 677 Statistical Process Control
- USE 610 Construction Systems and Management
- SWSE 625 Software Project Management

Command, Control, Communications, and Intelligence (C2I)
C2I 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 C2I 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 C2I systems of the military services. Private industry examples include the corporate management systems of large national and multinational firms.

These systems include the equipment, people, and procedures 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 emphasis 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 management of C2I systems. The courses offered emphasize the analytical and behavioral aspects of engineering complex C2I systems.


Elective courses: The set of elective courses must constitute a well-defined emphasis. Examples of emphasis include C2I architectures, C2I software, communications, decision support, modeling and simulation, or sensing and fusion.

Electives are chosen from the following list:
- SYST 621 Systems Architecture for Large-Scale Systems
- SYST 542 Decision Support Systems Engineering
- SYST 573 Decision and Risk Analysis
- SYST 595/ECE 595 Discrete Event 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
- SYST 761 Advanced Topics in C2I Systems Engineering
- ECE 542 Computer Network Architectures and Protocols
- ECE 630 Statistical Communication Theory
- ECE 631 Digital Communications
- ECE 637 Spread Spectrum Communications
- ECE 639 Satellite Communications
- ECE 642 Design and Analysis of Computer Communication Networks
- ECE 734 Detection and Estimation Theory

Systems Engineering of Computer-Based Systems
The computer-based systems emphasis provides specialized knowledge and experience in developing and modifying large, complex software systems. It emphasizes technical
and management aspects of the software engineering process. Computer-based systems engineers are concerned with the theoretical and practical aspects of technology, cost, and social impact of computer systems that are both effective and efficient.

**Basic methods courses**: Students must complete SYST 621 Systems Architecture for Large-Scale Systems and one of the following:

- SYST 563 Research Methods in Systems Engineering and Information Technology
- SYST 573 Decision and Risk Analysis
- SYST 595 Discrete Event Systems
- OR 542 Stochastic Models in Operations Research

**Elective courses**: The set of elective courses must constitute a well-defined emphasis. Basic methods courses beyond the two required methods courses may also be counted as elective courses. The set includes the following:

- SYST 512 Systems Engineering for Design and Development
- SYST 513 Total Systems Engineering, Re-engineering, and Enterprise Integration
- SYST 542 Decision Support Systems Engineering
- SYST 555 Introduction to Intelligent Systems Engineering
- SYST 572 Introduction to Systems Integration Engineering
- CS 650 Computer Communications and Networking
- ECE 542 Computer Network Architectures and Protocols
- INFS 612 Data Communications and Distributed Processing
- INFS 622 Information Systems Analysis and Design
- SWSE 619 Software Construction
- SWSE 620 Software Requirements and Prototyping
- SWSE 621 Software Design
- SWSE 623 Formal Methods and Models in Software Engineering
- SWSE 625 Software Project Management

**Certificate in Command, Control, Communications, and Intelligence (C3I)**

A certificate in C3I is available to students who hold a master's degree in an engineering or a scientific discipline, or who are in graduate status in such programs. To obtain the certificate in C3I, students must take (1) SYST 680 and SYST 681; (2) ECE 528 or OR 542; and (3) two approved electives from the C3I emphasis. 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**: SYST 611, ECE 528, or OR 542

**Elective courses**: SYST 680, 681; two C3I-approved elective courses

**Project**: SYST 798 or OR 680

**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 students who hold a bachelor's degree in an engineering or a scientific discipline, or who are in graduate status in such programs. To be eligible for a certificate, students must complete SYST 510, 512, 513, and 530, and one of these elective courses: ECE 542, CS 656, INFS 612, SYST 542, SYST 595, SWSE 620, or INFS 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 emphasis

**Elective courses**: SYST 512, 513; certificate elective course: an elective approved for the 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 that are working in, 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 the candidate can receive the certificate with 15 graduate credits. If the candidate has already taken a course equivalent to OR 542, then the candidate 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 and management science 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 and Management Science, 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 541, 635; and STAT 634, and must choose any two of the following electives: CSI 744, 773; OR 542, 680; or SYST 683. If the candidate has already taken the equivalent of any of the required courses, then the candidate may (with the permission of the department chair) complete the certificate program taking only 15 credits of course work.
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.

Northern Virginia Commonwealth Graduate Engineering Program

Graduate programs in engineering and information technology are offered under the auspices of a commonwealth network in Northern Virginia. This network includes George Mason University (GMU), 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 laboratory instruction from GMU and live interactive televised lectures from other universities. Afternoon and evening instruction is provided at the GMU Fairfax Campus, and the UVA/VPI&SU Northern Virginia Center.

Master's degree programs are offered by UVA, VPI&SU, ODU, and GMU. Discipline areas of 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, or Civil Engineering (Structural Focus). From VPI&SU, the following degree programs are offered: Master of Engineering Administration; Master of Science or Master of Engineering in Electrical Engineering, Civil Engineering (Environmental), and Systems Engineering; and Master in Mechanical Engineering. ODU offers the Master of Engineering Management. GMU offers the Master of Science in Computer Science, Electrical Engineering, Information Systems, Operations Research and Management Science, Software Systems Engineering, Statistical Science, Systems Engineering and Urban Systems Engineering (described in this chapter). Also offered by GMU is the Ph.D. in Information Technology, and a variety of certificate programs.

Students apply to a degree program at one of these four institutions on the basis of course offerings and programs sponsored by an institution and the direction a student wishes to follow. Program requirements are the responsibility of the degree-granting institution and, subject to these requirements, courses may be taken from any of the five universities. Within the framework of departmental and graduate school approval, the majority of courses must be taken through the student's home institution; and additional courses approved by the home institution may be transferred between the four cooperating institutions (VCU offers one course per year to support the other universities' degree programs). UVA, ODU, and VPI&SU degree programs are composed primarily of televised courses and are supported by additional courses from GMU. These degree programs do not generally have a thesis or research component.

Course registration is contingent upon admission to a degree program or acceptance for nondegree studies. Students are responsible for learning about program requirements and obtaining course approval. Students may register while application materials are being processed as space permits and with permission from their program advisors and instructors. In addition, courses may be transferred between institutions with written approval of the home institution before registering.

For program information, contact the Commonwealth Graduate Engineering Program at (703) 993-1512.
The School of Management (SOM) is located in Enterprise Hall.

Teresa J. Domzal, Dean
Timothy F. Sugrue, Senior Associate Dean
David J. Harr, Assistant Dean
Mary Erickson, Undergraduate Program Director
Gopal V. Krishnan, Graduate Program Director
Mary W. Leventhal, Managing Director of Executive Programs
John H. Crockett, Academic Director of Executive M.B.A. Program
Doris Holt, Interim Academic Director of M.S. in New Professional Studies: Technology Management
Virginia Ann Lewis, Director of Student Services

Financial/Accounting Information Systems
Brown, Brown-Hruska, Buchanan, Christophe, Coffinberger, Crockett, Erickson, Faughnan, Ferri, Hallows, Hanweck, Harr, Heller, Holt, Hysom, Johnston, Krishnan, Nutter, Ryan-Webster, Samuels, Sugrue, Varosi, Wilkie, Yau, Young

Management Strategy, Organizational Development and Change
Beekman, Christie, Cramton, Eland, Kandelin, Kovach, Lee, Morse, Pruett, Schmidt, Ruth, Wasserman

Marketing Processes, Information Systems, and Decision Sciences
Bedewi, Chen, Das, Domzal, Dutta, Entrikin, Fortino, Harvey, Hsu, Hughes, Jugic, Kerman, McCarty, McCrohan, Meamber, Poisant, Reston, Schank, Sigman, Singer, Tetzlaff, Tongren

Course Work
The School of Management offers all course work designated ACCT, BULE, DESC, EMBA, FNAN, MBA, MGMT, MIS, and MKTG in the “Course Descriptions” chapter of this catalog.

UNDERGRADUATE PROGRAMS
Bachelor of Science Degree
The programs in business education offered by the university culminate in a B.S. degree with a major in 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 the literacy requirement, English composition requirement, general education requirements, residence requirements, and other academic requirements.
School of Management

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 have those courses cancelled.

Degree Requirements

The following requirements must be met by all degree applicants:

All students 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 MGMT 498 Business Strategy and Policy.

While a student may apply 12 credits of D grades toward graduation, no D grades may be applied to the business core requirements and no D grades may be applied to the major.

General Education Requirements

Language arts and culture ........................................ 18

- English composition ........................................ 6
- Communication .................................................. 3
- Literature and humanities ..................................... 9
- Social science .................................................. 18
- Principles of Economics ...................................... 6
- Economics ......................................................... 3
- History, government, or geography ....................... 3
- Psychology, sociology, and/or anthropology ........... 6
- General sciences ............................................... 11
- Mathematics (MATH 108)* ................................... 3
- Laboratory sciences ........................................... 8

Organizational Behavior and Administration (MGMT 302) ........................................ 3
Principles of Marketing (MKTG 301) ................................ 3
Business Strategy and Policy (MGMT 498 must be taken in the final semester) .................. 3

Major** .................................................................... 18

All 18 credits must be taken at George Mason. A grade of C or better is required in each course presented on the graduation application.

General Electives** ................................................. 20

These 20 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, recreational activities, music, theater, and art. No more than 11 credits of general electives may be in courses offered by SOM or the Department of Economics.

Total ....................................................................... 120

- Completion with a grade of C or better is required for graduation.
- Accounting majors must complete 21 credits in the major (including BULE 402) and 17 credits of general elective course work, of which a maximum of 8 credits may be in course work offered by SOM and/or the Department of Economics.

Acceptance into a Major

This applies to all students accepted to George Mason under the 1998-99 University Catalog and later.

A student interested in pursuing a major in accounting, decision sciences and management information systems, finance, management, or marketing must separately apply for admission to SOM. Until the application is filed and approved, a student is classified as a prebusiness major.

To be eligible to apply for acceptance into SOM, the following requirements must be satisfied: (1) completion of 60 or more credits at George Mason University and/or through acceptable transfer credits, and (2) completion, at George Mason University and/or through acceptable transfer credits, of the following 25 credits with a grade of C or better in each course:

- Financial and Managerial Accounting: ACCT 201 and 202
- Statistical Analysis for Management: DESC 210
- Introduction to Computer-Based Management Information Systems: MIS 201
- Four business core courses: FNAN 301, DESC 301, MGMT 302, and MKTG 301

Acceptance into SOM is competitive based on the grade point average computed on the above credits. The applicant should check with the SOM Admissions Office in Enterprise Hall, Room 38A, for the GPA standard for the semester of application. Applicants who do not receive a 2.000 GPA for the semester of application will be denied acceptance, regardless of their overall academic performance.

Applications for acceptance to SOM must be submitted by December 1 for the following spring semester, by May 1 for the following Summer Term, or by August 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.

**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 SOM satisfy the writing-intensive requirement for their major by completing MGMT 498.

**Academic Advising**
Academic planning sheets for prebusiness students are available in SOM's Office of Student Services, Enterprise Hall, Room 42. Students are encouraged to consult with academic advisors on a regular basis.

Call (703) 993-1880 to make arrangements for advising. Also visit SOM through the university's website at www.gmu.edu for valuable information that is helpful in advising.

**Enrichment Program**
The enrichment program uses guest speakers from the business community to provide students with contemporary examples of how to apply academic theory to business practice.

### Accounting, B.S.

**Degree Requirements**
The B.S. in Accounting prepares students for professional careers in public, private, and governmental accounting. The degree is separately accredited by the American Assembly of Collegiate Schools of Business. The B.S. provides a basic foundation of accounting and business knowledge in areas such as financial and managerial accounting, auditing, tax accounting, and accounting information systems. The program emphasizes the accounting profession and its role in business, professional responsibilities and ethics, conceptual understanding, technical competency, analytic abilities, communication skills, and computer literacy.

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. The following courses are required of all accounting majors (21 credits): ACCT 310, 311, 330, 334, 351, 432, and 461, and BULE 402. Students may elect to complete the following electives: ACCT 411, 452, 472, 491, and/or 499.

Advising materials are available in SOM's Office of Student Services to provide guidance regarding recommended electives. Students should see their advisors when selecting courses within the field of accounting. Students who anticipate sitting for the Uniform CPA, CMA, or CIA examinations should consult applicable regulations and discuss their programs with a member of the accounting faculty.

### Decision Sciences and Management Information Systems, B.S.

**Degree Requirements**
The decision sciences and management information systems faculty offer a variety of courses and programs of study that apply mathematical modeling, statistical analysis, and computer-based information systems to the practical problems of business and government.

In addition to the general degree requirements for the B.S., students who major in decision sciences and management information systems must complete 18 credits of upper-level business courses with a grade of C or better in each course. Requirements include a common core of courses (6 credits) and electives (12 credits) as defined below.

Students have considerable flexibility in their choice of electives and may choose programs of study that develop expertise in areas such as computer systems, decision analysis, information resource management, managerial and decision economics, production and operations management, and statistical modeling. Students are urged to discuss their choice of electives and programs of study with an advisor in SOM's Office of Student Services.

Required courses: MIS 310 and DESC 352.

Electives: 12 credits of noncore, upper-level DESC and/or MIS courses; 3 credits may be satisfied by ACCT 311, ECON 345, INFS 310, 311, 312, 315, or 316. Limited electives are available in DESC.

### Finance, B.S.

**Degree Requirements**
The B.S. in Finance prepares students for professional careers in various branches of finance. In addition to the general degree requirements for the major, students wishing to major in finance must complete 18 credits in upper-level business administration courses with grades of C or better in each course.

Required courses: Three from FNAN 302, 311, 321, or 401.

Electives: Three or more from FNAN 302, 311, 321, 351, 401, 411, 412, 421, 423, 440, 451, 452, 453, or 491 if not taken as a required course.

### Management, B.S.

**Degree Requirements**
The B.S. in Management prepares students for managerial careers 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 grades of C or better in each course. Beyond MGMT 302, students are required to take the following:

MGMT 312 Principles of Management
MGMT 321 Human Resource Management
MGMT 491 Seminar in Management

Beyond these three required courses, students must choose three courses from the following:

MGMT 331 Employee-Management Relations
MGMT 411 Organizational Theory
MGMT 421 Current Issues in Human Resource Management

MGMT 431 Labor Legislation and Collective Bargaining
MGMT 471 Organizational Management and Environmental Change

MGMT 492 Field Experiences in Management
MGMT 493 Management of Technology

Students specializing in human resources/personnel should take MGMT 331, 421, and 431.
Marketing, B.S.

Degree Requirements

The B.S. in Marketing prepares students for a broad range of global and domestic career options. Opportunities are increasing in marketing as government agencies, the nonprofit sector, service industries, and small businesses adopt a marketing orientation that was traditionally perceived as a practice limited to large corporations.

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 grades of C or better. 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 Administration

A minor in business administration is available for nonbusiness majors and requires 20 credits. All courses at the 300 level must be taken at George Mason University. A grade of C or better is required in each business course presented on the graduation application. MATH 108 is a prerequisite.

- MIS 102 ........................................... 1
- DESC 210 ........................................... 4
- ECON 103 ........................................... 3
- ACCT 201 ........................................... 3

Students must complete three core courses totaling nine credits: one course of FNAN 301 or DESC 301; one course of MKTG 301, MGMT 302, or BULE 302; and one additional course from the above course work.

Graduate Programs

The School of Management offers the Master of Business Administration (M.B.A.). The program is accredited by the American Assembly of Collegiate Schools of Business (AACSB). To receive an application or more information, send a request to the School of Management’s Graduate Admissions Processing Center at MS 5A2, Fairfax, VA 22030-4444; call (703) 993-2136; or send an e-mail to gradadms@som.gmu.edu; or fax to (703) 993-1886. Students are encouraged to submit their applications online at www.gradadvantage.org.

Business Administration, M.B.A.

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 an 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. Important consideration is given to a professional background, with emphasis on leadership potential. These criteria are applied with a certain amount of flexibility to ensure that individuals with unusual academic qualifications are not denied admission.

Fast Track, Part-Time M.B.A.

The M.B.A. Fast Track program is a part-time evening program. Fast Track students are admitted for the fall and spring semesters.

The curriculum effectively integrates functional areas with an emphasis on the use of information technology, oral and written communication, and teamwork. The Fast Track M.B.A. program requires 48 credits, including 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.

Core Courses, 30 Credits

The core courses are offered during the first five semesters, with students taking six credits each fall, spring, and summer. Every course sets the foundation for the next and builds on knowledge gained in previous courses. All Fast Track 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 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 ........................................... 1.5
- MBA 678 Strategy and Policy ........................................... 3
Elective Courses, 18 Credits
After implementing the core courses, students can choose from several market-driven elective courses offered by the School of Management in the following disciplines: accounting; decision sciences; finance; management; management information systems; and marketing.

Electives may also be chosen from courses offered by other graduate programs in the university, with approval from the School of Management. Students may choose to use electives to pursue an area of emphasis. For more information on emphases, contact the graduate program director at (703) 993-1833 or visit the SOM website through the university main page at www.gmu.edu.

◆ Executive M.B.A.
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 skills, change management, and strategic management of technology.

The class schedule of alternating Fridays and Saturdays, two one-week residencies, and one two-week international residency is designed to allow participants to continue their careers while they study and master a broad range of functional and managerial skills.

The curriculum incorporates three distinctive elements: a focus on services as the dominant context, an underlying philosophy of relationship-based management, 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 Allstate Insurance, Atlantic Research Corporation, AT&T, Bell Atlantic, Fannie Mae, Freddie Mac, General Motors, Landmark Systems Corporation, Mobil Oil Corporation, Paxton Van Lines, TASC, the U.S. government, and Xerox Corporation.

Methods of Instruction
Study groups are an essential part of the Executive M.B.A. experience and are selected by the director/associate director of the program. The groups usually meet off campus 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 electronic communications, using the groupware platform Lotus Notes, provided by the program.

Faculty encourage 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, so each person’s contribution to the discussion is essential.

Residency Weeks
Live-in sessions complete the Executive M.B.A. experience. The first residency, held at the beginning of the program at a local hotel or conference center, is five days long. Participants not only begin their formal course work but learn how to work within a study group, how to use the Internet to do research, and how to use the groupware platform Lotus Notes. The second 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 final residency week is held at the beginning of the last semester in the program. The week includes formal classroom study, presentations by CEOs, and a computer business simulation.

For the most current information on the program, contact the program office by e-mail at emba@gmu.edu or by phone at (703) 993-4025.

Program Schedule
Fall Semester—First Year
One-Week Residency
EMBA 600 Managerial Economics
EMBA 610 Financial Reporting
EMBA 630 Managerial Statistics
EMBA 650 Organizational Behavior
EMBA 755 Special Topics in Management: Managerial Communications
EMBA 755 Special Topics in Management: The Role of the General Manager

Spring Semester—First Year
EMBA 612 Managerial Accounting
EMBA 635 Operations Management
EMBA 670 Marketing Management in a Global Environment
EMBA 641 Financial Management
EMBA 745 Special Topics in Finance: Business, Government, and the Global Economy
EMBA 755 International Residency Special Topics: International Business Environment

Fall Semester—Second Year
EMBA 660 Information Technology Management
EMBA 745 Special Topics in Finance: Applied Macroeconomics
EMBA 745 Special Topics in Finance: Global Capital Markets
EMBA 750 Business Strategy
EMBA 765 Special Topics in MIS: Electronic Commerce

Spring Semester—Second Year
One-Week Residency
EMBA 715 Special Topics in Accounting: Taxation and Business Strategy
EMBA 720 Law and Ethics for Managers
EMBA 751 Corporate Strategy and Policy
EMBA 755 Special Topics in Management: Human Resource Management
EMBA 755 Special Topics in Management: Managing Change
EMBA 755 Special Topics in Management: Corporate Governance
EMBA 775 Special Topics in Marketing: Integrated Marketing Communication
EMBA 755 Special Topics in Marketing: Pricing Strategy and Topics
New Professional Studies: Technology Management, M.S.

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. As an 18-month executive program that meets on Saturdays with occasional weekday sessions, it awards an M.S. in New Professional Studies: Technology Management to business executives in the information technology professional services and telecommunication industries.

The technology management program in the School of Management includes an international residency. During the spring of the first year of study, students go abroad to explore project management across cultures and to have a weeklong program that examines economic, sociopolitical, and cultural issues that affect the international marketplace.

For program information, contact the managing director at (703) 993-1835.
The mission of New Century College is to provide a learning environment that integrates interdisciplinary knowledge with workplace and lifelong learning skills.

New Century College 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 learning in the form of internships, co-ops, service-learning, or study abroad. New Century College educates students to develop original ideas, engage in active learning, and conduct independent inquiry with the highest ethical standards. Both the structure and curriculum of New Century College respond to the needs of civic and corporate communities and provide instruction for the changing world of work.

New Century College believes it can offer undergraduate students the finest small college education within the context of a large state university. The curriculum is enhanced by the college’s commitment to the pervasive use of technology.

Administration
John O’Connor, Dean
Karen Oates, Associate Dean
Donna R. Bafundo, Director, B.I.S., B.A. in Interdisciplinary Studies Programs
Miriam Raskin, Director, Social Work Program
Elizabeth Gunn, Internship Director

Adina Elfant, Academic Advisor, B.A., B.S. in Integrative Studies Program

Faculty

Centers
Center for Field Studies
Luther Brown, Director

Center for Service and Leadership
Laura Gaither, Director of Service
Lynn Leavitt, Director of Leadership

Center for Child Welfare
Ruth Zambrana, Director

Freshman Center/University 100
Noreen McGuire, Director for Educational Programs and Research
Peggy Chalker, Associate Director for Educational Programs and Research
Elizabeth Patten, Associate Director

http://catalog.gmu.edu
Course Work
New Century College offers all course work designated BIS, NCLC, SOCW, and UNIV 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 major. Although there are many possibilities, the following are some examples of the programs of study that have been created: preprofessional (medicine, law, education), family studies, arts administration, computer graphics and design, multimedia design, conflict resolution studies, liberal studies, nonprofit management, and leadership studies.

In the first year, students take one highly focused, interdisciplinary course (eight credits) 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 a major in a traditional discipline or with an interdisciplinary specialization that they develop with faculty guidance. Preprofessional majors can develop a program of study best suited to their particular goals. The program requires mastery of essential competencies (communication, valuing, global perspectives, problem solving, social interaction, effective citizenship, aesthetic response, critical thinking, and information technology) assessed through an extensive portfolio.

Admission Requirements
A student who meets George Mason University's general admissions requirements may apply for 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 is assigned 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 below), and 32 credits in general education. A student's specialization usually consists of 30 credits, which may draw from learning communities, experiential learning, independent study, and traditional university courses. The student must present a final, cumulative portfolio at 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 specialization (Division III). A student may join learning communities or take courses in other academic units in the university any time after Division I.

George Mason University's general education requirements are met in Divisions I and II. The six credits of humanities, the six credits of social science, and the six credits of natural and mathematical sciences are met through completion of Division I. The requirement of six credits of English composition are met through completion of Division I and II. Students majoring in integrative studies fulfill the university writing-intensive requirement by completing their major program. All 300-level courses and above include at least one writing assignment that requires revision. The graduation portfolio demonstrates competency in communication.

Division I, the first year: Division I is a four-unit common curriculum. Units 1 through 4 are each six weeks long and are separated by two-week interims 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; and Unit 4 studies the relationship between the individual and society. The intersessions are built into the curriculum to allow cocurricular 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, each of which combines subjects usually taught in several separate courses into a single course of study. Learning communities offer the equivalent of between 4 and 15 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 of understanding 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 are required for graduation.

Division III, a specialization. The specialization is the equivalent of a major in a traditional degree program. Students can complete a traditional disciplinary specialization within the integrative studies curriculum or they can create, with faculty advice, a unique program of study to fit their particular interests and needs. The specialization 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.
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 also may 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
New Century College 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. The college's academic advisors will 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 the college's academic advisors at (703) 993-1436.

Interdisciplinary Minor in Multimedia
New Century College and the Institute of the Arts coordinate the interdisciplinary minor in multimedia. See the “University Academic Programs and Resources” chapter for a description of the minor.

Interdisciplinary Studies, B.A.
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 resources and organizational management, cultural ecology, environmental management and public policy, science writing, child and family welfare, international and political economics, media communication, philosophy and history 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 who maintain a GPA of 3.30. 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 counselor. Appointments for these sessions may be made by calling (703) 993-2302. Students may be recommended by faculty or administrators or may nominate themselves. The application includes a written statement of academic objectives and an interdisciplinary program proposal. 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 conditional until students have a two- or three-member faculty committee and an approved educational contract on file. Although staff members can assist, it is the student's responsibility to organize the committee. The committee comprises 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 director must approve educational contracts and changes in contracts.

Program 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 (numbered at the 300 and 400 level), including at least 12 credits of George Mason course work in the field of study.

In addition to fulfilling 62 credits of general education requirements, students must complete at least 36 credits in their interdisciplinary area of study (including UNIV 498 and 499). The upper-level requirement for the interdisciplinary area of study is a minimum of 24 credits. Courses in the area of study may be applied to the degree only if passed with a grade of C- or better. 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.

Within the interdisciplinary area of study, students must complete UNIV 498 Directed Readings in Interdisciplinary Studies as a prerequisite to UNIV 499 Senior Thesis in Interdisciplinary Studies. Three credits are awarded for successful
completion of each course. The interdisciplinary thesis is presented and discussed in a seminar of all students taking UNIV 499 that term. The thesis is evaluated by the student's faculty committee and usually is completed during the final semester of study. UNIV 499 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, entitling them to many of the services of the University Scholars Program. The Interdisciplinary Scholars, along with the University Scholars, form a dynamic learning community that serves to enhance the intellectual and personal growth of its members. Interdisciplinary Scholars have priority registration and 24-hour access to the University Scholars Center study lounge and computer resource lab.

**Individualized Study, B.I.S.**

Since 1975, the Bachelor of Individualized Study degree program has offered adult students an alternative to traditional baccalaureate degrees. With the guidance of a faculty advisor, B.I.S. students develop an individualized, interdisciplinary program of study that meets their academic needs and interests. The B.I.S. program accepts liberal transfer of nontraditional credit from other institutions. Also, recognizing that college-level learning may be acquired through varied professional, service, and personal experiences, the B.I.S. degree provides mechanisms to translate experiential learning into academic credit.

Adult students have entered this individualized study program for many different reasons. Some are pursuing the B.I.S. degree as preparation for graduate and professional programs. Others see the B.I.S. degree as a gateway for professional advancement or career transition and validation. Still others want to complete their undergraduate degree through the B.I.S. program 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 eight years before admission, and have accumulated at least 30 credits with a minimum GPA of 2.000. At least 15 of the 30 credits required for B.I.S. program acceptance must have been earned through conventional classroom instruction.

**Application/Acceptance Process**

Students who meet the eligibility requirements must first attend a B.I.S. information session. Reservations for these sessions may be made by calling (703) 993-2302. While a person may attend an information session before applying to the university, the B.I.S. application is considered only after admission to the university. Acceptance into the program is conditional until the student obtains a faculty advisor and has an approved educational contract on file.

Acceptance decisions are based on assessment of the individualized, nontraditional nature of the program of study proposed by the applicant, the availability of courses relevant to the proposed program of study, the availability of faculty advisors in the field, the student's GPA, and the likelihood that the student will benefit from the proposed program of study. In general, a nontraditional, individualized program of study is defined as one not offered through a traditional department or academic unit within the university.

Reapplication to the B.I.S. program is required of students who have been inactive for two years or more or who wish to change their individualized programs of study.

**B.I.S. Residence Requirement in Northern Virginia**

The B.I.S. program draws upon the educational resources of Northern Virginia, including George Mason University (which awards the B.I.S. degree), Marymount University, Northern Virginia Community College, Strayer University (Northern Virginia campuses), and the Northern Virginia Center of the University of Virginia. Approved courses completed at any of the above institutions count toward the 30-credit B.I.S. residence requirement, at least 12 credits of which must be upper-division course work (300 or above) in the B.I.S. program of study.

**Program Requirements**

B.I.S. students must complete a minimum of 120 credits of course work. At least 45 credits must be in upper-level courses (numbered at the 300 and 400 level), and at least 30 credits must be completed at George Mason University or at other designated Northern Virginia institutions (see B.I.S. Residence Requirement in Northern Virginia).

The 30-credit general education requirement includes 6 credits in English Composition (ENGL 101 or 100, and 302, or equivalent). The remaining 24 credits must be distributed among the following academic areas: (1) humanities, (2) social science, and (3) science/analytical reasoning.

To fill in gaps in the B.I.S. student's general education, six or nine credits are required in appropriate areas from the above categories.

In conjunction with an advisor from the full-time or adjunct faculty of the university, a B.I.S. student also designs and completes an individualized program of study relevant to his or her nontraditional educational interest. The program of study is entered on an educational contract that must be approved by the director. The student is encouraged to obtain a faculty advisor and submit an educational contract as early as possible in the program. Although B.I.S. staff members can assist B.I.S. students in the process, students are responsible for finding a faculty advisor. A minimum of 24 credits of course work must be completed after an approved contract is on file. Written permission must be obtained from the director for B.I.S. students to take courses at other institutions.

The individualized study core is 33-45 credits (including BIS 490). At least 18 credits of the core must be upper-division course work (300- and 400-level), 12 of which must be completed at a B.I.S. residence institution. No more than six credits of D grades may be included in the core. Courses in the core may not be counted toward general education requirements.

As a part of the B.I.S. core, the student completes a three-credit capstone project, BIS 490 Bachelor of Individualized Study Project. BIS 490 is taken when no more than two courses remain in the core concentration. The type of final project 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 B.I.S. core concentration. A grade of C or better in BIS 490 is required to graduate with a B.I.S. degree. A committee consisting of the student's
academic advisor and at least one other faculty member or qualified professional evaluates the BIS 490 project.

A student who fails to earn at least a grade of C must re-enroll in BIS 490 and complete another project. A grade of IP (In Progress) may be awarded to allow a student additional time to complete the project. The IP grade is automatically changed to an F grade if the project is not completed by the end of the following semester. The completed final project designed by advisors:

changed to an F grade if the project is not completed by the last week of the semester.

Following is a sampling of the more than 1,500 previous individualized B.I.S. programs of study, which have been designed by B.I.S. students in conjunction with faculty advisors:

- Art, dance, or music therapy
- Children’s literature and illustration
- Computer information systems management
- Convention management and planning
- Corporate/community relations
- Ecological tourism marketing
- Electronic publishing
- Environmental writing
- Federal government taxation policy
- Fire science administration
- Health care administration
- Historical writing
- Human resources management
- Information and network systems management
- Information systems management
- International public relations
- Legal studies
- Multicultural learning
- Multimedia design technology
- Nutrition and fitness management
- Performing arts management
- Political and social advocacy
- Procurement and contract management
- Therapeutic recreation
- Women’s studies

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 applies fewer restrictions to the transfer of credits earned through traditional course work at accredited institutions. It also allows B.I.S. students to receive college credit for learning acquired through a variety of nontraditional methods:

- Nontraditional modes of learning certified by regionally accredited institutions of higher learning
- Technical courses, as well as certain recognized certificated programs, related to the B.I.S. core concentration
- A maximum of 30 credits through examination (CLEP, DANTES, departmental, etc.)
- A maximum of 30 training credits (private industry, government, military) if indexed and recommended as college-level credit by the American Council on Education
- A maximum of 30 credits for experiential learning demonstrated by portfolios equated as college-level credit by approved educational institutions

BIS 489 Directed Readings and Research can be undertaken by B.I.S. students for specialized readings/research in their individualized B.I.S. programs of study.

BIS 490 Bachelor of Individualized Study Project (see program requirements) can vary according to the B.I.S. student’s program of study.

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.

The social work program at George Mason University does not provide credit toward field experience or course work based on life or previous work experience(s) of a student.

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: ARIN 101, BIOL 103, CS 103, ENGL 101, SOCI 101, and ENGL 201; three credits in American history or government (other than GOVT 204); MATH 106 or above, and three credits in philosophy or religious studies.

2. COMM 100; three additional credits in literature at the 200-level or higher.

3. Three credits in economics, GOVT 204, and PSYC 100.

4. BIOL 104, and either PSYC 300 or SOCI 313.

5. ENGL 302.

6. Forty-four credits in social work, including SOCW 300, 301, 323, 324, 351, 352, 357, 358, 359, 453, 454 or 455, 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 453-454 and 455) is graded on a satisfactory/no-credit basis (Pass/Fail).

7. 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.

8. Satisfactory completion of a minimum of 450 hours in a social service agency approved by the director of field instruction in conjunction with SOCW 453-454 or 455 (Senior Practicum).

9. Additional credits to total 120.

http://catalog.gmu.edu
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 BIOI 103, BIOI 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, BIOI 103 and BIOI 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 who wish to register for Block Placement (SOCW 455, 10 credits) must meet specific requirements and be advised by the director of field instruction. This course is offered in the spring semester only.

Students must have completed six 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, 453, 454, and 455 are not open to minors. See an advisor in the social work program for more information.

**Immunization and Fees**
All students who are enrolled in a course that requires a field placement (SOCW 301, 359, 453-454, or 455) 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).
The State Council of Higher Education for Virginia and the State Board of Nursing approved the baccalaureate nursing program in 1974. Since this 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
- Myra H. Fisher, Assistant Dean for Administration
- Georgine M. Redmond, Associate Dean for Undergraduate Programs
- James Vail, Associate Dean for Graduate Programs and Research
- Rosemarie C. Brenkus, Assistant Dean for Student Academic Affairs

**Faculty**
- **Professors:** Allinger, Butler, Carty (dean), Cary, Dear, Feeg, Johnson-Brown, Metcalf, Liu, Silva, Walker, Wakefield
- **Associate professors:** Alemi, Choi, Douglas, Gaffney, Hale, Harper, Maddox, Moore, Noble, Redmond, Sorrell, Trainor, Vail
- **Assistant professors:** Bernstein, Boland, Boyd, Brenkus, Cianci, Conti, Fisher (assistant dean), Harrington, Kodadek, Langley, Normile, Roberts, Rudowski, Wu
- **Adjunct professor:** Brooks, Tornabeni
- **Adjunct associate professors:** Bednash, DeLeon, Geolot, Johnson
- **Adjunct assistant professor:** Barry
- **Instructors:** Alsace, Blasser, Dawson, Durham, Langan, Leoffler, Maradiegue, Merritt, Miklancie, Moss, Robertson, Urban, Venske
- **Lecturers:** Burch, Brown, Miller, White
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.

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. Those who do not appear for nursing courses are dropped from the class.

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.

Saudi-U.S. University Project
In 1995, the College of Nursing and Health Science received a grant from the Kingdom of Saudi Arabia through the Saudi-U.S. University Project to assist in preparing baccalaureate-prepared nurses for the Kingdom of Saudi Arabia. The established second degree program is used for this project. This program is offered under a contract.

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. 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.

Candidates for the degree must present at least 120 credits. Specific requirements for the B.S.N. are as follows.

Degree Requirements

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<thead>
<tr>
<th>Credits</th>
<th>Language arts and culture</th>
<th>15</th>
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<tbody>
<tr>
<td></td>
<td>ENGL 101, 302 (three credits of humanities are a prerequisite to 302)</td>
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<tr>
<td></td>
<td>Communication</td>
<td>3</td>
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<tr>
<td></td>
<td>Humanities (three credits must be from PHIL 151 or 309)</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>Art (appreciation, history, criticism, or theory)</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>Music (appreciation, history, criticism, or theory)</td>
<td>6</td>
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<tr>
<td></td>
<td>Literature (at 200 level or above, does not include ENGL 101, 302)</td>
<td>6</td>
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<tr>
<td></td>
<td>Philosophy, language, religion, or humanities</td>
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<tr>
<th>Social and behavioral sciences</th>
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<tbody>
<tr>
<td>Sociology or anthropology</td>
<td>3</td>
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<tr>
<td>Psychology (PSYC 100 and 211)</td>
<td>6</td>
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<tr>
<td>(Any psychology for RNs and LPNs)</td>
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<tr>
<th>Natural sciences and mathematics</th>
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<tbody>
<tr>
<td>Science (biology, chemistry, physics)</td>
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<td>BIOL 124,125</td>
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<td>Microbiology (BIOL 246 and 306)</td>
<td>4</td>
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<tr>
<td>Statistics (STAT 250, PSYC 300, SOCI 221, or DESC 200)</td>
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<td>Normal nutrition (HSCI 295)</td>
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<th>Nursing major</th>
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<table>
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<tr>
<th>Physical education activities</th>
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<tbody>
<tr>
<td>(recommended as part of elective credits)</td>
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<table>
<thead>
<tr>
<th>Electives</th>
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<tbody>
<tr>
<td>(No more than three credits of nursing electives may be used to satisfy this requirement.)</td>
<td>10-16</td>
</tr>
</tbody>
</table>

Total 120

The school 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.

Special Requirements

<table>
<thead>
<tr>
<th>Fees and Expenses</th>
</tr>
</thead>
<tbody>
<tr>
<td>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).</td>
</tr>
</tbody>
</table>
A one-time lab fee of $80 is required for traditional and LPN students before beginning the first semester of nursing. A lab fee of $10 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 immunization series 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 with regard to the HIV or HBV status of the client. Failure to practice universal precautions and bloodborne 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, Robinson Hall, Room A382.

All students are required to have an active 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.

A junior student must have CPR certification before entering NURS 331 and maintain it through the remainder of the program. Either the American Red Cross's Professional Rescuer or the American Heart Association's Basic Life Support is required.

The drop period for nursing courses offered for fewer than 14 weeks is 3 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 have established, with approval of university faculty and administration, the following special major field quality standards that go beyond the general university quality standards printed elsewhere in this catalog.

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.

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 to the nursing program.

To be eligible to apply for junior standing, traditional prenursing students must complete the 40-42 credits of required general education, which applies 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 fall semester.

Students must earn a C or better in psychology (6); sociology or anthropology (3); BIOL 124-125 (8); BIOL 246 and 306 (4); and science (chemistry, biology, physics) (3-4).

Admission to the nursing program is competitive. It is based on a minimum cumulative GPA of 3.000 in the 42-44 credits of general education (wherever taken) required for the degree (excluding electives). 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 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.

Additional 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 associate 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 university’s 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.

**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 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 associate 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 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 associate 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 the student may have a legitimate complaint, the dean will appoint a committee of three faculty 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 associate dean.

**Health Science, B.S.**
The B.S. degree 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: (1) health systems management, and (2) 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. Students interested in the program 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 enrollment in major courses.

**Program Requirements**

**Health Systems Management Traditional Pathway**

<table>
<thead>
<tr>
<th>Category</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Language arts and humanities</td>
<td>15</td>
</tr>
<tr>
<td>English</td>
<td>6</td>
</tr>
<tr>
<td>Communications (COMM 101)</td>
<td>3</td>
</tr>
<tr>
<td>Humanities (PHIL 309 Biomedical Ethics,..</td>
<td>6</td>
</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>
<td></td>
</tr>
<tr>
<td>Psychology (PSYC 100)</td>
<td>3</td>
</tr>
<tr>
<td>Statistics (SOCI 313)</td>
<td>4</td>
</tr>
<tr>
<td>Natural science</td>
<td>11</td>
</tr>
<tr>
<td>Biology (BIOL 103 and 104)</td>
<td>8</td>
</tr>
<tr>
<td>Computer science (CS 103)</td>
<td>3</td>
</tr>
<tr>
<td>Business and management</td>
<td>15</td>
</tr>
<tr>
<td>Economics (ECON 103)</td>
<td>3</td>
</tr>
<tr>
<td>Accounting (ACCT 201)</td>
<td>3</td>
</tr>
<tr>
<td>Business (BULE 302)</td>
<td>3</td>
</tr>
<tr>
<td>Management (MGMT 302 and 471)</td>
<td>6</td>
</tr>
<tr>
<td>Government (GOVT 103)</td>
<td>3</td>
</tr>
<tr>
<td>Health science major</td>
<td>45</td>
</tr>
<tr>
<td>HSCI 295, 302, 303, 332, 378, 402, 436, 440, 453, 465, 495</td>
<td></td>
</tr>
<tr>
<td>Electives (two must be in HSCI)</td>
<td>21</td>
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<td><strong>Total</strong></td>
<td><strong>120</strong></td>
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</tbody>
</table>

**Health Care Coordination Traditional Pathway**

<table>
<thead>
<tr>
<th>Category</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Language arts and humanities</td>
<td>21</td>
</tr>
<tr>
<td>English composition</td>
<td>6</td>
</tr>
<tr>
<td>(three credits must be in advanced composition)</td>
<td></td>
</tr>
<tr>
<td>Communications (COMM 101, 305 and 320)</td>
<td>9</td>
</tr>
<tr>
<td>Humanities (PHIL 309 Biomedical Ethics and three credits in literature)</td>
<td>6</td>
</tr>
</tbody>
</table>

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### Health Care Coordination Accelerated Pathway for Students with Associate’s Degrees in Allied Health

<table>
<thead>
<tr>
<th>Language arts and humanities</th>
<th>21</th>
</tr>
</thead>
<tbody>
<tr>
<td>English composition</td>
<td>6</td>
</tr>
<tr>
<td>(three credits must be in advanced composition)</td>
<td></td>
</tr>
<tr>
<td>Communications</td>
<td>3</td>
</tr>
<tr>
<td>Humanities (PHIL 309 Biomedical Ethics)</td>
<td></td>
</tr>
<tr>
<td>Behavioral and social sciences</td>
<td>12</td>
</tr>
<tr>
<td>Sociology or anthropology</td>
<td>3</td>
</tr>
<tr>
<td>(SOCL 101 or ANTH 114)</td>
<td></td>
</tr>
<tr>
<td>Psychology (PSYC 100, 211, and 321)</td>
<td>9</td>
</tr>
<tr>
<td>Natural science</td>
<td>11</td>
</tr>
<tr>
<td>Biology (124 and 125)</td>
<td>8</td>
</tr>
<tr>
<td>Computer science (CS 103)</td>
<td>3</td>
</tr>
<tr>
<td>Statistics (SOCL 313)</td>
<td>4</td>
</tr>
<tr>
<td>Business and management</td>
<td>12</td>
</tr>
<tr>
<td>Accounting (ACCT 201)</td>
<td>3</td>
</tr>
<tr>
<td>Economics (ECON 103)</td>
<td>3</td>
</tr>
<tr>
<td>Marketing (MKTG 301)</td>
<td>3</td>
</tr>
<tr>
<td>Management (MGMT 302)</td>
<td>3</td>
</tr>
<tr>
<td>Health science major</td>
<td>45</td>
</tr>
<tr>
<td>HSCI 250, 295, 332, 341, 344, 402, 436, 440, 453, 465, 497</td>
<td></td>
</tr>
<tr>
<td>Electives (two must be in HSCI)</td>
<td>15</td>
</tr>
<tr>
<td>Total</td>
<td>120</td>
</tr>
</tbody>
</table>

* Upon completion of bridge course HSCI 334, students are awarded 23 advanced placement hours from the associate's degree program.

#### 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 then permits the student to prepare in professional skill areas such as counseling, recreation, social work, nursing, and administration.

The certificate program in gerontology is administered by the College of Nursing and Health Science. Four academic units participate in the program: the Graduate School of Education, College of Nursing and Health Science, 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 from the College of Nursing and Health Science.

#### Certificate Requirements

The certificate program in gerontology consists of 24 credits. Students receiving the certificate must either hold a baccalaureate degree or have earned one from George Mason University by the time they receive the certificate.
GRADUATE PROGRAMS

Nursing, M.S.N.
The Master of Science in Nursing 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. 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.

Admission Requirements
In addition to meeting the graduate admission requirements, an applicant to this program must have a cumulative GPA of 3.000 (on a 4.000 scale) 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 and research courses 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 their 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. 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. 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 must also 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 nurse practitioner tracks require an additional 29-35 credits. The M.S.N./M.B.A. program requires 57 graduate credits, including graduate nursing, business, decision sciences, and elective courses.

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 five years to earn the M.S.N. with a minimum of undergraduate course work. Three credits of the 63 credits are 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 NLN-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 five years, with a minimum of two consecutive years of clinical practice as a registered nurse.

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Program of Study

**Bridge (Established Courses)**

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>NURS 453 Research in Nursing*</td>
<td>3</td>
</tr>
<tr>
<td>NURS 440 Nursing for Communities</td>
<td>3</td>
</tr>
<tr>
<td>NURS 623 Clinical Concepts in Family Primary Care</td>
<td>3</td>
</tr>
</tbody>
</table>

*For students who have not taken an undergraduate research course

After completion of the bridge courses, 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 755 Theoretical Foundations Related to Nursing .......................... 3
- NURS 790 Applications in Nursing Research ...... 4
- NURS 794 Organization of Nursing and Health Care Delivery Systems 3

**Nursing Tracks (Select One)**

**Adult or Gerontological Nurse Practitioner in Primary Care**

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>NURS 623 Clinical Concepts in Family Primary Care</td>
<td>3</td>
</tr>
<tr>
<td>NURS 746 Practicum in Adult Primary Care Nursing I</td>
<td>6</td>
</tr>
<tr>
<td>NURS 748 Practicum in Adult Primary Care Nursing II</td>
<td>8</td>
</tr>
</tbody>
</table>

**Family Nurse Practitioner**

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>NURS 623 Clinical Concepts in Family Primary Care</td>
<td>3</td>
</tr>
<tr>
<td>NURS 720 Practicum in Family Primary Care Nursing I</td>
<td>4</td>
</tr>
<tr>
<td>NURS 721 Practicum in Assessment and Management of the Developing Family</td>
<td>8</td>
</tr>
<tr>
<td>NURS 722 Practicum in Family Primary Care Nursing II</td>
<td>8</td>
</tr>
</tbody>
</table>

**Nursing Support Courses**

- NURS 552/HCS 205 Assessment and Management of Health Deviations .................. 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
- Colisted 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**

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>NURS 773 Advanced Clinical Nursing I</td>
<td>3</td>
</tr>
<tr>
<td>NURS 775 Advanced Specialty Practice I</td>
<td>3</td>
</tr>
<tr>
<td>NURS 776 Advanced Clinical Nursing II</td>
<td>3</td>
</tr>
<tr>
<td>NURS 778 Advanced Specialty Practice II</td>
<td>3</td>
</tr>
</tbody>
</table>

**Nursing Support Courses**

- NURS 550 Pathophysiologic Bases for Major Health Deviations of Individuals .......... 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 SOCI 602, PUAD 620, PSYC 632, or MGMT 600 Related discipline support course ....................... 3

### M.S.N./M.B.A. Program

**M.B.A. Courses**

- MBA 653 Organizational Behavior
- MBA 633 Statistics for Business Decision Making
- MBA 613 Financial Reporting and Decision Making
- MBA 603 Managerial Economics and Decisions of the Firm
- MBA 643 Managerial Finance
- MBA 663 Introduction to Information Technology and Management
- MBA 623 Marketing Management
- MBA 638 Managing Operations for Competitive Advantage
- MBA 673 Legal and Ethical Environment for Management
- MBA 612 Managing Costs and Evaluating Performance
- MBA 677 Application of Business Theories and Simulation
- MBA 678 Strategy and Policy

**M.S.N. Courses**

- NURS 660 Seminar in the Ethics of Health Care
- NURS 755 Theoretical Foundations Related to Nursing
- NURS 763 Administrative Theory in Nursing
- NURS 765 Practicum in Nursing Administration I
- NURS 766 Administrative Strategies in Nursing
- NURS 768 Practicum in Nursing Administration II
- NURS 790 Applications in Nursing Research
- NURS 794 Organization of Nursing and Health Care Delivery Systems
- HSCI 703 Financial Management of Health Systems

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New Professional Studies: Health Systems Management, M.S.
The aim of this degree program is to equip working health care professionals with the skills and tools to serve as leaders and mid- and executive-level managers in evolving health systems or as health policy advisors. The 39-credit curriculum integrates concepts from a variety of disciplines: business management, economics, philosophy, organizational behavior, information technology, social psychology, public policy, law, and ethics.

Admission Requirements
Physicians and health care/allied health professionals with undergraduate degrees and at least three years of leadership experience in the health field are eligible to apply. An accelerated teaching/learning format consistent with “executive” style programs is used. Class expectations are rigorous and require that students learn technically complex material at a fast pace. Students are also expected to have 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 studies, a letter of interest specifying study goals, a curriculum vitae, and a completed copy of the George Mason University Graduate Admissions form. Standardized graduate admission tests may be requested. Applicants are competitively selected to constitute each program cohort, commencing studies in January and September of each year.

The program is scheduled to be convenient for working professionals. It employs a two-and-one-half year, part-time study schedule of two classes (six credits) per semester. Most classes are held on Friday evenings and Saturday days, every other week. Selected courses are taught online.

Degree Requirements
The program of study for the M.S. in Health Systems Management comprises 13 courses for a total of 39 credits.

Core Courses (Required)

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>HSCI 701</td>
<td>Quantitative Decision Making in Health Systems</td>
<td>3</td>
</tr>
<tr>
<td>HSCI 702</td>
<td>Managerial Accounting in Health Systems</td>
<td>3</td>
</tr>
<tr>
<td>HSCI 703</td>
<td>Financial Management of Health Systems</td>
<td>3</td>
</tr>
<tr>
<td>HSCI 704</td>
<td>Contemporary Issues in Health Systems Leadership</td>
<td>3</td>
</tr>
<tr>
<td>HSCI 705</td>
<td>Strategic Management and Marketing in Health Care</td>
<td>3</td>
</tr>
<tr>
<td>HSCI 706</td>
<td>Integrated Health Systems Management</td>
<td>3</td>
</tr>
<tr>
<td>HSCI 707</td>
<td>Health Care Management Policy, Law, and Ethics</td>
<td>3</td>
</tr>
<tr>
<td>HSCI 708</td>
<td>Operations/Quality Management of Health Systems</td>
<td>3</td>
</tr>
<tr>
<td>PUAD 620</td>
<td>Organizational Behavior</td>
<td>3</td>
</tr>
</tbody>
</table>

HSCI 709 Medical Informatics for Health Systems Managers .................. 3
HSCI 710 Health Management Practicum and Capstone Seminar ................ 3
HSCI712 Health Services Research ................................................ 3
HSCI 715 Health Economics .......................................................... 3

Total .......................................................... 39

For further information, or to discuss questions about the program or application process, contact P. J. Maddox at (703) 993-1982 or by e-mail at pmaddox@wpgate.gmu.edu.

Certificate in International Health
The certificate in international health allows students to develop an understanding of international health through a practicum and a sequence of courses that include global health, anthropology, international relations, communications, geography, and other courses.

Certificate Requirements
Students applying to the certificate program must hold a bachelor's degree, be in degree status in a graduate program, or hold a master's degree. Application is made through the College of Nursing and Health Science.

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>NURS 543</td>
<td>Global Health: Trends &amp; Policy</td>
<td>3</td>
</tr>
<tr>
<td>HSCI 698</td>
<td>International Health Care: Theoretical and Practical Dimensions</td>
<td>3</td>
</tr>
<tr>
<td>HSCI 699</td>
<td>Practicum in International Health Care</td>
<td>3</td>
</tr>
<tr>
<td>CONF 501</td>
<td>Introduction to Conflict Resolution</td>
<td>3</td>
</tr>
<tr>
<td>CONF 617</td>
<td>COMM 505, NURS 611, SOCI 599, PUAD 739, SOCI 523, HSCI 630, CONF 621</td>
<td>6</td>
</tr>
</tbody>
</table>

Total .......................................................... 18

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 purpose of the certificate program is to prepare 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 and to use the tools and techniques of statistical process control and selected methods and tools from operations research and quality improvement. Additionally, they will be 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
Students applying to the certificate program must hold a bachelor's degree. Application is made through the College of Nursing and Health Science.

Required courses
- HSCI 701 Quantitative Decision Making in Health Systems Management .......... 3
- HSCI 708 Operations/Quality Management of Health Services ....................... 3
- HSCI 709 Health/Medical Informatics for Health System Managers ................... 3
- HSCI 730 Clinical and Managerial Optimization in Health Care ...................... 3

Elective courses
Graduate courses as approved by the student's advisor.

Note: Courses considered optional for students who already possess the requisite knowledge and skills and required for those who do not include 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).

Total ...................................................... 15-18

Students must complete all courses with a 3.000 GPA to earn the certificate.

Certificate in Nursing Administration
The certificate program 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
- NURS 763 Administrative Theory in Nursing ............................................ 3
- NURS 765 Practicum in Nursing Administration I ....................................... 3
  or NURS 768 Practicum in Nursing Administration II .................................. 3

Elective courses
Graduate courses related to nursing administration as approved by the student's advisor.

Total ...................................................... 15

Students must complete all courses with a 3.000 GPA to earn the certificate.

Certificate in Nursing Education
The graduate certificate 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
Persons applying to the graduate certificate in nursing education must hold a bachelor's degree in nursing. Application is made through the College of Nursing and Health Science.

Required courses
- NURS 657 Perspectives in Nursing Education ............................................ 3
- NURS 658 Practicum and Seminar in Nursing Education .................................. 3-6
  (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.)
- EDRS 531 Educational and Psychological Measurement .................................. 3
- EDCI 701 Educational Program Development ............................................... 3
  or NURS 610 Curriculum Development ..................................................... 3

Total ...................................................... 15

Students must complete all courses with a 3.000 GPA to earn the certificate.

Certificate in Gerontology
The graduate certificate 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. Various academic units participate in the program: the College of Nursing and Health Science, and Departments of Psychology, and Sociology and Anthropology. The program is administered by the college and supervised by a committee with representatives from the participating academic units.

Certificate Requirements
Students applying to the certificate program must have a bachelor's degree in nursing or related discipline. Application is made through the College of Nursing and Health Science. The certificate requires 18 graduate credits: 6 credits in a field of study, 6 credits outside the field of study, and 6 credits of practicum. A maximum of three credits may be transferred from outside the university. For more information, call (703) 993-1911/1900.
Nursing, Ph.D.

The Ph.D. in Nursing program at George Mason University 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. in Nursing program 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 are also 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 are required, 36 of which must have been earned at George Mason University. The candidate may apply a maximum of 12 graduate credits toward the Ph.D. degree, but may present only graduate credits in which satisfactory grades have been earned and that meet the requirements of the Ph.D. curriculum.

A written comprehensive examination must be successfully completed in addition to the program of studies outlined in the curriculum of the Ph.D. in Nursing program. Successful completion of a dissertation for which nine 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 their total programs of study.

Program of Study

The curriculum of the Ph.D. in Nursing program 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 of the College of Nursing and Health Science.

Internship in Health Care Administration

Students are required to enroll in a one-semester internship, NURS 874 Internship in Health Care Administration/Policy/Ethics (5), for experiential learning in health care administration, which includes planned seminars. For the internship, a student is assigned to a doctoral-prepared executive who serves as the preceptor in the student's field of emphasis.

A field experience of 200 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 faculty: the 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 who hold membership in the George Mason 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.

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.

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**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, 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 Ph.D. 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. The original and two copies of the approved doctoral dissertation must be submitted to the university doctoral coordinator, College Hall.

**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.
The Institute of Public Policy

Faculty
Bowen, Button, Dinan, Finkelstein, Friesz, Fukuyama, Fuller, Gifford, Gulledge, Haynes, High, Hill, Kash, Lavoie, Lipset, Malawer, McNeely, Perry, Rodrigo, Schintler, Sibley, Stough, Tolchin, Van Schaik, Volpe, Warfield

Research and Visiting Faculty

Adjunct Faculty

Course Work
The Institute of Public Policy (TIPP) offers courses designated PUBP and ITRN in the "Course Descriptions" chapter of this catalog. Further academic courses are offered in conjunction with the research activities of the Mason Enterprise Center for Regional Analysis and Entrepreneurship and the Electronic Commerce Resource Center.

GRADUATE PROGRAMS

Public Policy, Ph.D.
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 tension between rapidly changing technological capabilities driven by science and engineering and the less fluid elements of culture and institutions. The program places great emphasis on original research focused on important problems and issues in public policy.

The Ph.D. program is organized around faculty research interests in technology-driven organizational change. Emphases in the program are science and technology policy; evolutionary systems and economic policy; regional development policy; society, values, and policy; governance and public management policy; and organizational informatics.

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 mentor who assists in designing and developing the student’s program. The Institute of Public Policy, within which the Ph.D. in Public Policy program is housed, has the investigation of
alternative approaches to policy as a primary interest. This interest results from a view that the rapid changes resulting from modern technology require modifications both in the substance of public policy and in the way public policy is made. A goal of the program is to contribute to conceptual developments that will allow policy modifications to occur while protecting the fundamental, pluralistic, and democratic character of policy making in the United States.

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. Thus, the program seeks students who can manage and integrate both kinds of information and produce convincing, well-organized, written syntheses. The ideal Ph.D. program applicant intends to be a full-time student and has demonstrated capabilities in research and writing, basic mathematical skills roughly equal to the first semester of calculus and a competence in statistics, some background in economics, and a theoretical and working knowledge of public policy processes. Applicants with strong records who are deficient in one or more of these areas may be admitted to the program and will receive assistance in making up deficiencies. Part-time study is also possible for those able to commit to a demanding program. The following items should be included with the application for graduate admission:

1. A two-page written statement of the student’s interest in and goals for advanced public policy and study.
2. A resume or vita.
3. A master’s degree from an accredited institution with a GPA of 3.000 or better and official transcripts of all university work.
4. Satisfactory scores on the Graduate Record Examination (GRE) or the General Management Aptitude Test (GMAT). Exam scores should not be older than 5 years.
5. Two letters of recommendation from faculty at the prospective student’s previous institutions or from persons acquainted with policy-relevant work.
6. A writing sample such as a technical report, professional publication, or term or seminar paper.

Deadlines
The application deadline for students desiring financial aid is April 1. The deadline for all other students is May 1 for the fall semester and November 1 for the spring semester.

Degree Requirements
Students are required to complete a minimum of 82 credits of course work, of which no more than 24 credits 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 graduate program director. Credit is not given for comprehensive examinations passed at other universities.

Specific course work requirements for the doctorate include four core courses in research and analytic methods and three in foundational policy topics, three courses divided among two of the areas of program concentration (typically the first course in each of two areas and the second in one of them), and a three-course sequence in advanced methodology tailored to the student’s research needs and interests. This sequence is determined in collaboration with the student’s advisor and the graduate program director and typically draws widely from courses offered throughout the university as well as in the program.

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, typically 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.

International Commerce and Policy, M.A.
The Master of Arts in International Commerce and Policy is an innovative graduate program for current and aspiring private- and public-sector professionals who seek the knowledge and skills to be effective in an increasingly complex global marketplace.

This interdisciplinary course of study focuses on the global economy, but from a point of view that integrates economics and business with the study of politics, technology, and society. Unlike traditional international affairs programs, the program is focused on international economic issues such as global trade and investment. The ICP degree 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. This degree is designed to provide the practical tools needed to compete in the world marketplace.

The core faculty draws on the strengths of TIPP. It is supplemented by a large number of adjunct faculty who bring a wealth of practical knowledge and experience to the program. They are drawn from such agencies as the Department of Commerce, Office of the United States Trade Representative, International Trade Commission, and State Department, as well as from the private sector.

Courses are offered in the evenings to fit the schedules of busy professionals. In addition to classroom study at George Mason, the program emphasizes experiential learning. It supports student internships, cooperative planning, and research activities with private- and public-sector employers, as well as a variety of study abroad experiences. For instance, the program has a special arrangement with Saint Peter’s College, Oxford University, which permits qualified students to study at Oxford during the summer session. A study abroad program has also been established with the Capitol University of Economics and Business in Beijing, China.

Admission Requirements
Students from many academic disciplines and personal backgrounds provide a lively and diverse student body for the program. To enter the program as a degree candidate, a student must meet the following minimum requirements:
1. A bachelor's degree from an accredited college or university.
2. A GPA of 3.000 or higher in the last 60 credits of undergraduate work.
3. A completed graduate application, along with official transcripts from all colleges and universities attended.
4. A resume.
5. An expanded goals statement.
6. Two letters of recommendation, preferably from academic institutions.

Results of either the GRE or GMAT taken within the last five years are strongly recommended.

Students whose first language is not English, or who have not received a degree from an English-speaking institution, must achieve a score of 575 or higher on the Test of English as a Foreign Language (TOEFL). While students from any major may apply, applicants are expected to have some knowledge of economics, preferably at least one undergraduate economics class.

**Degree Requirements**

The M.A. program requires 39 credits of course work. All degree candidates must take 24 credits of work in the required courses, as described below. The remaining course work encompasses electives, and a final project, internships, independent studies, or study abroad. These should be chosen in consultation with an advisor, and related to the student's career objectives. 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 opt to focus their studies on a particular region, policy issue, or business sector.

**Courses**

**Core Curriculum**

The M.A. program is based upon a cohort system, in which each entering class must take the same sequence of courses for the first half of the program. The curriculum for this sequence of eight courses is designed as a single unit. All eight required courses will be offered in both fall and spring semesters, with electives concentrated in the summer. Besides allowing class members to get to know each other well, this system ensures that students have adequate background for higher level courses, and allows the faculty to plan the required core courses as a coherent group.

The first courses in the fast-track core are ITRN 500 and ITRN 503. ITRN 500 Approaches to International Commerce and Policy uses a case method of instruction to help students understand the interactions of business, finance, technology, and government in the world economy. ITRN 503 Investment and Macroeconomics for International Commerce focuses on macroeconomic theory and mathematical concepts with an emphasis on its application to international finance and business activity. This course is integrated with the ITRN 500 case studies. (Students with significant prior study or experience in economics and analysis may be exempted from ITRN 503.)

Students then take the remaining six core courses that provide critical research, analytical, and communications skills, as well as an introduction to the complex environment of international commerce. ITRN 504 Trade and Microeconomics in International Commerce focuses on microeconomic theory and its application to international trade. ITRN 601 Research and Analysis Methods for International Commerce is a methodology course. These courses provide conceptual grounding in economic analysis, as well as practical skills in identifying, acquiring, and analyzing qualitative and quantitative data related to international trade, finance, and business operations.

All students also must take ITRN 502 Comparative Political Institutions, which focuses on American political institutions and those of America's major trading partners in Europe, Asia, and Latin America.

Students must take at least two of the following three courses: ITRN 602 International Financial Institutions and Globalization; ITRN 603 International Trade Relations; and ITRN 604 International Trade and Technology.

The last core course is ITRN 605 International Commerce and Culture, which examines different cultural perspectives. The course combines readings, research, and lectures with small-group discussions led by a multicultural team of faculty.

**Elective Courses**

Students take five elective courses that broaden their knowledge of international commerce and provide practical skills they can employ in the workplace. Students may select electives from 700-level courses, or from courses offered by other university departments, institutes, and centers, with the approval of an advisor. Internships and other practical experience are strongly recommended. A maximum of 3 credits in the final 12 credits of the program are given for internships and independent studies. In addition, students are strongly urged to participate in one of the study abroad programs.

**Examples of Course Selections**

The following are examples of courses that students with a particular interest might take, after completing the required core curriculum. Students are encouraged to take electives that are of interest to them.

**International Finance**

A student with an interest in international finance issues and operations would take ITRN 602 International Financial Institutions and Globalization and five electives, such as the following:

- ITRN 701 International Finance
- ITRN 710 International Business Transactions: Finance and Investment
- ITRN 711 Regulation of International Commerce
- ITRN 732 International Commodities Transactions
- ITRN 734 Pricing in International Commerce

**International Marketing**

A student with an interest in an international business career would take ITRN 602 International Financial Institutions and Globalization and five other electives.

- ITRN 709 International Business Transactions: Marketing and Distribution
- ITRN 731 Business to Business Marketing in International Commerce
- ITRN 734 Pricing in International Commerce
- ITRN 738 Fundamentals of International Marketing
- ITRN 739 International Strategic Market Planning
- ITRN 758 Global Market Planning Practicum

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International Business Operations
A student with an interest in international business would take ITRN 602 International Financial Institutions and Globalization or ITRN 603 International Trade Relations and five electives, such as the following:
- ITRN 612 International Business Operations and the Multinational Corporation
- ITRN 711 Regulation of International Commerce
- ITRN 752 International Business Lobbying: United States, Europe, and Japan
- ITRN 753 State and Local Strategies for Trade and Development
- ITRN 759 Trade Licensing, Controls, and Documentation
- ITRN 770 International Contract Negotiation

Technology and International Commerce
Students in this emphasis take ITRN 604 International Trade and Technology and five electives, such as the following:
- ITRN 701 Special Topics in International Commerce: Global Political Economy of Cyberspace
- ITRN 718 Japan's International Trade and Technology
- ITRN 730 Information Technology Fundamentals for International Business and Trade
- ITRN 737 World Trade in Semiconductors & Information Technologies
- ITRN 754 International Commercialization of Space
- ITRN 772 International Telecommunications

Regional Perspectives on International Commerce and Policy
The M.A. program offers students the opportunity to concentrate their studies on one or more global regions.
In cooperation with the Center for Asia-Pacific Economic Cooperation, the program offers a focus in Asia-Pacific trade and investment. For this focus, a student might take the following:
- ITRN 701 Special Topics in International Commerce: Economic Development and Crisis in Asia
- ITRN 702 Special Topics in International Commerce: Study Abroad (summer study in China; 6 credits)
- ITRN 718 Japan's International Trade and Technology
- ITRN 764 Trade, Investment, and Politics in East Asia
A student who wants to focus on the implications of European integration for international trade might take ITRN 603 International Trade Relations and then five electives, such as the following:
- ITRN 702 Special Topics in International Commerce: Study Abroad
  - (Oxford University summer program; 6 credits)
- ITRN 716 European Union in the International System
- ITRN 752 International Business Lobbying in the United States, Europe, and Japan
- ITRN 761 European Political and Economic Union

Other Electives
In addition to a regular series of electives on policy issues, business skills, and regional perspectives, the M.A. program offers a continually changing series of courses on current topics under ITRN 701 Special Topics in International Commerce. Recent examples of such course offerings include International Competitive Strategies, Global Trade Policy, International Banking and Country Risk, Global Policy and Business Scenarios, Technology Policy and International Strategies, Current Environmental Issues in the Global Economy, and ABCs of Importing and Exporting. These courses are taught by visiting or adjunct faculty who are directly involved in the topics under study.

Final Project or Comprehensive Exam
All students must integrate their knowledge and skills in a final project or a comprehensive exam. This is required for graduation and is assigned three credits. The project includes a 40-page research paper that draws together the key themes from the program.

Certificate Programs
The university offers six certificate programs 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 master's degree who seek continuing education and fresh skills to remain competitive in an increasingly complex global economy. The certificates are awarded after completion of 15 credits.

Related Degree Program
TIPP offers a concentration in regional economic development and technology within the Master of Arts in Interdisciplinary Studies. Refer to the Interdisciplinary Studies section of the "College of Arts and Sciences" chapter.

Joint M.P.A./Ph.D. Admissions
Students with outstanding academic records and a clear interest in public policy research may be eligible for this program. For more information, contact the program coordinator at (703) 993-3183.

Special Programs
TIPP sponsors a variety of specialized seminars and short courses throughout the year, including an annual program on the Future of the Northern Virginia Economy. In preparation is a new series of specialized flexible courses in science, trade, and technology policy.
### Course Descriptions

#### 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:

- Accounting: ACCT
- Administration of Justice: ADJ
- African American Studies: AFAM
- Anthropology: ANTH
- Art History: ARTH
- Art Studio: ARTS
- Arts Institute: ARIN
- Astronomy: ASTR
- Bachelor of Individualized Study: BIS
- Biology: BIOL
- Biosciences, Bioinformatics, and Biotechnology: IB3
- Business Legal Studies: BULE
- Chemistry: CHEM
- Chinese: CHIN
- Classical Studies: CLAS
- College of Arts and Sciences: CAS
- Communication: COMM
- Community College Education: COMC
- Community College Education: EDCC
- Comparative Literature: CL
- Computational Sciences and Informatics: CSI
- Computer Science: CS
- Conflict Analysis and Resolution: CONF
- Counseling and Development: EDCD
- Cultural Studies: CULT
- Dance: DANC
- Decision Sciences: DESC
- Economics: ECON
- Education: EDUC
- Education Leadership: EDLE
- Education Research: EDRS
- Electrical and Computer Engineering: ECE
- Elementary/Secondary Education: EDCI
- Engineering: ENGR
- English: ENGL
- Environmental Science: EVSC
- Environmental Science and Public Policy: EVPP
- Executive Master of Business Administration: EMBA
- Exercise, Fitness, and Health Promotion: EFHP
- Finance: FNAN
- Foreign Languages: FRLN
- French: FREN
- Geography: GEOG
- Geology: GEOLO
- German: GERM
- Government and International Politics: GOVT
- Health Education: HEAL
- Health Science: HSCI
- History: HIST
- Honors: HNRS

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Course Descriptions

Information and Software
  Systems Engineering  INFNS
  Information Technology  INFST
  Initiatives in Educational Transformation—Teaching  IETT
  Instructional Technology  EDIT
  Interdisciplinary Studies  MAIS
  International Commerce and Policy  ITRN
  Latin  LATN
  Learning, Social and Organizational  LRNG
  Liberal Studies  LS
  Linguistics  LING
  Management  MGMT
  Management Information Systems  MIS
  Marketing  MKTG
  Master of Business Administration  MBA
  Master of New Professional Studies  MNPS
  Mathematical Sciences  MATH
  Medical Technology  MTECH
  Military Science  MLSC
  Music  MUSI
  New Century College  NCLC
  Nursing  NURS
  Operations Research  OR
  Parks, Recreation, and Leisure Studies  PRLS
  Philosophy  PHIL
  Physical Education  PHED
  Physics  PHYS
  Psychology  PSYC
  Public Administration  PUAD
  Public Affairs  PUAF
  Public Policy  PUBP
  Reading Education  EDRD
  Religious Studies  RELI
  Russian  RUSS
  Social Work  SOCW
  Sociology  SOCI
  Software Systems Engineering  SWSE
  Spanish  SPAN
  Special Education  EDSE
  Statistics  STAT
  Study of the Americas  STAM
  Systems Engineering  SYST
  Technology  TECH
  Telecommunications  TELE
  Theater  THR
  University/Interdisciplinary Studies  UNIV
  Urban and Suburban Studies  USST
  Urban Systems Engineering  USE
  Visual Information Technologies  VIT
  Women's Studies  WMST

Semester Notation
At the end of the course description, 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,summer) means the course is taught fall and summer only; a fall, spring, summer designation (f,s,summer) 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, reading, 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:

500-599 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.

600-799 Open only to students admitted to graduate degree or certificate programs.

800-999 Primarily doctoral courses open only to students admitted to graduate degree programs.

Degree programs may extend permission to enroll bachelor's degree holders.

Courses with the following numbers are reserved for the uses designated:

600-609 Limited applicability, graduate-credit courses. Courses 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 project research.
799 Master's thesis research.
800 Studies for the Doctor of Philosophy in Education program.
998 Doctoral project research.
999 Doctoral dissertation research.
790, 894 Internship.
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 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 university as a degree-seeking student.


202 Managerial Accounting (3:3:0). Prerequisite: Grade of C or better in ACCT 201. Survey of managerial accounting. Manufacturing cost systems, budgets, and cost-volume-profit analysis are introduced. Special attention is directed to the use of accounting information in management decision making.

310 Accounting Systems and Concepts (3:3:0). Prerequisite: Completion of at least 48 credits including a grade of C or better in ACCT 202, MIS 201. This course may be taken in the semester of application to SOM. An introductory, practical approach to understanding and creating efficient accounting information systems that focus on a conceptual basis for transaction processing. Manual handling and processing of transactions in revenue, expenditure, payroll, and inventory cycles serves as a platform for developing and manipulating accounting information within a computerized transaction-processing and electronic database environment. Practical application of accounting knowledge is a significant aspect of course requirements.

311 Cost Accounting (3:3:0). Prerequisite: A grade of C or better in ACCT 310, degree status, permission of instructor for nonaccounting major; corequisite: FNAN 301. Accumulation, allocation, analysis, and reporting of cost information for external reporting and internal management. Discussion of the uses of cost information in inventory valuation, income determination, planning, controlling, and decision making.

330 Intermediate Accounting (3:3:0). Prerequisites: A grade of C or better in ACCT 310, admission to SOM. Intensive study of financial accounting and disclosure requirements of selected topics including current and noncurrent assets, liabilities, and shareholders' equity. Consideration of professional pronouncements and their impact on financial statements.

334 Topics in Financial Accounting (1:1:0). Prerequisite: A grade of C or better in ACCT 330. Consideration of specialized topics in financial accounting with special emphasis on recent and complex accounting standards.

351 Federal Taxation (3:3:0). Prerequisite: A grade of C or better in ACCT 330. Introduction to federal income taxation of individuals. Examination of tax laws and procedures through the use of illustrative examples and problems.

411 Advanced Managerial Accounting (3:3:0). Prerequisite: A grade of C or better in ACCT 311. Managerial uses of accounting data in planning, controlling, performance evaluation, and decision making.

432 Financial Accounting Theory (2:2:0). Prerequisite: A grade of C or better in ACCT 334, may be taken in same semester. Preparation of consolidated financial statement and consideration of international and multinational accounting standards.

452 Essential of Corporate Taxation (1:1:0). Prerequisite: A grade of C or better in ACCT 351. Introduction to the subject of business taxation that provides an overview of the fundamentals of corporate income taxation. Coverage includes tax aspects of the creation, operation, reorganization, and partial liquidation of corporations.

461 Auditing for Public Accountants (3:3:0). Prerequisite: A grade of C or better in ACCT 330. Introduction to the public accounting profession with emphasis on the attest function and auditor's report. Includes an examination of auditing standards and procedures, the impact of internal controls, professional ethics and responsibilities, and an introduction to statistical auditing and the audit of computerized accounting systems.

472 Governmental and Not-for-Profit Accounting and Auditing (1:1:0). Prerequisite: A grade of C or better in ACCT 461 or 462. Introduction to the theory and practice of financial reporting and auditing in the governmental and not-for-profit sectors. Special emphasis on reporting by colleges and universities, voluntary hospitals, and voluntary health and welfare organizations. Introduction to governmental auditing standards is also provided.

491 Accounting Seminar (3:3:0). Prerequisites: 90 credits, ACCT 334, and degree status. Discussion of selected current topics in the theory and practice of accounting and auditing.

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 undergraduate program director before registration. Written report required. May be repeated for a maximum of six credits if topics vary.

712 Accounting Systems (3:3:0). Prerequisite: Graduate degree status. Accounting systems design and integration with other information systems.

713 Managerial Accounting Theory (3:3:0). Prerequisite: Graduate degree status. Controllership function in public or private organizations, particularly in regard to development of policy and evaluation of performance.

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792 Seminar in Accounting (3:3:0). Prerequisite: Graduate degree status. Selective analysis of current accounting topics addressing important issues in contemporary accounting practice. Discussion of two or three major topics. Consult the Schedule of Classes. Course may be repeated for credit with different topics.

796 Independent Study and Directed Readings (3:3:0). Prerequisite: ACCT 650 or MBA 612. By special arrangement with professor and approval from the graduate program director.

Administration of Justice (ADJ)
Public and International Affairs

303 Experiencing the Criminal Justice System (3:3:0). Prerequisite: 60 credits. An experiential learning course designed to give pre-service 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.

400 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, rape, etc., and the characteristics of the various offenders.

403 Comparative Criminal Justice (3:3:0). Designed to give students an international perspective on criminal justice processes and systems by travel to London, England, for a firsthand examination.

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.


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.

480 Internship (3-6:0:0). Prerequisite: Open to administration of justice majors with 90 credits and a minimum GPA of 2.8. Contact the Administration of Justice Program at least one semester before enrollment. Internships are approved work-study programs with specific employers or agencies. Credit is determined by the program.

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.

577 Legal Issues for the Law Enforcement Manager (3:3:0). Examines the civil liability of individual officers, managers, and agencies. Constitutional right of public employees, employee rights, and constitutional issues is 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.

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 Present; Music, Movies, and Civil Rights; and Black Political Thought.

490 Internship (3:3:0). Prerequisites: AFAM 200 and 60 credits. Credit is 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.

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.
135 Human Evolution, Biology, and Culture (3:3:0).
Exploration of human origins and nature; of primate social groups and behavior; of fossil evidence for human evolution; and for the evolution of culture and human society.

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 trans-temporal 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 of 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. Examination of Latin American cultures and of selected aspects of historic 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., India, South America).

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.

307 Peoples and Cultures of the Middle East (3:3:0). Prerequisite: ANTH 114, 60 credits, or permission of instructor. For non-Western credit. Examination of cultures in the Middle East and North Africa; focus on articulation of societies in the interplay of ecological and historical factors.

308 Peoples and Cultures of Africa (3:3:0). Prerequisite: ANTH 114, 60 credits, or permission of instructor. For non-Western credit. Examination of cultures in sub-Saharan Africa. Several traditional societies are studied in depth, with attention to their emerging roles in modern African nation-states.

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 are 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.

322 Historical Archaeology (3:3:0). Prerequisite: ANTH 120, 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.

325 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.

332 Cultures in Comparative Perspective (3:3:0). Prerequisite: ANTH 114 or permission of instructor. For non-Western credit and credit toward the Sociology B.A. degree. 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.

360 Biological Aspects of Human Sociality (3:3:0). Prerequisite: ANTH 135, 60 credits, or permission of instructor. Inquiry into the biological dimensions of humans as culture-bearing animals. Topics include altruism, aggression, primate social organization, morphology, comparative ethology, and microevolutionary genetic differentiation.

365 Race and Racism (3:3:0). Prerequisite: ANTH 135, 60 credits, or permission of instructor. Examination of biological dimensions of human variation and the beginnings 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.
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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 will be discussed.

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 between 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 twentieth century, with emphasis on the mechanisms for providing assistance, asylum, and resettlement.

670 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 archaeological chosen by student and instructor. May be repeated for a maximum of six 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 six 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 six 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 fieldwork, 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.

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.

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, both parts 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, Baroque, and modern Europe and the Americas. 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.

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. 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. 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.

333 Early Christian and Byzantine Art (3:3:0). Prerequisite: 24 credits. Art and culture of the medieval Mediterranean, concentrating on Late Antiquity and the Byzantine Empire. Designed to take advantage of unique local museum resources.

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.

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 Durer.


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 neo-expressionism) and important artists in 20th-century painting and sculpture. Discussion focuses on art, art theory, and the relation of both to European history.

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 to make several field trips, including one New York Saturday bus trip. 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. 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.

381 Asian Art (3:3:0). Prerequisite: 24 credits. Aspects of the art of South and East Asia, taking advantage of local museum collections. Focus may be on specific regions (India, China, Japan, Korea, Southeast Asia, or Indonesia) or themes, depending on instructor.

393 Art History Internships (3-6:0). 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 three to six credits or repeated for up to six 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 the Washington, D.C., museums 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.

It is recommended that students complete their ENGL 302 requirement before taking a 400-level course.
400 Historiography and Methods of Research in Art History (3:3:0). Prerequisite: Six 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: 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 Art (3:3:0). Prerequisite: 300-level course in medieval art or permission of instructor. Study of a single topic in medieval art. May focus on a particular period, region, or medium; or may explore cultural interconnections within the medieval world. May be repeated for credit.

440 Advanced Studies in Renaissance and Baroque Art (3:3:0). Prerequisite: 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: 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.

490, 491 Independent Study in Art History (3:0:0), (3:0:0). Prerequisites: 60 credits, permission of instructor and permission of 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). Prerequisite: Admission to the art history honors program, 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 three credits of readings should normally be taken before the three credits of research, though they may be taken concurrently.

539 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 three to six credits or repeated for up to six 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 the Washington, D.C., museums or museums in other locations. Specific focus may vary with instructor.

596 Independent Study (1-3:0:0). 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. Topics vary, but course entails extensive critical readings and discussion, development of bibliographies, and advanced-level research papers.

Art Studio (ARTS)
Institute of the Arts

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: ARTS 104. Second 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. Continues the study of color and extends the study of methods and media into selected areas in two and three dimensions.

200 Introduction to the Artist's Studio (3:3:0). For nonmajors 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.

204 Visual Thinking (3:3:0). Also ARIN 204, DANC 204, and THR 204. Not open to students who have had ARTS 102. 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 Impulses (3:3:0). Also ARIN 205, DANC 205, and THR 205. 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.

215 Graphic Design I (4:2:4). Prerequisites: ARTS 104, 105, and 222 or equivalent, or permission of instructor. Introduction to graphic design and its techniques. Creation of a visual vocabulary to solve typical problems in graphic design, such as in newspaper and advertising layout.
222 Drawing I (4:2:4). Prerequisites: ARTS 104 and 105 or equivalent, or permission of instructor. Fundamentals of drawing with emphasis on perspective systems and skills in representing space, objects, and textures with a variety of methods.

232 Painting I (4:2:4). Prerequisites: ARTS 104, 105, and 222 or equivalent, or permission of instructor. Painting taught as concept and observation through techniques in oil- or water-based media, varying with the instructor.

243 Relief Printmaking (4:2:4). Prerequisites: ARTS 104, 105, and 222 or equivalent, or permission of instructor. Process and history of basic relief methods of printmaking, including woodcut, linoleum cut, wood engraving, and relief collagraph, is practiced and studied. Application of relief printmaking to the design, illustration, and production of books and portfolios is emphasized.

252 Photography I (4:2:4). Prerequisites: ARTS 104, 105, and 222 or permission of instructor. Introduction to black and white photography using conventional darkroom and contemporary photo image making processes.

262 Sculpture I (4:2:4). Prerequisite: ARTS 104, 105, and 222 or equivalent, or permission of instructor. Fundamentals of sculptural design with emphasis on three-dimensional forming processes in a variety of media, both traditional and unconventional, that are available to the sculptor today. Combines historical, critical, and practical aspects of sculpture in the form of lectures, critiques, discussions, demonstrations, and hands-on work.

280 Computer Graphics I (4:2:4). Prerequisites: ARTS 104, 105, and 222 or permission of instructor. Emphasis on aesthetics and design, using the computer both as tool and medium. Course focuses on elementary computer graphics techniques, programming concepts, and principles of design such as color, composition, and spatial relationships. Students construct a series of images to explore the creative process using elements of design. Through critiques, students discuss the conceptual and visual quality of their work.

307 Aesthetic Awareness (3:3:0). Also ARIN 307, DANC 307, and THR 307. Presentation of the historical, philosophical, and aesthetic traditions of the arts, with opportunities for each student to confront their own sense of beauty.

308 Cross-Cultural Arts Appreciation (3:3:0). Also ARIN 308, DANC 308, and THR 308. Gives students a cumulative arts experience by tying the subject matter to one of the major cultural productions of the Center for the Arts. Subject matter varies each semester.

311 Graphic Design II (4:2:4). Prerequisites: ARTS 104,105, and 215 or equivalent, or permission of instructor. Graphic design concepts and techniques. Solutions to typical problems encountered by graphic designers in publication design and environmental design.

313 Basic Typography (4:2:4). Prerequisites: ARTS 104 and 105 or equivalent, or permission of instructor. Introduction to elements of typographic composition, including historical development of letterforms; recognition, use, and specification of existing typefaces; alphabet design.

323 Drawing II (4:2:4). Prerequisites: ARTS 222 or permission of instructor. Fundamentals of drawing with emphasis on perspective systems and skills in representing space, objects, and textures with a variety of methods.

333 Painting II (4:2:4). Prerequisites: ARTS 232 or permission of instructor. Painting taught as concept and observation through techniques in oil- or water-based media, varying with the instructor.

344 Intaglio Printmaking (4:2:4). Prerequisites: ARTS 104 and 105, or permission of instructor. The process and history of basic intaglio methods of printmaking are practiced and studied, including monotype, metal and plastic engraving, etching, aquatint, embossing, soft- and lift-ground techniques, and an introduction to color intaglio printing.

350 Pinhole Photography (4:2:4). Prerequisites: ARTS 104 and 105, or permission of instructor. Beginning photographic design. An introduction to photography using student-built pinhole cameras. Course includes darkroom work in processing and printing paper negatives, as well as film development.

351 Color Slide Photography (3:0:6). Prerequisite: 24 credits. Study of 35mm photography in terms of camera manipulation, basic optics, and aesthetics of the color slide medium. Students are required to provide a manual 35 mm camera (preferably single lens reflex), a light meter, and film.

353 Photography II (4:2:4). Prerequisite: ARTS 252, or permission of instructor. Continuing study of photography with an additional focus on content and photographic meaning.

363 Sculpture II (4:2:4). Prerequisite: ARTS 262, or permission of instructor. Fundamentals of sculptural design with emphasis on three-dimensional forming processes in a variety of media, both traditional and unconventional, that are available to the sculptor today. Combines historical, critical, and practical aspects of sculpture in the form of lectures, critiques, discussions, demonstrations, and hands-on work.

370 Imaginary Impulse (3:3:0). Examination of the phenomenon that leads artists in all cultures throughout history to create disconcerting representations of the visible world by reordering sensory reality and inventing new orders.

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.

381 Computer Graphics II (4:2:4). Prerequisites: ARTS 280 or permission of instructor. Emphasis on high-resolution electronic imaging using the computer both as tool and medium. Complex menu structures, rotations and scaling, color mapping and palette design, font generation, video digitizing techniques, composition studies, and aesthetic concerns. Students construct a series of images to explore the creative process using elements of design. Through critiques, students discuss the conceptual and visual quality of their work.

382 Computer Art and Animation (4:2:4). Prerequisites: ARTS 381, or permission of instructor. Advanced computer graphics concepts as applied to computer animation. Lab
assignments address the technical and aesthetic challenges of computer animation. Students learn to transfer computer generated images to videotape format. Short animated sequences with accompanying audio are designed and executed.

383 Internet Multimedia Art (4:2:4). Prerequisites: ARTS 382, or permission of instructor. Course will investigate and present current networked computer technologies with special attention and focus on their artistic applications. Intermediate and advanced principles of form, content design, and aesthetic languages will be explored across closed and open (internet) network systems. Overview and comparison of current internet content development applications, hardware architectures, storage mediums, and interface schemes will be provided. At midterm, students will present an interactive network environment, and at the end of the semester, students will present an interactive networked art installation.

390 Digital Media and Video Art (4:2:4). Prerequisites: ARTS 104 and 105, 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.

391 Collaborative Arts (4:2:4). Prerequisite: 24 credits. Exploration of the nature of collaboration in the arts, that addresses both historical and contemporary collaboration. Deals with the theoretical, critical, and experiential aspects of collaboration and culminates in a collaborative course project.

392 Gallery Practices (4:1:3). Prerequisite: Three credits of ARTS or three credits of ARTH or junior standing, or permission of instructor. Introduction to gallery practices associated with the division's galleries, including planning, curatorial, budgetary, advertising, installation, and docentship activities. May be repeated for credit.

393 Internship in Art Studio (1-6:0-6). Prerequisite: Junior standing and completion of six credits of ARTS 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 credit.

396 Mixed Media (4:2:4). Prerequisite: 12 credits of 300- or 400-level ARTS production courses, or permission of instructor. Advanced studio course in which the combinations or synthesis of visual media and their critical analyses are the major component.

399 Special Topics in Art Studio (1-6:1-6-0-6). Exploration of topical studies in art studio 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 Corporate Image (4:2:4). Prerequisite: ARTS 311, or permission of instructor. Combined lecture/studio course in which students simulate a design firm with a number of corporate clients. In consultation with the instructor and other students, each student investigates a specific client, writes a design brief or contract, and produces a style manual that specifies the complete visual identity for the client. Specific elements of the visual identity, such as business stationery, promotional literature, and advertisements, are produced as full-size mock-ups or client comps.

422, 423 Drawing III, IV (4:2:4), (4:2:4). Prerequisites: ARTS 323, or permission of instructor for 422; ARTS 422, or permission of instructor for 423. Advanced drawing skills and techniques with an emphasis upon individual exploration in a variety of media.

432, 433 Painting III, IV (4:2:4), (4:2:4). Prerequisites: ARTS 333, or permission of instructor for 432; ARTS 432, or permission of instructor for 433. Advanced painting course intended to develop individual control and direction of various media while exploring contemporary issues in painting.

443, 444 Printmaking I, II (4:2:4), (4:2:4). Prerequisites: ARTS 344, or permission of instructor for 443; ARTS 443, or permission of instructor for 444. Process and history of printmaking in screen, relief, and/or intaglio methods are practiced and studied. The expressive and formal uses of color are explored via various printmaking processes and developed as an individualized project. Class projects include exhibitions and field trips.

452, 453 Photography III, IV (4:2:4), (4:2:4). Prerequisite: ARTS 353, or permission of instructor for 452; ARTS 452, or permission of instructor for 453. Sequence of advanced darkroom courses that focus on the individual photographer as artist. Includes conventional and experimental imagery and processes toward the development of a personal portfolio.

454 Photo Imaging (4:2:4). Prerequisites: ARTS 252 and one other 300-level ARTS course, or permission of instructor. Introduction to alternative photo imaging processes, including nonsilver emulsions and image transfers. Exploration of the interface of photographic processes with other media.

459 Video Imaging (4:2:4). Prerequisites: ARTS 259 and one other 300-level ARTS course, or permission of instructor. Introduction to video imaging processes, including electronic video, nonsilver emulsions, and image transfers. Exploration of the interface of video imaging processes with other media.

463 Sculpture III, IV (4:2:4), (4:2:4). Prerequisite: ARTS 363, or permission of instructor for 462; ARTS 462, or permission of instructor for 463. Combined lecture/studio course to develop individual ideas and solutions by promoting more advanced thinking toward sculpture. Through lectures, discussions, critiques, technical demonstrations, and projects, this course broadens students' practical skills and aesthetic understanding.

472 Critical Thinking (3:2:1). Prerequisites: ARTH 374 and PHIL 356, or permission of instructor. In-depth approach to criticism that addresses the theoretical, critical, and experiential factors of written and verbal critical analysis of the visual arts.

480 Advanced Animation Arts (4:2:4). Prerequisites: ARTS 382, or permission of instructor. Looks in depth at digital animation techniques. Camera movement, rotoscoping, 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.
489 Field Experience in the Arts (3-6:0:0). Also ARIN 489, DANC 489, and THR 494. Prerequisites: Junior standing and completion of six credits in IQA courses in the area of residency, ARIN 350, or 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 prearranged with the division director prior to enrollment. May be repeated for a maximum of 6 credits.

491, 492 Advanced Studio Problems (1-6:0:0), (2-4:0:0). Prerequisites: 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 credit.

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). Prerequisites: Senior Art Studio major. Students plan and develop a series of works and organize a final public exhibit.

522, 523 Drawing V, VI (4:2:4), (4:2:4). Prerequisite: ARTS 422 or 423 or permission of instructor for 522; ARTS 522 or permission of instructor for 523. Drawing on an advanced level. Emphasis on individual decision making and personal initiative.

532, 533 Painting V, VI (4:2:4), (4:2:4). Prerequisite: ARTS 432 or 433 or permission of instructor for 532; ARTS 532 or permission of instructor for 533. Painting on an advanced level. Emphasis on individual decision making and personal initiative.

562, 563 Sculpture V, VI (4:2:4), (4:2:4). Prerequisite: ARTS 462 or 463 or permission of instructor for 562; ARTS 562 or permission of instructor for 563. Sculpture on an advanced level. Emphasis on individual decision making and personal initiative.

593 Internships in Art Studio (3-6:0:0). Prerequisite: Senior standing and completion of six credits of ARTS 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 credit with permission of division.

596 Independent Study (1-4:0:0). Prerequisite: B.A. in art or equivalent, or permission of instructor. Independent reading and creative work on a specific project under the direction of a department member in the Division of Art Studio. Written report is required. May be repeated for credit with permission of division.

599 Special Topics in Art Studio (1-6:1-3:0-6). Prerequisite: Senior standing and completion of six credits in ARTS, or permission of instructor. Exploration of topical studies in art studio, 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.

601 Drawing (4:2:4). Prerequisite: Undergraduate degree in art or art education (B.A. or B.F.A.) or equivalent. Directed project in drawing with emphasis on individual development.

602 Painting (4:2:4). Prerequisite: Undergraduate degree in art or art education (B.A. or B.F.A.) or equivalent. Directed project in painting with emphasis on individual development.

605, 606 Graduate Printmaking I, II (4:2:4), (4:2:4). Prerequisite: Undergraduate degree in art (B.A. or B.F.A.) or equivalent, 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.

612 Graduate Design (4:2:4). Prerequisite: B.A. in art or equivalent, or permission of instructor. Advanced directed research in design, with emphasis on individual development.

622 Drawing (4:2:4). Prerequisite: B.A. in art or equivalent, 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.

Arts Institute (ARIN)

Institute of the Arts

101 Arts Pass (1:1:0). Introduction to appreciation of the arts through lecture-demonstration in visual art, music, dance, theater, and film. Emphasis on aesthetic principles in modern society. May be repeated three times. Satisfactory/no credit.

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.

204 Visual Thinking (3:3:0). Also ARTS 204, DANC 204, and THR 204. Not open to students who have had ARTS 102. 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 Impulses (3:3:0). Also ARTS 205, DANC 205, and THR 205. 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.

220, 221 A Cultural History of the Arts: Prehistory to 1800 and 1800 to the Present (4:4:0), (4:4:0). First semester begins with Prehistory and ends at approximately 1800. The second semester covers the 19th and 20th centuries. Course examines the development of dance, music, theater, and the visual arts from a global and cultural-historical perspective. Taught by instructors from different arts...
disciplines, course encourages students to think about the arts in an interdisciplinary way: that is, looking for common threads of vocabulary and thought that connect these related modes of human expression. Throughout the semester students not only observe how the arts have developed across the centuries and cultures, but also examine why one time and place in history might have seen the flowering of one art form but not another.

280 Computers in the Creative Arts (3:3:0). Prerequisites: Students majoring in the arts. Investigates and presents current computer technologies with special attention and focus on their artistic applications. Basic and intermediate principles of contemporary computer hardware and software systems will be discussed. Overview and comparison is provided of current operating systems, hardware architecture, storage mediums, peripheral devices, and telecommunication systems (internet). Provides an introduction to computer visual imaging, video, sound recording/editing and multimedia authoring software. By participating in interdisciplinary group media projects and individual assignments, students critique and evaluate the artistic potential of various computing environments. At the end of the semester, students publish their results on the courses website.

300 Distinctive American Voice (Living Artists) (3:3:0). Designed to present the multicultural spectrum of American art today. Students experience the various genres through attendance at live performances and lectures, participation in small discussion groups, completion of a reading list, and completion of a project tailored to the student's interests and field of study.

307 Aesthetic Awareness (3:3:0). Also ARTS 307, DANC 307, and THR 307. Presentation of the historical, philosophical, and aesthetic traditions of the arts, with opportunities for each student to confront their own sense of beauty.

308 Cross-Cultural Arts Appreciation (3:3:0). Also ARTS 308, DANC 308, and THR 308. 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.

320 The African American Experience in the Performing Arts (3:3:0). Through lectures, slides, audio recordings, videos, and films, examines 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.

350 Seminar in Arts Management (3:3:0). Prerequisite: Junior standing, admission to the arts administration interdisciplinary minor, or permission of instructor. Seminar course that involves the planning, programming, presentation, funding, and communications involved in managing the visual, performing, and historic arts. Course includes guest speakers, case analyses, and semester-long individual and group projects.

399 Special Topics in the Arts (3-6:0:0). In-depth presentation and exploration of topical studies in the arts. Subject matter varies. May be repeated once for credit.

489 Field Experience in the Arts (3-6:0:0). Also ARTS 489, DANC 489, and THR 494. Prerequisite: Junior standing and completion of six credits in IOA courses in the area of residency, ARIN 350, 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 once for credit.

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 once for credit.

592 Special Topics in Interdisciplinary Arts Studies (1-3:3:0). Topics in interdisciplinary arts including dance, theater, film, visual arts, and music.

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 six credits.

Astronomy (ASTR)

Physic and Astronomy


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 (1:0:2). Corequisite: ASTR 111. Laboratory portion of two-semester introductory astronomy sequence.

113 Introduction to Modern Astronomy II (3:3:0). ASTR 113 and 114 replace ASTR 106. Topics include electromagnetic radiation, stellar evolution, the interstellar medium, galaxies, cosmology, the scientific method, and critical thinking.

114 Introduction to Modern Astronomy Lab II (1:0:2). Corequisite: ASTR 113. Laboratory portion of two-semester introductory astronomy sequence.

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). Prerequisite: 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.

428/PHYS 328 Relativity and Cosmology (3:3:0). Prerequisite: 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; cosmic background radiation, thermodynamic considerations in cosmology, and cosmological models.

530 Astrophysics (3:3:0). Formerly PHYS 530. 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.

535/CSI 660 Space Instrumentation and Exploration (3:3:0). Formerly PHYS 535. Prerequisites: PHYS 262; 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.

761/CSI 761 N-Body Methods and Particle Simulations (3:3:0). Prerequisites: PHYS 613 and CSI 717, or permission of instructor. 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 stellar and galaxy dynamics, smoothed particle hydrodynamics, plasma simulations, and semiconductor device theory. Algorithms on parallel and vectorized systems are included.

764/CSI 764 Computational Astrophysics (3:3:0). 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.

765/CSI 765 High-Energy and Accretion Astrophysics (3:3:0). Prerequisites: PHYS 302, 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.

766/CSI 766 Relativity and Cosmology (3:3:0). 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.

769/CSI 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.

Bachelor of Individualized Study (BIS) New Century College

489 Directed Readings and Research (1-3:0:0). Prerequisite: Open only to degree students in the B.I.S. program. Individualized sections by arrangement. Readings/research are conducted on an individual basis in consultation with instructor.

490 Bachelor of Individualized Study Project (3:0:0). Final course in the B.I.S. core concentration. Open only to degree students in the B.I.S. core concentration. Topics are approved by the adviser and B.I.S. office. BIS 490 registration forms must be signed by the B.I.S. director. A grade of C or better is required to graduate with a B.I.S. degree.

Biology (BIOI)

Biology

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 the diversity of life and animal systems. Students who have already received four credits of biology are not eligible to take this course. f,s,summer

104 Introductory Biology II (4:3:3). Prerequisite: BIOI 103. Topics include human structure, function and homeostatic mechanisms, animal systems, behavior, plants, major ecosystems, and ecological problems. Students who have already received eight credits of biology are not eligible to take this course. s,summer

124, 125 Human Anatomy and Physiology (4:3:3), (4:3:3). Introduction to structure and function of major organ systems of the body. 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 BIOI 124 or 125 and 228. 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 228 or 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

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,sum

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

305 Biology of Microorganisms (3:3:0). Prerequisite: C or better in BIOL 228 or 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,sum

306 Biology of Microorganisms Laboratory (1:0:3). Corequisite: BIOL 305. Laboratory techniques in cultivating, staining, and identifying microorganisms. f,s,sum

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,sum

309 Introduction to Oceanography (3:3:0). Prerequisites: GEOL 101 or 111 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,sum

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 Patterns of Animal Development (4:3:3). Prerequisites: BIOL 303 and 60 credits, or permission of instructor. Concepts of vertebrate organization, reproduction, embryogenesis, and organ system development. s

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.

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.

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 successions 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). Prerequisites: 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.

380 Bioinstrumentation (4:3:3). Prerequisites: CHEM 211, 212, BIOL 213; one semester college mathematics, or permission of instructor. Introduces modern instrumentation including basic electronics, data processing, principles of measurements, and sample handling. Presents theory necessary to understand bases of the instruments and principles involved in specific measurements. s

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.
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.

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, biodegradation, and decomposition.

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.

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 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.

418 Current Topics in Microbiology (3:3:0). Prerequisites: BIOL 305, 306. Study of current topics in microbiology. Topics vary. May be repeated for credit.

425 Mammalian Physiology (4:3:1). Prerequisite: BIOL 213, 303, or permission of instructor. Organ system approach to the study of mammalian homeostasis, including cardiovascular, respiratory, renal, digestive, endocrine, and nervous system functions.

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 six credits toward the 44 credits for the B.S. and only four credits toward the 32 credits for the B.A., not to exceed four credits in any one semester.

446 Environmental Physiology (3:3:0). Prerequisite: BIOL 326 or permission of instructor. Physiological responses of animals to environmental factors and changes in the natural environment. Topics include biorhythms and adaptation to temperature, high pressure, and altitude. 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 impact. Laboratory emphasizes techniques for the experimental manipulation of fungi.

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 (ELISA), immuno-diffusion, 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 differentiations.

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 311, CHEM 313, 314, 315, 318, and 54 credits, or permission of instructor. Basic concepts of the structure and function of genetic material at the molecular level.

483 General Biochemistry (4:3:1). 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 both 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 1-2 credits and repeated once for a total of two credits. Total limit for 440, 495, and 497 is six credits toward the 44 credits for the B.S. and only four credits toward the 32 credits for the B.A., not to exceed four credits in any one semester.

497 Special Problems in Biology (1-4:0:0). Prerequisites: 60 credits and permission of both 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 six credits toward the 44 credits for the B.S. and only four credits toward the 32 credits for the B.A., not to exceed four credits in any one semester.

505 Selected Topics in Environmental Science (1-4:1-3:0-6). Prerequisite: A course in ecology or permission of instructor.

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: A 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.

520 Systematics in Complex Angiosperm Families (3:1:6). Prerequisite: BIOL 344 or 354 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: BIOL 324 or 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 fishes.

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.

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.

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.

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 man 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 or 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. Fieldwork and lab emphasize data collection and statistical analysis.

550 Waterscape Ecology and Management (3:3:0). Prerequisites: General chemistry and a course in ecology. Study of the physical, chemical, and biological components of freshwater ecosystems with emphasis on streams, rivers, and lakes; on linkages between watersheds and freshwater systems; and on the impact of human management.

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.

555 Laboratory in Waterscape Ecology (1:0:3). Prerequisite or corequisite: BIOL 550 or permission of instructor. Field and laboratory approaches to freshwater ecology with emphasis on study design, sample methods, laboratory and data analysis, and report writing.

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.

564 Techniques in Virology (2:1:3). Prerequisite or corequisite: BIOL 305, 306, or permission of instructor. Emphasis on propagation of animal viruses in embryonated eggs and cell culture, titration of animal viruses and bacteriophage, serological techniques used in virology, and biochemical and biophysical characterization of viruses.

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.

570 Laboratory Workshop (1-3:0:3-9). Prerequisite: BIOL 385 or 482 or permission of the director of biotechnology concentration. Current laboratory techniques in molecular biology and microbiology. Lecture and laboratory taught by ATCC and George Mason instructors. Workshops meet all day for two to five consecutive days. Topics vary. May be repeated for credit with permission of the department chair.

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.

577 Biogeochernistry: A Global Perspective (3:3:0). Prerequisites: Introductory courses in ecology and chemistry, or permission of instructor. Structure and function of ecosystems, 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.

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 (4:3:1). Prerequisites: BIOL 213, CHEM 313, 314, or permission of instructor. Structure and function of proteins, carbohydrates and lipids, enzyrnology, and metabolism and its controls. Chemistry of nitrogen compounds is emphasized.

584 Eukaryotic Cell Biology (3:3:0). Prerequisite: 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.

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.

607 Fundamentals of Ecology (3:3:0). Prerequisite: Permission of department. 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: 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. Laboratory exercises illustrate techniques used to demonstrate microbial degradation, detection of microbes, isolation, and evaluation of their physiological and genetic characteristics. Open first to those enrolled in BIOL 610.

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 and ground water movements.

641 Environmental Science and Public Policy (3:3:0). Prerequisite: Course in ecology or permission of instructor. Effects of human activities on environment. Airborne, waterborne, and solid "waste" material are considered with respect to sources, control, and effects on the ecosystem.
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. 

644 Wetland Ecology and Management (4:3:3). Prerequisites: Courses 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: BIOL 550 or permission of instructor. Study of biotic and abiotic interactions affecting 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.

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.

650 Environmental Analysis and Modeling (4:3:3). Prerequisite: Course in ecology, or permission of instructor. Students learn to conceptualize ecological systems, to represent these conceptualizations mathematically, and to develop and test models against field data. Model applications are emphasized.

655 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.

656 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 Environmental Biology (1:1:0). Topics vary. May be repeated for credit.

693, 694 Directed Studies in Biology (1-8:0:0). Prerequisites: Permission of instructor, chair, and student’s graduate committee. 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. May not be used to fulfill explicit undergraduate prerequisites for graduate work.

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.

741 Advanced Topics in Environmental Biology (1-4:1-3:0-6). Prerequisite: Eight credits of ecology or permission of instructor. Topics vary. May be repeated only with permission of department chair.

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: Eight 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 three credits.

798 Master’s Research Project (1-3:0:0). Prerequisites: Permission of instructor and department chair. 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. Students who take BIOL 793 may receive no more than 45 credits for both BIOL 793 and 798.

799 Thesis (1-6:0:0). Prerequisites: Eight graduate credits in BIOL and permission of instructor and department chair. Thesis research under direction of supervisor. Students who take BIOL 793 may receive no more than a total of six credits for both BIOL 793 and 799.

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 the 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, Bioinformatics, and Biotechnology (IB3)

510 Recombinant DNA: Techniques and Applications (2:1:3). Prerequisites: Graduate standing or permission of instructor. Laboratory-intensive course covering the current theory and practice underlying DNA procedures and methodologies. Course provides direct instruction in current recombinant DNA laboratory techniques and their applications in molecular biology. Lecture topics include molecular cloning, vectors, E. coli and other host genotypes, library construction, nucleic acid sequencing, restriction mapping, probes and PCR, and synthesis and cloning of cDNA. Laboratory sessions involve experimental protocols in characterizing and cloning DNA molecules and in constructing a genomic library. Laboratory protocols will change to reflect latest advances in techniques and domains of applicability.

511 Lab Human Mitochondrial DNA Analysis (3:1:6). Prerequisites: Graduate standing or permission of instructor. Laboratory-intensive course covering the current theory and practice underlying mitochondrial DNA procedures and methodologies. Course provides direct instruction in current mtDNA laboratory techniques and their applications. Lecture topics include mtDNA biology, genetics, and biochemistry as well as forensic science applications. Laboratory sessions involve experimental protocols in characterizing mtDNA and mtDNA sequencing and analysis. Laboratory protocols will change to reflect latest advances in techniques and domains of applicability. This course can be delivered in five intensive days and is offered during summer school and intersessions at least twice a year.

512 Human DNA Identification by STRs (3:1:6). Prerequisites: Graduate standing or permission of instructor. Laboratory-intensive course covering the science and technology of DNA polymorphism analysis. Presents current DNA polymorphism analysis techniques and applications. Lecture topics include DNA polymorphism molecular biology, molecular genetics, and biochemistry as well as forensic science, biomedical, and commercial applications. Students receive extensive hands-on laboratory training in DNA polymorphism analysis both on the ABD 310 and 377 Genetic Analyzers. Students complete a mock DNA case.

514 Advanced Analysis of Human STRs (2:2:0). Prerequisites: IB3 512 or permission of instructor. An advanced STR data analysis and interpretation course for experienced students. Course presents the theory, practice, and analysis of DNA STRs for complex forensic, clinical, and biomedical applications. Teaching will place heavy emphasis on practical examples obtained during actual casework. Students will understand the rationale of STR nomenclature, and will be able to designate alleles relative to allelic ladders in complex systems.

520 Polymerase Chain Reaction Applications in the Biosciences (2:1:3). Prerequisites: Graduate standing or permission of instructor. Laboratory-intensive course covering applications of the Polymerase 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. Lectures include, but are not limited to, PCR basics, PCR's use in determining taxonomic relationships, PCR fingerprinting, PCR in genetic and disease diagnostics, and current applications of PCR and recombinant DNA methodologies in the biosciences.

521 Advanced Methods in DNA Sequencing (2:1:3). Prerequisites: Graduate standing or permission of instructor. Laboratory-intensive course presenting the science and technology of DNA sequencing and analysis. Provides instruction in current fluorescent automated DNA sequencing techniques and applications. Lecture topics include DNA sequencing chemistry, biochemistry, and bioinformatics used in forensic, biomedical and biotechnology applications.

550 Introduction to Bioinformatics (3:3:0). Prerequisites: Graduate standing or permission of instructor. Provides an overview of methods and tools in bioinformatics. Internet interfaces to sequence databases; linkages between sequence databases and other relevant datasets such as metabolic pathways, regulatory networks, and molecular modeling tools; bioinformatics applications including molecular phylogeny, nucleic acid structure prediction, protein structure and function, and gene discovery.

551 Laboratory Information Management Systems (3:3:0). Prerequisites: IB3 550 or permission of instructor. Practical issues in designing and implementing a laboratory information management system for bioinformatics, biotechnology, and forensic biosciences are presented. Working in teams students organize, manage, and develop a laboratory information management system. Various approaches are compared in the context of DNA sequencing operations.

552 DNA Sequence Analysis (3:3:0). Prerequisites: IB3 550 or permission of instructor. In-depth survey of computational methods for the analysis of DNA sequences. Objective is to enable the student to analyze the products of a DNA sequencing project by comparing the resulting DNA sequence with known sequences, and to identify structural and functional similarity with known DNA sequences.

553 Phylogenetic Analysis (3:3:0). Prerequisites: IB3 550 or permission of instructor. Issues and algorithms for inferring phylogenies, including optimality criteria; rooted and unrooted trees; character, similarity, and distance data; distance methods; parsimony methods; maximum likelihood; searching for optimal trees; reliability of inferred trees; and available software packages.

655 Data mining for Bioinformatics (3:3:0). Prerequisites: IB3 550 or permission of instructor. Introduction to MineSet provides a highly interactive, three-dimensional (3D) visual interface for manipulating visual objects, as well as searching, filtering and animation. Analytical data mining tools, including an association rules generator, automatic binning, cluster generator, induction and classification tools for decision tables, decision trees, bayesian evidence, option trees, and regression trees are used. Visualization tools, including cluster visualizer, decision table visualizer, statistics visualizer, and tree visualizer are presented for bioinformatics, biotechnology, and forensic biosciences applications.

658 Modeling Dynamic Biological Systems (3:3:0). Prerequisites: IB3 550 or permission of instructor. Principles of modeling dynamic biological systems; steady state, oscillation, and chaos; spatial dynamics; extensive practical use
of a typical modeling system, such as STELLA; survey of biological applications including population dynamics; modeling metabolism; genetics models; and models of organisms, infectious disease, parasites, and predator-prey systems.

750 Genetic Algorithms for Bioinformatics (3:3:0). Prerequisites: IB3 550, and computer programming (C, C++, Matlab, or instructor’s approval). Approaches to evolutionary algorithms, including genetic algorithms, evolution strategies, evolutionary programming, genetic programming; theoretical foundations; applications to bioinformatics, including protein structure prediction, phylogenetic reconstruction, and DNA sequence assembly.

755 Neural Networks for Bioinformatics (3:3:0). Prerequisites: IB3 550 and computer programming (C, C++, Matlab, or instructor’s approval). Overview of neural network models of parallel and distributed computation. Analytical characterization of various neural network models and their relationships to radial basis functions. Application to biosciences, including image processing, pattern recognition, and classification of biomolecules.

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.

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 and business ethics.

402 Commercial Law (3:3:0). Prerequisite: BULE 302. Survey of topics regarding commercial law that are of interest to the accounting profession.

791 Seminar in Business Legal Studies (3:3:0). Prerequisite: Completion of BULE 700 or MBA 673 or permission of instructor. In-depth study of contemporary legal and/or ethical issues in the business environment within the seminar framework. Culminates in a substantial paper and an oral presentation.

Chemistry (CHEM)

CHEM 211, 212 is 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 thermodynamics, 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 atomic, ionic, covalent, and metallic lattices, oxidation-reduction, electrochemistry, chemistry of metals, and introduction to organic chemistry and polymers. Enrollment is 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 towards 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.


320 Spectroscopic and Qualitative Organic Analysis (2:1:3). Prerequisite: CHEM 313; corequisite: CHEM 314. Continuation of CHEM 315. Emphasis is on separation and identification of organic compounds using both classical and instrumental methods. Arranged to accompany CHEM 314, and is restricted to chemistry majors. One-hour recitation.

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 ion 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. Year-long 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. Prerequisites: MATH 114. Year-long 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.

422 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.


446 Bioinorganic Chemistry (3:3:0). Prerequisites: CHEM 313, CHEM 335. 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.

451, 452 Special Projects in Chemistry (2:0:6), (2:0:6). Prerequisites: Chemistry major/minor, 90 hours, and permission of department research committee. Introduction to chemical research or development. Includes literature search, conferences, and lab. Written and oral technical reports are required.

463/BIOL 583 General Biochemistry (4:3:1). Prerequisites: CHEM 314, CHEM 321, and BIOL 213. Survey course dealing with the structure of biomolecules, including proteins, carbohydrates, lipids, fundamentals of enzymology, and the molecular basis of metabolism.

465 Biochemistry Lab (2:1:3). Corequisite: CHEM 463. Introduction to modern biochemical experimental methods of studying chemical and physical properties of bio-
500 Selected Topics in Modern Chemistry (3:3:0). Topics of interest in analytical, biological, environmental, geo-, 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 review of synthetic pathways and application of this background to new topics emphasizing applications to fused ring aromatics, heterocyclics, 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 signal 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, optical methods, surface analysis methods, magnetic resonance spectroscopy, atomic emission and absorption spectrometry, and electroanalytical methods. The student, with approval of his or her research committee, is free to choose the methods studied.

554 Geochemistry of Environmental Hazards (3:2:3). Prerequisite: CHEM 314 or permission of instructor. Introduction 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 chemistry. Topic depends on the specialty of the instructor. May be repeated with different topics with approval of the department.

614 Physical Organic Chemistry (3:3:0). Prerequisite: CHEM 314 or permission of instructor. Principles underlying molecular structure, reactivity, and reaction mechanisms. Topics include valence-bond and molecular-orbital theory, the electronic interpretation of organic reactions, stereochemistry, conformational analysis, the kinetics and thermodynamics of organic reactions, and photochemistry. Organic core course.

620/PHYS 533 Modern Instrumentation (3:2:2). Prerequisite: CHEM 422 or permission of instructor. Methods of sensing and measurement of radiation, particles, pressure, concentrations of specific elements and compounds. 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. Theories 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.


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, cobalamins, iron sulfur proteins, inorganic model compounds, and metals in medicine. Inorganic core course.

651 Environmental Chemistry (3:3:0). Prerequisite: CHEM 332 or permission of instructor. Chemical behavior of pollutants in air, water, and soil. Emphasis is on thermodynamic principles and chemical transformation pathways important in the fate and transport of organic substances in the environment. Major topics include partitioning, photolysis, and fate modeling. 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.

713 Modern Polymer Chemistry (3:3:0). Prerequisite: CHEM 513 or permission of instructor. Synthetic and analytical 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.
228 Chemistry (CHEM) • Classical Studies (CLAS)

725 Electroanalytical Chemistry (3:3:0). Prerequisites: CHEM 321 and 331. Review of basic electrochemistry. Applications of modern electrochemical techniques such as chronocoulometry, cyclic voltammetry, pulse polarography, stripping voltammetry, AC voltammetry, coulometry, electrochemical sensors, and instrumentation are presented with emphasis on their use in analysis and research.

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, physisorption 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 statics, 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, Hartree-Fock, self-consistent field method, molecular structure calculations, scattering theory computations, and solid-state computations.

790 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 790 are required for the M.S. degree; an additional three credits are required after admission to the Ph.D. program.

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 three credit hours can be taken for this course the first two enrollment periods.

999 Doctoral Dissertation (3-12:0:0). Prerequisite: Enrollment in a doctoral program and permission of department. Experimental or theoretical research project chosen and completed under the guidance of a graduate faculty member. Thesis acceptable to the student's thesis committee and an oral defense are required. May be repeated as needed; however, no more than a total of 24 hours may be applied toward doctoral degree requirements.

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.

201 Intermediate Chinese I (3:3:1). Prerequisite: CHIN 102 or equivalent. Further development of skills acquired in CHIN 101-102, 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.

Classical Studies (CLAS)

Modern and Classical Languages

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. Fulfills the general requirement in literature for baccalaureate degrees.

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. Fulfills the general requirement in literature for baccalaureate degrees.

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 our Western tradition. Fulfills the general requirement in literature for baccalaureate degrees.

340 Greek and Roman Epic (3:3:0). Prerequisite: ENGL 101 or equivalent, or permission of instructor. Explores the development of classical epic as a genre from its beginnings with the Homeric epics to its transformations in the works of later Greek and Roman authors (e.g., Apollonius of Rhodes or Vergil). Course work in English. Fulfills the general requirement in literature for baccalaureate degrees.

350 Greek and Roman Tragedy (3:3:0). Prerequisite: ENGL 101 or equivalent, or permission of instructor. Follows the development of tragedy as a genre 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 Roman and later cultures. In addition to readings, some plays may be studied in visual form. Course work in English. Fulfills the general requirement in literature for baccalaureate degrees.

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 dramaticists Plautus and Terence. Course work in English. Fulfills the general requirement in literature for baccalaureate degrees.

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. Fulfills the general requirement in literature for baccalaureate degrees.

380 Greek and Roman Novels (3:3:0). Prerequisite: ENGL 101 or equivalent, or permission of instructor. Examines the origins and developments of the Greek and Roman novel, the different kinds of novels written in antiquity (e.g., Greek romances, satiric novels), and their influences on postclassical and modern novels. Special emphasis is given to the novels of Longus, Petronius, and Apuleius. Course work in English. Fulfills the general requirement in literature for baccalaureate degrees.

390 Topics in Classical Literature and Culture (3:3:0). Prerequisite: ENGL 101 or equivalent, or permission of instructor. Studies the forms, contexts, and developments of a distinctive literary genre or cultural phenomenon in the Greco-Roman world, focusing on careful study of the most representative texts and authors. Course work in English. Certain topics may have CLAS 250, 260, 301, 302, or 310 as prerequisites. Fulfills the general requirement in literature for baccalaureate degrees.

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 interdisciplinary 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 three credits for graduation. A grade of C or better is required to graduate with a concentration in classical studies.

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 credit hours, 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.

Communication (COMM)

Communication

100 Introduction to Oral Communication (3:3:0). Students gain an understanding of the elements involved in the process of oral communication. Emphasis on the principles and types of public oral communication, especially on giving information and understanding the principles of persuasion. Practice in preparing and presenting materials in public settings as well as listening to such messages.

101 Introduction to Interpersonal Communication (3:3:0). Principles involved in communicating in interpersonal relationships with the primary focus on dyadic and nonpresentational group situations. Skill development appropriate to these settings is emphasized.

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.

140 Forensics Seminar in Creative Arts (1:0:0). Prerequisite: Audition. Intensive work in creative forensic events and rhetorical criticism and epideictic, informative, persuasive, extemporaneous, after-dinner, and impromptu speaking. May be taken four times.

141 Forensics Seminar in Re-creative Arts (1:0:0). prerequisite: Audition. Intensive work in recreational forensic events and dramatic duo, mixed interpretation, poetry interpretation, dramatic pairs, original poetry, and prose interpretation. May be taken four times.
230 Communication (COMM)

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, newswriting, promotions, advertising, public relations, programming, or newscasting for the student radio station, WGMU. May be repeated for a total of three credits.

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 (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 relevant 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 (1:3:0:0). 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, propaganda, 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.

305 Foundations of Intercultural Communication (3:3:0). Prerequisite: Three COMM credits or permission of instructor. Analysis of communication variables as they relate to intercultural encounters. Emphasis is on the influence of culture on the communication process, including differences in values, assumptions, and communication rules.

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 cultural differences. Model of intercultural communication analysis is developed and applied to issues dealing with relations between a dominant society and subcultures, social change in developing countries, and international relations.

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, non-profit organizations, and educational institutions. Principles and practice of public relations, including topics such as broadcast, publicity, 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 and rhetorical criticism, epideictic, information, persuasive, extemporaneous, after-dinner, and impromptu speaking. May be taken four times.

341 Forensics Seminar in Re-creative Arts (1:0:6). Prerequisites: Four credits of COMM 141 or 60 credits and audition. Intensive work in various types of re-creative forensics events and dramatic duo, mixed interpretation, dramatic pairs, and original poetry. 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 lecturer. 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 systems.

345 Newspaper Workshop II (1:1:2). Prerequisite or corequisite: Three credits of COMM 145, COMM 351, or permission of instructor. Practical experience in writing and editing for the student newspaper or other papers. Coordinated with the instruction in COMM 351. 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 Magazine, 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. Intense practical application of previously acquired skills in production, promotions, advertising, public relations, programming, or newswriting for the student radio station, WGMU. May be repeated for credit 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 mass media on public decision making, and manipulation of the media by pressure groups, politicians, and media gatekeepers.

351 Newswriting and Reporting (3:3:0). Prerequisite: ENGL 101 or COMM 203. Experience in actual newsgathering. 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 on-line journalism.

352 News Editing: Print and Beyond (3:3:0). Prerequisite: COMM 351 or permission of instructor. Copy preparation, headline writing, news judging, and lay-out for various forms of print and electronic formats. Introduction to working on news copy desks.

353 Broadcast Journalism (3:3:0). Prerequisites: COMM 351 or permission of instructor, and keyboard skills. Investigation of the unique writing style of journalists in the electronic media. Emphasis on concise, conversational, and timely newswriting. 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 II: Performance and Writing (3:3:0). Prerequisite: COMM 355 or portfolio assessment. Focus on writing for video, performances skills for on-talent work, and interviewing.

357 Television Workshop (1:1:3). Prerequisite: COMM 157 or permission of instructor. Practical experience in electronic field production while working for the student video center. Video experience necessary.

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 II: Intermediate Production (3:2:3). Prerequisite: COMM 355 or portfolio assessment. Focus on advanced techniques in lighting, editing, camera, new media, and visual communication theories which underlie the practice of video production.

361 Advanced Newswriting and Research: Electronic Journalism (3:3:0). Prerequisite: COMM 351 or permission of instructor. Advanced reporting course which focuses on researching and writing stories for new 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 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.

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 Internal and Public Relations Communication for Trade Associations (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.

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 with permission of department.

400 Introduction to Research Methods in Communication (3:3:0). Prerequisite: 60 credits or permission of instructor. Primary research methodologies used in communication. Rhetorical and experimental-statistical methodologies.

401 Relational Communication (3:3:0). Prerequisite: COMM 301 or permission of instructor. Comprehensive study of the theories and research associated with the development and deterioration of interpersonal relationships. Emphasis on such dimensions as interpersonal needs, norms, rituals, attraction and attribution, intimacy, conflict and conflict resolution, roles, male-female communication, and rhetorical sensitivity.


412/GOVT 412 Politics and the Mass Media (3:3:0). Prerequisite: GOVT 103 or permission of instructor. Responsibilities and freedoms of the mass media in a democracy. Influence of media on citizens' opinions, on elections, and on decisions of public officials.

420 Senior Seminar in Theories of Communicative Interaction (3:3:0). Prerequisite: 105 credits or permission of instructor. Primary theories explaining human communicative behavior. Traditional rhetorical theory, temporary social science theories, and critical theories.

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 between speaker, message, and audience; and the relationship between attitudinal and behavioral change.

431 Information Technology and the Political Process (3:3:0). Prerequisite: GOVT 103 or 133, or junior status as a major in communication, 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.' Interaction between media and politics are examined as 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, institu-
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 employment interview, and the performance-appraisal interview.

435 Computers and Communication (3:3:0). Prerequisites: 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 fieldwork study programs. Internships are arranged and supervised by the Department of Communication through an internship coordinator. May be repeated.

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 repeated once for credit.

452 Media Production Practicum (3:1:0) Prerequisite: COMM 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, 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. Major foreign mass media systems as they compare with the American mass media system. Emphasis on comparing the systems of America, England, France, Germany, and other countries.

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, Jonathan Edwards, Daniel Webster, 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 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.

475 Journalism Law (3:3:0). Prerequisite: COMM 351 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). Prerequisites: 75 credits and permission of department. Study of a selected area in public, interpersonal, or mass communication or journalism. 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 postbaccalaureate students or advanced undergraduates with permission of the department.

501 Communication in Professional Relationships (3:3:0). Theoretical perspectives and relevant research related to communication techniques 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.

502 Theories and Research of Mass Communication (3:3:0). Prerequisite: Admission to graduate study, or senior standing and permission of instructor. 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.

504 Communication and Interpersonal Conflict (3:3:0). Prerequisite: Admission to graduate study, or senior standing and permission of instructor. 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. Class activities include lectures, guided discussions, case analyses, exercises, and simulations.

505 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.
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.

531 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.

534 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.

535 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.

536 Communication Consulting (3:3:0). Prerequisite: COMM 335. Investigation of theories providing the foundation for communication consulting. Provides both the theoretical information and the mechanisms for applying necessary to modify communicative behavior within organizations.

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 topic. 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.

550 Communication in the Classroom (3:3:0). Prerequisite: 90 credits. 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.

551 Developing Students' Speaking and Listening Skills (3:3:0). Prerequisite: 90 credits. Emphasis on development of assignments that both 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.

553 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.

554 Telecommunications Policy and Regulation (3:3:0). Prerequisites: COMM 302 and senior standing in communication or public affairs, or a baccalaureate degree. Review of the history and principles of telecommunications regulation. Study of relevant policymaking 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.

555 Theories of Visual Communication in Telecommunications (3:3:0). Prerequisite: A baccalaureate degree or senior standing in COMM. Theories of visual communication 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.

556 Global Communication (3:3:0). Prerequisites: COMM 302 and senior standing in communication or public affairs, or a baccalaureate degree. Study of global telecommunications 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.

590 Seminar in Communication (3:3:0). Intensive study of specific topics in interpersonal, public, and mass communication. Specific content varies. May be repeated for credit with permission of department.

596 Directed Readings and Research (1-3:0:0). Prerequisite: Permission of department. Reading and research on a specific topic under the direction of a faculty member. Written report is required; an oral or written examination may be required. Course may be repeated for a maximum of six credits.

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597 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.

694 Communication Internship (3-6:1-2:0). Prerequisites: Graduate standing 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.

800 Studies for the Doctor of Philosophy in Education (variable credit). Prerequisite: Admission to the Ph.D. in Education program to study 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 disciplinedirector and results in a paper reporting original contributions of the student. Enrollment 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. Same as EDCC 806.

Community College Education (COMC)

Graduate School of Education

885 Internship in Community College Education or Graduate Certificate Program (1-6:0:0). Prerequisite: Admission to the D.A. program and approval by the National Center for Community College Education. Provides supervised internship at a community college, or in the case of experienced teachers, work in other nonteaching settings. Administrative internships are arranged as appropriate.

897 Directed Reading in Community College Education (1-6:0:0). Prerequisites: Admission to the D.A. program and approval by the National Center for Community College Education. Allows independent reading on a topic agreed to by the student and a faculty member assigned by The National Center for Community College Education.

998 Doctoral Project/Research Preparation (3:0:0). Prerequisites: Admission to the D.A. program. Required of all students. Provides instruction on research leading to the development of a proposal for a doctoral project.

999 Doctoral Project Research (credits vary). Prerequisites: Completion of COMC 998, Advancement to candidacy and permission of the National Center for Community College Education. Provides independent study on the doctoral project.

Community College Education (EDCC)

Graduate School of Education

801 The Community College (3:3:0). Prerequisite: Admission to the D.A. program or permission of instructor. Studies the institutional character of the community college, including a review of the history, purpose, clientele, organization, finance, and social functions. Attention is given to current issues facing community colleges.

802 Community College Teaching Through Learning Styles (3:3:0). Prerequisite: Admission to the D.A. program or permission of instructor. Focuses on the theory of multiple styles of learning and various ways in which individuals demonstrate ability. Emphasized are alternative instructional approaches to enhance and measure learning of community college students at risk for failure. Emphasis is on study, analysis, and application to teaching in the community college.

805 Teaching Thinking (3:3:0). Prerequisite: Admission to the D.A. program or permission of instructor. Through lecture, discussion, and demonstration, students design, analyze, apply, and evaluate practical approaches to teaching critical thinking at the community college level. Application to subject matter courses of the student’s choice is stressed.

806 Seminar in Communication Skills for Teaching (3:3:0). Prerequisite: Admission to the D.A. program or permission of instructor. Studies principles and practices underlying effective lecturing and in leading instructional discussions. Application to the student’s field of study is encouraged as a way of establishing the teaching environment.

892 Special Topics in Community College Education (3:3:0). Prerequisite: Admission to the D.A. program or permission of instructor. Variety of current issues are studied. May be repeated for credit.

893 Leadership (3:3:0). Prerequisite: Admission to the D.A. program or permission of instructor. Study of leadership emphasizing philosophical and pragmatic examples.

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). Prerequisite: 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)
Institute for Computational Sciences and Informatics

601 Computational Science Tools I (1:1:0). Not applicable to the 48-hour course total for the CSI Ph.D. Introduction and usage of basic tools in computational science. Covered tools include UNIX, LateX, HTML, graphics, and math packages. Emphasis on application and use rather than theory. Combination of lecture and lab.

602 Computational Science Tools II (1:1:0). Not applicable to the 48-hour course total for the CSI Ph.D. Introduction and usage of basic tools in computational science. Covered tools include UNIX, shell scripts, Perl, and Java. Emphasis on application and use rather than theory. Combination of lecture and lab.

603 Introduction to Scientific Programming I (1:1:0). Not applicable to the 48-hour course total for the CSI Ph.D. Introduction and usage of basic programming. Emphasis on application and languages rather than theory. Combination of lecture and lab.

604 Introduction to Scientific Programming II (1:1:0). Not applicable to the 48-hour course total for the CSI Ph.D. Introduction and usage of basic programming. Emphasis on object-oriented languages such as C++. Combination of lecture and lab.

605 Software Construction Tools for Scientists (1:1:0). 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. Topics include 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 tool used in construction.

606 Scientific Graphics and Visualization Tools (1:1:0). Prerequisites: CSI 601 or permission of instructor. Introduction into the use of scientific visualization tools for data analysis. Use of specific packages will be taught. Packages include PV-WAVE, S-Plus, SV, XMGR, and the pnm tools, on a rotating basis.

607 Database Tools for Scientists (1:1:0). Prerequisites: CSI 601 and 602 or permission of instructor. Introduction to database tools. Teaches the student how to deal with the relation model, which is at the basis of database packages such as Oracle. Under this language database design concepts, table operations, triggers, sequences, and introduction to simple query language (SQL) will be covered.

650 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. Covalent bonding, quantum mechanical basis of bond formation, three-dimensional structure of molecules, reaction mechanisms, catalysis, polymers, enzymes, thermodynamic and kinetic foundations, metabolic pathways, sequence and structure of macromolecules. Extensively uses computer approaches to convey the essential computational and visual nature of the material.

651 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. The areas covered include cell structure, intracellular sorting, cellular signaling (i.e., receptors), cytoskeleton, cell cycle, DNA replication, transcription, translation. Extensively uses computer approaches to convey the essential computational and visual nature of the material.

652 Bioinformatics III (3:3:0). Prerequisites: General chemistry, general physics, organic chemistry, calculus, or permission of instructor. Provides the necessary review of ecology and population dynamics for graduate students to begin research in bioinformatics and global change.

655/PHYS 575 Introduction to Physics and Chemistry of the Atmosphere (3:3:0). Prerequisites: PHYS 305, 352, and 350 or permission of instructor. Introduction to basic physical and chemical processes that operate in the Earth's atmosphere. Emphasis is 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.

660/ASTR 535 Space Instrumentation and Exploration (3:3:0). Prerequisites: PHYS 352, MATH 213 or equivalent, or permission of instructor. 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 United States and other countries.

687/PHYS 512 Solid State Physics and Applications (3:3:0). Prerequisite: PHYS 502 or equivalent. Crystal structures, binding, lattice vibrations, the free electron model, metals, semiconductors, semiconductor devices, superconductivity, magnetism.

700/MATH 685 Numerical Methods (3:3:0). Prerequisites: MATH 214, 203, and some programming experience. 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 type of data encountered in practice. Theoretical development as well as implementation, efficiency, and accuracy issues in using algorithms and interpreting the results are included. When applicable, computer graphical techniques are used to enhance interpretation of results through visualization.

709 Topics in Computational Sciences and Informatics (3:3:0). Prerequisites: Admission to Ph.D. program and permission of instructor. Selected topics in computational sciences and informatics not covered in fixed-content computational sciences and informatics courses. May be repeated for credit as needed.

711/CHM 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. Topics include 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 and properties, molecular symmetry, and intermolecular forces.

714 Spectroscopy and Structure (3:3:0). Prerequisite: CHEM 332. Quantum mechanics of the interaction of atoms and molecules with electromagnetic radiation. Modern spectroscopic methods as applied to the elucidation of molecular structure and dynamics are surveyed.

719 Topics in Computational Chemistry (3:3:0). Prerequisite: Permission of instructor. Selected topics in computational chemistry not covered in fixed-content computational chemistry courses. May be repeated for credit as needed.

720 Fluid Mechanics (3:3:0). Prerequisites: CSI 780, 700, or permission of instructor. Covers basic and advanced fluid mechanics. Studies of the continuous hypothesis to define fluids. Introduction to tensor analysis; Euclidean and Lagrangian representation of fluid flow; Laplace's equation; the continuity equation; 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 (i.e., MATH 603 or CSI 740/MATH 625), coding experience in FORTRAN or C; or permission of instructor. 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. Some of the more advanced topics of CFD, 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.

729 Topics in Continuum Systems (3:3:0). Prerequisite: Permission of instructor. 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 CFD; algorithms for concurrent machines; formation of high-energy particle jets in astrophysical applications; application to Earth atmospheric problems; and flow considerations in molten materials.

734 Computational Neurobiology (3:3:0). Prerequisites: CSI 651 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 650, 651, or permission of instructor. Overview of the nervous system and biological neural networks. Topics include learning and memory, sensory systems, and motor systems. Design and implementation of computational models will be stressed. Students will be 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.


741/ECE 721 Nonlinear Dynamical Systems (3:3:0). Prerequisites: Knowledge of linear algebra, advanced calculus, and differential equations. Contemporary topics in the field of nonlinear dynamical systems are illustrated in mathematical models from the natural sciences and engineering. Traditional qualitative analysis of difference and differential equations provides the background for understanding chaotic behavior when it occurs in these models. Topics include stability of equilibria and periodic orbits, bifurcation theory, Hamiltonian systems, Lyapunov exponents, and chaotic attractors.

742/MATH 687 The Mathematics of the Finite Element Method (3:3:0). Prerequisite: MATH 446 or 685 or permission of instructor. The finite element method is a commonly used technique for developing numerical approximations to problems involving ordinary and partial differential equations. This course develops the underlying mathematical foundation for the method, examines several specific types of finite elements, analyzes the convergence rates and approximation properties of the method, and uses it to solve a number of important equations. Students develop their own codes and are expected to complete independent projects.
744 Linear and Nonlinear Modeling in the Natural Sciences (3:3:0). Prerequisite: Permission of instructor. Develops the tools of mathematical modeling while simultaneously carrying out numerical simulations of the models. Examples from across the sciences are considered throughout the course. Topics include basic issues (models, simplification, linearity, and nonlinearity); dimensionless parameters; dimensional analysis; models involving differential equations; examples from population growth, chemical kinetics; models involving partial differential equations; diffusion; transport; nonlinearity and shocks; probabilistic modeling; perturbation methods; extrapolation; and an introduction to stability.

745 Mathematical Tomography (3:3:0). Prerequisite: MATH 675. Covers physical principles of tomography; the Radon transform in Euclidean space, inversion formulas, the Radon transform on distributions; integral geometry and generalized Radon transforms; the Radon transform on symmetric spaces; and applications to CAT, PET, radar imaging, and synthetic aperture radar.

746 Wavelet Theory (3:3:0). Prerequisites: Knowledge of convolution and Fourier transforms of sequences; some familiarity with Hilbert space theory helpful but not required; knowledge of a scientific programming language. 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 and developing the appropriate numerical algorithms, then develops the theory of wavelet bases on the real line, discussing multiresolution analysis, splines, time-frequency localization, and wavelet packets.

748/MATH 629 Symbolic Computation (3:3:0). Prerequisites: 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 a project.

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 a current climate is maintained, the sensitivity of climate, the mechanisms that have produced climate change in the past, and possible mechanisms whereby humans will produce climate change in the future.

752 Physical and Dynamical Oceanography (3:3:0). Prerequisites: CSI 751 or permission of instructor. Introduction to the climatology and dynamics of the oceans. 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 are covered.

753 Observations of the Earth and its Climate (3:3:0). Prerequisite: CSI 660 or an introductory remote sensing course, or 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 the Earth. Limitations imposed by satellite engineering, sensor limitations on data gathering, and a survey of data reduction specific to remote sensing applications are described along with current research issues, including examples pertaining to the atmosphere, land masses, and oceans. Current efforts by agencies such as NASA and NOAA to provide integrated data gathering and dissemination systems are discussed.

754 Earth Observations/Remote Sensing Data and Data Systems (3:3:0). Prerequisites: CSI 753 or permission of instructor. Covers how to access and apply earth Observation/Remote Sensing DATA for Earth system science research and applications. Major topics are data formats, analysis and visualization tools, and data applications. Covers combining innovative information technology techniques and Earth science data to set up on-line data centers for web users to be able to access data through WWW.

755 Introduction to Atmospheric Dynamics (3:3:0). Prerequisite: CSI 655, M.S. Physics or M.S. Mathematics, or permission of instructor. First part of the course 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 discussed.

756 Ocean Dynamics and Ocean Modeling (3:3:0). Prerequisite: CSI 752, 755 or permission of instructor. A mix of formal lectures, computer laboratory work with ocean models, and reading of published papers on ocean dynamics and ocean modeling. Topics will include ocean observations, ocean dynamics, tropical wave dynamics, ocean modeling, ocean data assimilation, and coupled ocean-atmosphere models.
757 Techniques and Algorithms in Earth Observing and Remote Sensing (3:3:0). Prerequisites: CSI 753 or permission of instructor. Retrieval, analysis, and application of geophysical parameters derived from remotely sensed data for Earth system research and applications. Covers 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. 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. 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. 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 stellar and galaxy dynamics, smoothed 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. Study of 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. Emphasis is on the imperfect nature of actual data sets and hypotheses. Examples are drawn from current space science research.

764/ASTR 764 Computational Astrophysics (3:3:0). Prerequisite: ASTR 530. Study of statistical mechanical 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.

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, including atomic and nuclear physics; 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. 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: 300-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 coordinate plots, and other graphical devices; re-expression and transformation of data; influence and leverage; and dimensionality reduction methods such as projection pursuit.

776/INFT 746 Stochastic Calculus (3:3:0). Prerequisite: STAT 652, or ECE 630 or 632, or permission of instructor. Introduction to modern theory of stochastic calculus such as 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.

778/INFT 776 Real Analysis and Statistics (3:3:0). Prerequisite: STAT 652, or ECE 620, 621, or 630, or permission of instructor. Advanced calculus and linear algebra needed for doctoral work in statistics and related fields. Topology, vector spaces, matrices, continuity, differentiation, sequences and series of real numbers and real-valued functions, Riemann and Riemann-Stieltjes integrals, and multidimensional calculus are covered. Applications in probability and statistics including response surface methodology.
779 Topics in Computational Statistics (3:3:0). Prerequisite: Permission of instructor. Selected topics in computational statistics not covered in fixed-content computational statistics courses. May be repeated for credit as needed.

780/PHYS 613 Computational Physics and Applications (3:3:0). Prerequisites: PHYS 510; FORTRAN, C or C++ programming; PHYS 502 or equivalent recommended; or permission of instructor. Study of diverse physical systems with emphasis on modeling and simulation. Development of numerical algorithms and application of numerical methods to gain understanding of the mechanisms and processes taking place in the physical system. Several projects are undertaken, which are drawn from such areas as atomic and molecular interactions, molecular dynamics, quantum systems, chaos, percolation, random walks, and aggregation mechanisms.

781 Plasma Science (3:3:0). Prerequisite: PHYS 513 or PHYS 722/CSI 785, PHYS 711/CSI 782/CHM 730; or permission of instructor. Study of ionized matter, theory, and some computation with application to astrophysics, industrial plasma processing, magnetosphere, and ionosphere problems. Vlasov and fluid equations are derived and applied in plasma science, including the study of plasmas with and without magnetic fields.

782/PHYS 711 Statistical Mechanics (3:3:0). Prerequisites: PHYS 502 and 613 or permission of instructor. Microcanonical, canonical, and grand canonical ensembles and fluctuations. Fermi-Dirac and Bose-Einstein statistics, the ideal monoatomic gas and diatomic gas, the Liouville equation, equipartition of energy, crystals, imperfect gases, kinetic theory, quantum statistics, and transport processes.

783/PHYS 736 Computational Quantum Mechanics (3:3:0). Prerequisites: PHYS 502 and PHYS 613/CSI 780, 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 Schrödinger'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.

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, Schrödinger 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, multipoles, 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. Computational approaches to model 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. Stochastic simulations such as Brownian motion, Langevin dynamics, Monte Carlo methods and random walks, and an introduction to cellular automata are included.

787 Computational Materials Science (3:3:0). Prerequisites: PHYS 512/CSI 687 and PHYS 736/CSI 783, or permission of instructor. 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 PHYS 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, hydrodynamical 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.

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.

801 Foundations of Computational Science (3:3:0). Prerequisite: Competency in UNIX and programming at the level of CS 601-604, PHYS 700, or permission of instructor. 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 visualization methods. Case studies in bioinformatics, space science, physics, and global change demonstrate important scientific accomplishments enabled by computation. Class projects involve work in teams to learn the mathematical models, abstract algorithms, and concrete algorithms for these cases, and conduct experiments and simulations with them.

803/INFT 875 Scientific and Statistical Visualization (3:3:0). Prerequisite: STAT 534 or CS 651 or permission of instructor. Visualization methods used to provide new insights and intuition concerning measurements of natural phenomena and scientific and mathematical models. Present 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. Emphasizes software tools on the Silicon Graphics workstation, but other workstations and software may be used for the project.

810 Scientific Databases (3:3:0). Prerequisite: ISSE 614 or equivalent, or permission of instructor. 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 Earth-orbiting satellite.

852 Geophysical Fluid Dynamics (3:3:0). Prerequisite: CSI 755 or permission of instructor. Covers an introduction to geophysical fluid dynamics, the study of rotating stratified flows. Topics include hydrostatics, the equations of motion, wave dynamics and stratified flow, effects of rotation, midlatitude 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. Topics include 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. 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 are also discussed.

876/INFT 876 Measure and Linear Spaces (3:3:0). Prerequisite: INFT 776/CSI 778 or permission of instructor. 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 in wavelets, applications to stochastic processes, and nonparametric functional inference.

877/INFT 877 Geometric Methods in Statistics (3:3:0). Prerequisite: STAT 751 or permission of instructor. Modern multivariate statistical methods including visualization of multivariable data rely on geometric insight and methods. 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. 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 Colloquia in Computational Sciences and Informatics (1:1:0). Attendance of colloquium presentations in specific research areas in computational sciences and informatics by CSI faculty, staff, 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). Attendance of colloquium presentations in a variety of areas of computational sciences and informatics by institute faculty, staff, and professional visitors. May be repeated for credit; however, a maximum of three credits of CSI 898, CSI 899, and CSI 991 may be applied toward the Ph.D.

909 Advanced Topics in Computational Sciences and Informatics (3:3:0). Prerequisite: Permission of instructor. Selected topics in computational sciences and informatics not covered in fixed-content courses. May be repeated for credit as necessary.

972/INFT 972 Mathematical Statistics I (3:3:0). Prerequisite: STAT 652 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 efficiency 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/INFT 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/INFT 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.

http://catalog.gmu.edu
978/INFT 978 Statistical Analysis of Signals (3:3:0). Prerequisite: 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 presumed. 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/INFT 979 Advanced Topics in Computational Statistics (3:3:0). Prerequisite: Permission of instructor. Selected topics in computational statistics not covered in fixed-content computational statistics courses. May be repeated for credit as needed.

986 Advanced Topics in Large-Scale Physical Simulation (3:3:0). Prerequisites: Permission of instructor. 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). A consideration of 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, 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 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. 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)

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 class numbered 112 or higher. Introduction to the nature and uses of computers using both lecture and laboratory practice. Widely used computer applications, including word processing, spreadsheets, databases, presentation software, and computer communications and networking are studied. Laboratory projects are required in these areas. Additional lectures address computer systems organization, legal and ethical considerations, security, artificial intelligence, and the Internet.

105 Computer Ethics and Society (1:1:0). 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.

108 Programming Fundamentals (3:2:1). Prerequisite: Knowledge of high school algebra. Introduction to programming fundamentals for non-technical majors. Software development process is presented. Students learn to write programs in a high level language that supports object oriented design. Students may not receive credit for both CS 108 and CS 112 (Computer Science and some other majors require CS 112).

112 Computer Science I (4:3:2). Prerequisite: Qualification for MATH 113 on 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 correctness, and applications development in a high-level programming language that supports modular design.

161 Introduction to Programming (1:1:0). Prerequisite: Knowledge of high school algebra. Not available for CS major credit. Introduction to computer programming, using the C++ programming language. Other languages may be offered at times.

211 Computer Science II (3:3:0). Prerequisite: Grade of C or better in CS 112. Continuation of CS 112. Topics include abstract data types and data structures (sets, files, strings, linked lists, stacks, queues, trees, graphs) and examples of their applications. Emphasis on program development continues and is reinforced through several larger programming projects. Additional programming language instruction supplements the major topics of this course.

265 Assembly Language Programming (3:3:0). Prerequisite: Grade of C or better in CS 211; corequisite: CS 105. Symbolic assembly language and computer structures; arithmetic and logical operations; machine representations of numbers, characters, and instructions; input-output and data conversions; addressing techniques; assembler directives; subroutine linkage; and macroprocessing.
310 Computer Science III (3:3:0). Prerequisite: Grade of C or better in CS 211. Tools and techniques required to develop moderate to large programs. Topics include continued study of object-oriented techniques, data structures, recursion, and problem-solving skills. Students complete several moderate-size programs.

330 Formal Methods and Models (3:3:0). Prerequisites: Grade of C or better in CS 211 and MATH 125. Abstract concepts that underlie much advanced work in computer science, with major emphasis on formal languages, models of computation, logic, and proof strategies.

332 Object-Oriented Specification and Implementation (3:3:0). Prerequisite: Grade of C or better in CS 310. Concentration on the transition from an abstract data type (ADT) specification to its implementation. Covers symbolic logic for reasoning about programs, axiomatic and algebraic methods for ADT specification, and introduction to goal-directed programming. The term project involves the design and construction of a program incorporating several ADTs.

363 Comparative Programming Languages (3:3:0). Prerequisite: Grade of C or better in CS 265. Key programming mechanisms described independently of particular machines or languages including control, binding, procedural abstraction, and types. Systematically surveys diverse high-level language capabilities.

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.

421 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 Data Base Concepts (3:3:0). Prerequisite: Grade of C or better in CS 310 and CS 330. Data models and data sublanguages for the relational, hierarchical, and network approaches to data base 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. Graphics devices and hardware, graphical user interface, scan conversion of geometric primitives, 2D-3D transformations and viewing, curves, hidden surface removal, illumination and color models, and a programming project that includes designing a menu-driven system.

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 seven-layer ISO reference model. Emphasis is on 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, CS 330, CS 365, and either OR 481 or MATH 446. Issues in multiprocessing. 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. fs

475 Distributed Systems (3:3:0). Prerequisite: Grade of C or better in CS 471 or permission of instructor. Practical issues in designing and implementing distributed software. Topics include concurrent programming, synchronization, multithreading, 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 CS 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. fs

483 Data Structures and Analysis of Algorithms (3:3:0). Formerly CS 465. Prerequisites: Grade of C or better in CS 310, CS 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. fs

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. fs

498 Independent Study in Computer Science (1-3:0:0). 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 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, search and traversal techniques, approximation algorithms), the analysis of specific algorithms falling into these classes, NP-Hard and NP-Complete problems.


621/SWSE 621 Software Design (3:3:0). See SWSE 621.


625/SWSE 625 Software Project Management (3:3:0). See SWSE 625.

627 Software Engineering Methods and Metrics (3:3:0). Prerequisites: CS 540 and either CS/SWSE 619 or CS 421. Presentation of the software engineering principles of management, methodologies, and metrics. Topics of software engineering management, process, and quality are presented in an integrative approach, stressing software improvements through measurements of software products and processes.

631/SWSE 631 Object-Oriented Software Development (3:3:0). Prerequisite: CS/SWSE 619 or 540, or equivalent. Principles of object-oriented analysis and design, development, and programming. Includes relationships between object-oriented design concepts and software engineering principles, techniques of object-oriented design and programming, and application of object-oriented techniques.


635 Foundations of Parallel Computation (3:3:0). Prerequisites: CS 583 and 540 or 371, 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.

652 Computer Graphics (3:3:0). Prerequisite: CS 583. Architecture of graphics input and display devices. Includes hardware interfaces; graphics software design concepts and techniques; basic algorithms for windowing, clipping, panning, and zooming; raster scan and random scan processing; data structures and graphics symbols; and hidden line removal algorithms and presentation of solid areas.

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 protocols of the seven-layer ISO reference model. 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 queueing networks, single

680 Natural Language Processing (3:3:0). Prerequisites: CS 340 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 686. 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 intelligent 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.

689 Intelligent Tutoring Systems (3:3:0). Prerequisite: CS 580. Principles, design, and development of computer-based tutoring systems and learning environments, with emphasis on the application of techniques from artificial intelligence. Covers organizing and representing subject matter and expertise in forms structured for presentation and communication, diagnosing a learner's actions to obtain information that can usefully guide tutorial decision making about subject matter, generating problems, and learning about various forms of assistance. Case studies and evaluation strategies are discussed.

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 (3:3:0). 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). Prerequisites: CS 571 and 635 or 619 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.
Computer Science (CS) • Conflict Analysis & Resolution (CONF)

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.

752 Interactive Graphics Software (3:3:0). Prerequisites: CS 652 and 583. Study of interactive graphics programming, architecture of display devices, graphics systems functional capabilities, and implementation concepts and techniques. Extends basic raster techniques to device independent algorithms such as two-and-three dimensional viewing, clipping, and transformations. Raster/scan conversion techniques, hidden surface and edge removal algorithms, shading and texturing techniques, and color models are discussed. User dialogues and human factors are examined.

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 queuing 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). Prerequisite: CS 580 and CS 652 or CS 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.

798 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.

799 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.

Conflict Analysis and Resolution (CONF)
Institute for Conflict Analysis and Resolution

Unless otherwise noted, all nondepartmental majors require permission of instructor to register for CONF classes.

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, fac-

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 masters students’ 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. 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.

697 Directed Reading (1-3:0:3). 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.

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.

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 Intercommunal 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, and classism.
725 Conflict and Spirituality (3:3:0). Prerequisite: CONF501 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 conceptions 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 facilitation 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 district 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.

740 Third-Party Roles, Resources, and Ethics (3:3:0). Prerequisites: CONF 501 or 801, 713. Analyzes and critiques the nature and roles of third parties in conflicts. Theoretical perspectives and case histories are used to understand the settings in which third parties may operate. Covers roles as mediator, conciliator, arbitrator, and facilitator, and types of intellectual and other resources third parties may bring to conflicts. Includes ethical assessment of third-party 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 Conflict Termination: Dynamics of the Peace Process (3:3:0). Prerequisite: CONF 501 or 801 or permission of the instructor. 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 (3:3:0). 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, Advanced Field Research Techniques, Grassroots Applications of Conflict Resolution.

799 Master’s Thesis Option (6:0:6). Prerequisites: CONF 501, 713, 610. Two semesters. Original research or analysis under the direction of a thesis committee.

801 Introduction to Conflict Analysis and Resolution (3:3:0). Prerequisite 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. (Note: 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 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 undergirding 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 (3:3:0). 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 (3:3:0). (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 See EDUC 500.
597 See EDUC 597.
598 See EDUC 598.
599 See EDUC 599.
600 See EDUC 600.

525 Advanced Human Growth and Development (3:3:0). Studies human development throughout the life span, including emotional, physical, and cognitive development, and emphasizes personal adjustment and achievement.

604 Analysis of the Individual (3:3:0). Develops a framework for understanding the individual in counseling including methods of gathering and interpreting data; choosing, administering, and interpreting individual and group tests; studying individual differences; and using case study techniques.

605 Introduction to Counseling Theory and Practice (3:3:0). Introduces counseling theories, principles, and practices. Students study, discuss, and analyze four of the basic therapeutic approaches to individual and group counseling with clients. Emphasis is on learning basic counseling skills through supervised practice and critique sessions. Course includes a lab.

607 Advanced Counseling Theory and Practice (3:3:0). Prerequisites: Admission to the Counseling and Development program, EDCD 525 or equivalent, and EDCD 605; or permission of instructor. Studies in depth selected counseling theories, principles, and topics. Provides intensive practice in advanced counseling techniques and approaches with emphasis on supervised practice sessions. Lab is included.

608 Group Processes and Analyses (3:3:0). Prerequisites: Admission to the Counseling and Development program and EDCD 605, or permission of instructor. Presents theories appropriate to various types of groups and descriptions of group practices, methods, dynamics, and facilitative skills. Attention is given to application of theory to practice. Lab is included.

610 Career and Educational Counseling (4:3:2). Prerequisites: Admission to the Counseling and Development program and EDCD 604, 605, and 607; or permission of instructor. Studies vocational choice theory, sources of occupational and educational information, approaches to career decision-making processes, and career development exploration techniques. Attention is given to application of theory to practice. Lab is included.

623 Principles and Practices of Elementary School Counseling (3:3:0). Introduces school counseling programs at the elementary school level. Philosophy, principles, and practices of effective elementary school counseling, as well as developmental needs of students 5-10 years of age, are presented.

625 Principles and Practices of Middle School Counseling (3:3:0). Introduces school counseling programs at the middle school level. Philosophy, principles, and practices of effective middle school counseling, as well as developmental needs of students 10-14 years of age, are presented.

627 Principles and Practices of Secondary School Counseling (3:3:0). Introduces school counseling programs at the secondary school level. Philosophy, principles, and practices of effective secondary school counseling, as well as developmental needs of students 14-18 years of age, are presented.

644 College Student Development (3:3:0). Introduces theory, nature, and background of the student personnel profession in higher education. Structure, organization, and administration of services and programs are emphasized.

654 Counseling in the Community, Agency, and Business Settings (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 counselor in the agency setting, and the personnel needs of the individual agency.

655 Diagnosis and Treatment Planning for Mental Health Professionals (3:3:0). Prerequisites: Admission to the Counseling and Development program and EDCD 605, or permission of instructor. Using actual and hypothetical cases, 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, and EDCD 605 and 607 taken previously or concurrently; or permission of instructor. Introduces major approaches to counseling couples and families. Case studies and simulations facilitate the transition from theory to practice.

660 Counseling and Development for Special Populations (3:3:0). Prerequisites: Admission to the Counseling and Development program and EDCD 605, or permission of instructor. Studies the nature, characteristics, and needs of special groups seeking counseling and development services. Analyzes content, techniques, and goals of programs developed to serve these groups.

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. Attention is given to consultation and collaboration with other professionals to facilitate human development and self-direction.

670 Gender Issues in Counseling (3:3:0) Corequisite: EDCD 603. Prerequisites: EDCD 605. Explores how gender stereotyped, cultural messages can affect physical and emotional health. Students will study the psychosocial development of females and males to understand how societal messages can impact negatively on personal and professional relationships, create impediments to health family systems, and pose limitations on individual potential. Students will learn counseling interventions to help clients become aware of and combat restrictive gender stereotypes in order to become more fully functioning.

670L Horizons: 2000 Gender Issues in Counseling Lab (3:3:0). Prerequisites: EDCD 605, 670, and permission of instructor. Counseling and Development School Counseling students will be trained to teach the Horizons: 2000 curriculum. After training, students will teach Horizons:
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2000 in the Horizons Summer Camp or in a school, community, or higher education setting.

Prerequisites: Admission to the Counseling and Development program, EDCD 605 and 607, and permission of advisor. Focuses on basic counseling skills through simulated and actual counseling experiences. Students are required to volunteer in a counseling setting and spend time in class meetings to present, analyze, and practice techniques. Those taking EDCD 754 in a school setting must have prior or concurrent teaching or other experience at the placement level or must have completed the specialization course on counseling at that level.

790 Internship in Counseling and Development (6:0:0).
A. Elementary; B. Middle; C. Secondary; D. Higher Education; E. Agency. Prerequisites: Admission to the Counseling and Development program, completion of the graduate program except for the internship; permission of advisor; an overall GPA of 3.0 and no more than two grades of C in all graduate course work required by the program. Provides supervised practice of counseling in a setting similar to that in which the student plans to work (School placements are open to certified personnel only).

797 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.

Cultural Studies (CULT)

Cultural Studies

802 Histories of Cultural Studies (3:3:0).
Prerequisites: Admission to program, to M.A. “feeder” track, or permission of instructor. Provides a historical survey of the principal works and theories of cultural studies. Cultural studies has come to be constituted in many different and often competing strands. Offers an overview of the contemporary situation of cultural studies and assess the possibilities for its future development.

806 Research Seminar in Cultural Studies (3:3:0).
Prerequisite: 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).
Prerequisites: 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).
Prerequisites: 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).
Prerequisites: 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).
Prerequisites: 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).
Prerequisites: 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).
Prerequisites: Admission to program or permission of instructor. Surveys the making of racial, ethnic, 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). 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 tracks as agreed upon in consultation with student’s advisors. 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.

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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.

Dance (DANC)
Institute of the Arts

101 Dance Appreciation (3:3:0). Introduction to dance as a cultural art form. Elements of dance are examined separately and combined in various dance forms. A brief survey of the basic forms leads to a more intensive study of modern and the new dance. Criticism and evaluation are stressed. f,s

114 Rhythmic Analysis and Music Resources for Dance (3:3:0). Prerequisite: Dance major or permission of instructor. May not be taken if DANC 313 has been previously credited. 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. af

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 six credits. Fulfills non-western requirement for students in the College of Arts and Sciences and the Institute of the Arts.

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 six credits. f,s

131 Beginning Jazz Technique (3:3:0). Students are advised to take DANC 125 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 six 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 six credits. f,s

150 Dance Improvisation (3:3:0). Exploration into the creation of spontaneous movement experiences. Emphasis on encouraging freedom of self-expression and creative awareness. s

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 six credits.

170 Orientation to Dance Production (1:1:1). Prerequisite: 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. f

204 Visual Thinking (3:3:0). Also ARIN 204, ARTS 204, and THR 204. Not open to students who have had ARTS 102. 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 Impulses (3:3:0). Also ARIN 205, ARTS 205, and THR 205. 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.

210 Dynamic Alignment (3:3:0). Prerequisite: Dance major or permission of instructor. May not be taken if DANC 305 has been previously credited. Aspects of anatomy and kinesiology that directly apply to the correct development of dance technique. Emphasis on the use of exercise corrective techniques and imagery to correct insuffcient muscle pattern and reduce stress upon the body. af

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 nine credits. f,s

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 nine credits. f,s

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. f

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 six credits. f,s

307 Aesthetic Awareness (3:3:0). Also ARIN 307, ARTS 307, and THR 307. Presentation of the historical, philosophical, and aesthetic traditions of the arts with opportunities for each student to confront their own sense of beauty.

308 Cross-Cultural Arts Appreciation (3:3:0). Also ARIN 308, ARTS 308, and THR 308. Course 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 each semester.
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: 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 three credits.

345 Intermediate Ballet (1-3:1-3:0). Prerequisite: 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. f,s

350 Advanced Dance Improvisation (3:3:0). Prerequisites: DANC 125 and 150, or permission of instructor. Lecture/performance course for continued study of dance improvisation. Each student is responsible for creating and directing advanced problems in dance improvisation.

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.

370 Dance Performance (1:0:3). Prerequisite: Audition or permission of instructor. Practical experience in the areas of performance, repertory, and choreography through rehearsal and public performance of university dance concerts or guest artist programs. May be repeated for a total of 12 credits. f,s

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 six credits. f,s

372 Advanced Dance Production (1:1:1). Prerequisite: DANC 170 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). History of the social, cultural, and philosophical factors in the development of Western dance as an art form to the 20th century. af

391 Dance History: 20th Century (3:3:0). History of the social, cultural, and philosophical factors in the development of Western dance as an art form in the 20th century. as

394 Intermediate Labanotation (2:2:1). Prerequisite: DANC 114, 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, philosopich approach to 20th-century dance artists, cinedance). Topic depends on instructor. May be repeated for a total of nine credits.

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. f,s

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, philosopich approach to 20th-century dance artists, cinedance). Topic depends on instructor. May be repeated for a total of nine credits.

425 Advanced Modern Dance (1-3:1-3:0). Prerequisite: 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. f,s

445 Advanced Ballet (1-3:1-3:0). Prerequisite: 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.

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 maximum 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.

489 Field Experience in the Arts (3:6-0:0). Also ARIN 489, ARTS 489, and THR 494. Prerequisite: Junior standing and completion of six credits in I OA courses in the area of residency, ARIN 350, or 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 prearranged with the division director prior to enrollment. May be repeated for a maximum of six credits.

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 nine credits.

525 Advanced Modern Dance (1-3:1-3:0). Prerequisite: Audition. 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: Audition. 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.

550 Advanced 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.

557 Directed Choreography (1-3:3:0). Prerequisite: Permission of instructor. Individual choreographic project supervised by a faculty member. May be repeated for a total of six credits.

570 Advanced Dance Performance (1:0:3). 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 six 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 (1-3:0:0). Individual research or a creative project in close consultation with an instructor. May be repeated for a total of six 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 six 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.

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.

210 Statistical Analysis for Management (4:4:0). Prerequisites: MATH 108 or 113. Corequisite: MIS 102. Introduction to the application of statistical methods to support quantitative decision analysis in resolving business problems.

301 Decision Models in Business and Operations Management (3:3:0). Prerequisite: Completion of at least 48 credits including MATH 108 and DESC 210. Examination of the principal functions of operations managers in various settings. Analytic models are used to describe key planning and control activities in both product and service industries. Linear programming, service systems, network analysis, simulation, inventory models, quality control, forecasting, work measurement, and layout models are introduced as tools for effective management. Extensive use of computers in problem solving.

320 Logistics Systems Management (3:3:0). Prerequisite: DESC 301. Consideration of design, planning, and development of logistics systems with emphasis on the various logistics activities required throughout the system/product life cycle. Topics include development of concepts and factors in system design, test and evaluation, production/construction, operational support, and system retirement/disposal.

352 Methods and Models of Management Science (3:3:0). Prerequisite: DESC 301, degree status. Operation research for general management. Emphasis on effective application of math programming and stochastic process analysis. Topics include linear programming, integer programming, goal programming, decision theory, networks, simulation Markov processes, inventory theory, and queuing theory. Extensive use of microcomputer software in problem solving.

415 Computer Integrated Production Planning and Control (3:3:0). Prerequisite: DESC 301. Focus on production planning, master production scheduling, material requirements planning, shop floor control, and inventory

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control. Problems in these areas are examined from the viewpoint of modern computer systems (e.g., MRP II systems) currently used for the control of manufacturing operations.

435 Computer Simulation (3:3:0). Prerequisites: DESC 210 and programming course recommended. Introduction to the basic concepts of simulating complex systems by computer. Topics include Monte Carlo methods, discrete-event modeling, a specialized simulation language, and the statistics of input and output analysis.

452 Business Forecasting (3:3:0). Prerequisite: DESC 210. Introduction to forecasting that examines alternative models and their application to a variety of business operations. Topics include trend analysis, moving averages, exponential smoothing, adaptive models, multiple regression and correlation, and time series analysis.

456 Quality Management (3:3:0). Prerequisite: DESC 301. Development of the basic concepts and procedures associated with a quality control system. Extensive use is made of modeling and statistical inference in monitoring and evaluating performance quality control functions. Emphasis is placed on the management aspect of the quality control system. Both microcomputers and cases are used.

493 Management of Technology (3:3:0). Prerequisites: MGMT 302, MKTG 301, and DESC 301. Cross listed as MGMT 493. Technology development and implementation is a key to business success in the 21st century. Examines issues involved in managing technology including technological lifecycles, sourcing technology (internal or external development), decisions to lead or to follow in innovation, and design of the innovative organization.

499 Independent Study in Decision Sciences (1-3:0:0). Prerequisite: DESC 352. Investigation of a business problem according to individual interest that uses state-of-the-art decision science methodology.

710 Business Forecasting (3:3:0). Prerequisite: DESC 650 or MBA 638. Study of forecasting techniques that are employed in the private and public sector. Primary emphasis is on time series techniques. Students will learn to model stationary and nonstationary processes with autoregressive, moving average, and mixed models. These techniques will be demonstrated and used through computer software.

720 Project and Cost Management (3:3:0). Prerequisite: DESC 650 or MBA 638. Focus on project scheduling, time-cost tradeoffs, 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.

746 Operations Management in the Service Industry (3:3:0). Prerequisite: DESC 650 or MBA 638. Provides an understanding of the basic concepts, techniques, and practices used in managing operations within a service organization, such as service strategies, service system design, capacity planning, scheduling of services, and quality management.

763 Seminar in Operations Management (3:3:0). Prerequisite: DESC 650 or MBA 638. Aspects of productivity, technology, new processes, materials, products, equipment, and facilities. Implications of new technology in managing the operation (production) function. Lecture, discussion, cases, and problems.

796 Independent Study and Directed Readings (3:0:0). Prerequisite: DESC 650 or MBA 638. By special arrangement with the professor and approval from the director of Student Services.

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). 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 modelling 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.


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.
256 Economics (ECON)

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.

322 Economics of Income Distribution (3:3:0). Prerequisites: ECON 103 and 104. Theoretical models of functional and personal distribution of income with emphasis on human capital welfare considerations and screening.

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; debt management and its economic effect.

335 Environmental Economics (3:3:0). Prerequisites: ECON 103 and 104. Microeconomic analysis to analyze environmental problems. Topics include an analysis of externals 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. 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.

375 Economics of Transportation (3:3:0). Prerequisites: ECON 103 and 104. Transportation industry in the United States. Structure modes and economic problems of the competing types of transportation.

380 Comparative Economic Systems (3:3:0). Prerequisites: ECON 103 and 104 or permission of instructor. Theory, programs, and practices of economic systems including capitalism, socialism, and fascism.

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 economics, 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.

499 Independent Study (1-3:0:0). Prerequisites: Economics majors with 90 credits and permission of both department and instructor. Individual study of a selected area of economics. Directed research paper required.

ECON 306 and 311, or equivalent, are prerequisites to all graduate courses except ECON 600 and 602. Undergraduates are not permitted to enroll in 600-level courses. Additional prerequisites are noted. With permission of the instructor, additional prerequisites may be waived.

535 Survey of Applied Econometrics (3:3:0). Prerequisites: 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.)

602 Economic Analysis (3:3:0). Prerequisite: Baccalaureate degree. Course cannot be taken for credit toward a
graduate degree in economics. A rigorous, concentrated introduction to micro- and macroeconomic analysis. Emphasized are economic concepts, tools of analysis, public policy, and business applications.

**611 Microeconomic Theory (3:3:0).** Prerequisite: 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.

**615 Macroeconomic Theory (3:3:0).** Prerequisite: 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.

**623 American Economic History (3:3:0).** Prerequisites: 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.

**630 Mathematical Economics I (3:3:0).** Prerequisite: 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.

**637 Econometrics I (3:3:0).** Prerequisite: 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.

**676 Comparative Economic Systems (3:3:0).** Capitalism, socialism, and corporatism historical perspective. Includes examination of the economies of representative contemporary countries.

**715 Macroeconomic Theory I (3:3:0).** Prerequisite: 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.

**799 Thesis (1-6:0:0).** Students who take ECON 896 and then elect the thesis option receive three credits for ECON 799 upon completion of the thesis. Students who do not take ECON 896 receive six credits for ECON 799 upon completion of the thesis.

**812 Microeconomic Theory II (3:3:0).** Prerequisite: ECON 611. Nature of the firm, theory of supply, and production functions, factor pricing, and supplies. Introduction to microeconomic foundations of theories of public finance and public choice.

**816 Macroeconomic Theory II (3:3:0).** Prerequisites: ECON 611 and 715 or permission of instructor. Aggregate economic activity and price levels with emphasis on dynamic models. Topics vary.

**817 Monetary Theory and Policy (3:3:0).** Prerequisites: 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.

**820 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.

**821 History of Economic Thought II (3:3:0).** Development of economic analysis from the "marginal revolution" of 1877 to present. Emphasis on the development of neoclassical economic theory.

**823 Topics in Economic History (3:3:0).** Prerequisites: 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.

**827 Economic Philosophy (3:3:0).** Prerequisite: 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.

**828 Constitutional Economics (3:3:0).** Prerequisite: ECON 611 or permission of instructor. Analysis of existing and proposed elements of the "economic constitution." 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.

**829 Economics of Institutions (3:3:0).** Prerequisite: 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 discussion of classical and contemporary approaches to an economic theory of institutions.

**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.

**842 Labor Economics (3:3:0).** Prerequisites: ECON 611 and 615 or permission of instructor. ECON 637 is recommended. Formal models of labor demand, supply, utilization, and wage determination. Determination of factor shares in an open economy. Theory of collective bargaining and impact of trade unions on wage rates and resource allocation. Measurement, types, and causes of unemployment. Benefit-cost analysis of manpower training and development projects.


849 Public Finance (3:3:0). Prerequisite: ECON 611 or permission of instructor. Theoretical and institutional analysis of public expenditure, taxation, debt management, and intergovernmental fiscal relations. Allocations and distributional effects of alternative tax and subsidy techniques. Principles of benefit-cost and cost-effectiveness analysis for government decisions.

851 State and Local Public Finance (3:3:0). Prerequisite: ECON 611 or permission of instructor. Analysis of public spending and taxation at the subfederal level. Theory of public goods, positive and normative explanatory models of public expenditure determination, and intergovernmental fiscal relations. Problems in providing specific state and local services, including education and police and fire protection.

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 615 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.

872 Managerial Economics (3:3:0). Prerequisites: ECON 602 and PUAD 641. Economic theory as it applies to specific business situations and decisions. Production levels, price determination, cost, competition, profits, supply/demand.

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. 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.

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 (3:3:0). 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.

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.

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. Litigation and legislation pertaining to the education of diverse populations are emphasized. 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. Contemporary theories of human development and their relevance to educational practice are emphasized. 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 and/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. Emphasis is on the critical review of contemporary theories of human development and their relevance to educational practice.

511 Introduction to Elementary Education in International Schools (3:3:0). Introduces the student to the structure and variations of international schools. Includes an analysis of human growth and development (early/middle grades), 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. Develops 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). Studies 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. Students are introduced 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 (3:3:0). Prerequisite: Admission to the Graduate School of Education or permission of instructor. Provides an overview of the various ways of educating and of the socialization processes operating within American educational institutions and other organizations. Current educational practices are analyzed in terms of history, philosophy, psychology, and sociocultural factors of formal and informal learning. Emphasis is on trends, issues, and alternative futures.

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. Emphasis is on applications to all disciplines taught in secondary schools. Current educational trends and issues are examined in relation to the sociology of secondary school settings. Field experiences are required.

529 Pluralism and Exceptionality in U.S. Education (3:3:0). Prerequisite: Admission to the Graduate School of Education or permission of instructor. Examines cultural pluralism in American education, with a focus on the nature of linguistic and cultural diversity in public schools, including special education settings, the relationship between nonverbal communication and language systems, and interpersonal skills needed for encouraging harmony between the dominant culture and culturally and linguistically diverse communities in the United States.

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 understand the social issues and suggest possible remedies through practice and policy.

539 Psychological Foundations of Adolescent Learning and Development (3:3:0). Prerequisite: EDUC 522. Synthesizes the psychological foundations of secondary education. Emphasis is on principal theories and practices in contemporary educational settings. Simultaneous enrollment in a methods course is encouraged.

597 Special Topics in Education. Prerequisite: Admission to a program in the Graduate School of Education. Provides advanced study in 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 credit. No more than six hours of EDUC 500 (also may be listed as EDLE, EDCD, EDCI, EDIT, EDRD, or EDSE), 598, and/or 600 may be applied to degree credit.

599 Thesis (6:0:0). Prerequisite: EDRS 590. Studies a problem of significant interest to the student, using accepted research methods under the supervision of a member of the graduate faculty.

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 (3:3:0). Prerequisite: Admission to the Graduate School of Education or permission of instructor. Examines research in educational anthropology, focusing on its applications to educational practice. Topics include culture and learning, cultures in the schools, social interaction patterns, culture contact, and variability within cultures. Students acquire alternative ways of viewing educational processes, learn skills in analyzing and reflecting on educational settings, and develop strategies to improve educational 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.

695/ENGL 695 Northern Virginia Writing Project Inservice Program (1-3:0). 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 six semester hours of credit in EDUC 695, ENGL 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. Focus is 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. 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, examining the disciplines' subject matter, scope, key concepts, principles, methods, and theories. Selected philosophical traditions underlying educational practice and research are analyzed. 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. 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. Studies 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 study 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 in 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. Study of policy as process in the local, state, and federal arenas. Primary focus is on policy questions of compulsory schooling, the purpose of schooling, curriculum and testing, governance, and finance. Issues of quality, efficiency, equity, and choice are also addressed.

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. 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, are explored in depth from federal, state, and local points of view.

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 six 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. in Education program or permission of instructor. Doctoral seminar that examines how theories and research from educational anthropology and educational sociology can help understand and address
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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). Doctoral seminar examining the knowledge base, policy issue, 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 six 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 (2:2:0). 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; EDCI 701, 705, 895; EDLE 895; EDCD 895; EDCI 895.

Education Leadership (EDLE)

Graduate School of Education

500 See EDUC 500

597 See EDUC 597

598 See EDUC 598

600 See EDUC 600

611 Schools and Communities (3:3:0). Studies schools from historical, political, psychological, sociological, and anthropological perspectives. Gives equal attention to theories and practices of effective school and community relations. (EDLE 611 and 621 should be the first courses taken in education leadership programs.)

612 Education Law (3:3:0). Prerequisites: EDLE 611 and 621. A basic course in law related to education.

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.)

624 Curriculum Development and Evaluation: Elementary/Middle Education (3:3:0). Studies curriculum design and evaluation at the elementary and middle/junior high school levels, with emphasis on instructional leadership (should not be taken by a degree student who has successfully completed EDLE 626 or 627 or its equivalent).

625 Curriculum Development and Evaluation: Middle/Secondary Education (3:3:0). Studies curriculum design and evaluation at the middle/junior high and secondary school levels, with emphasis on the roles of educational leaders (not available to students who have completed EDLE 627 or 628 or its equivalent).

631 Supervision and Evaluation of Instruction (3:3:0). Prerequisites: EDLE 611 and 621. Analysis of instructional elements and processes; and theory and practices in evaluation/supervision of instructional programs and staff.

725 School Business Management (3:3:0). Prerequisites: EDLE 611 and 621. Research, theories, and practices in the management of finances in education. Emphasis is on school-site tasks; attention is given to site-based management.

740 Personnel Administration in Education (3:3:0). Prerequisites: EDLE 611 and 621. Studies theory, research, and practice relating to personnel administration in education.

789 Education Leadership (3:3:0). Prerequisites: EDLE 611 and 621. Studies basic theories and models of leadership with application to leadership in education. Major emphasis is on shared leadership in professional environments.

791 Internship I in Education Leadership (3:0:3 or 6:0:6). Prerequisite: Permission of advisor. Applies administrative and supervisory theory to practice and analysis of practice through approved field experiences. Internship may be repeated for credit.

792 Internship II in Education Leadership (3:0:3 or 6:0:6). Prerequisite: Permission of advisor. Translates administrative and supervisory theory into practice through approved field experiences. (Candidates for endorsement as school administrators in Virginia must meet special requirements; consult adviser.) The internship usually is a full-day, extended-time experience. Internship may be repeated for credit.

797 See EDUC 797.

895 Emerging Issues in Administration and Supervision (3:3:0). Prerequisite: Admission to the Ph.D. program or permission of instructor. Studies selected emerging issues in educational leadership. Students engage in research, study, discussion, and writing about the various topics selected for study.

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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. Interpretation of standardized tests of ability, aptitude, achievement, interest, and personality is also discussed.

590 Education Research (3:3:0). Develops skills, insights, and understandings basic to performing research, with emphasis on interpretation and application of research results. The course critiques research and uses findings in educational settings.

597 See EDUC 597.

690 Research in Practice (3:3:0). Prerequisite: EDUC 590 or permission of instructor. Enables practitioners to develop skills for conducting research related to their professional practice. Involves examining examples of such research, identifying research questions, identifying and using appropriate research designs and methods, writing up the results of the research, and exploring rationales for such studies.

797 See EDUC 797.

810 Problems and Methods in Education Research (3:3:0). Prerequisite: Admission to the Ph.D. program or permission of instructor. Advanced course in the interpretation and application of education research methods. Emphasizes comparing 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). Prerequisite: Satisfactory completion of EDUC 810 or its equivalent, or permission of instructor. Explores the development and types of current systems and models for evaluating educational programs and curricula. Emphasis is on procedures for evaluating public and private elementary and secondary schools, colleges and universities, and government and industrial education programs. f,s,even

895 Emerging Issues in Qualitative Research (3:3:0). Prerequisite: EDRS 812 or its equivalent. Examines current issues in qualitative research, such as designing and writing a qualitative research proposal, interviewing, collecting video data, using qualitative computer programs, analyzing data, and writing qualitative reports. Provides students with opportunities to apply new skills and knowledge to projects related to their own interests and to design relevant individualized components.

Electrical and Computer Engineering (ECE)

101 Introduction to Information Technology (3:3:1). Course is open to non-ECE majors. 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: MATH 114. 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 computer models are related to physical reality provided by hands-on experiments. f,s

220 Signals and Systems I (3:3:1). Prerequisite: 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. f,s,summer

280 Electric Circuit Analysis (5:4:2). Prerequisites: Grade of C or better in ECE 201 and in PHYS 260 and 261 (formerly 350 and 351); corequisites: 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. f,s,summer

301 Digital Electronics (3:2:2). 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 elementary computer architecture. fs

305 Electromagnetic Theory (3:3:0). Prerequisite: PHYS 262 (formerly 352) 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. fs

320 Signals and Systems II (3:3:1). 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. fs, sum

331 Digital System Design (3:3:0). Prerequisite: Grade of C or better in ECE 280 or permission of instructor; corequisite: 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. fs

332 Digital Electronics and Logic Design Lab (1:0:3). Prerequisite: PHYS 261 or 262 (formerly 351 or 353) or permission of instructor; corequisite: ECE 331. Lab associated with ECE 331. fs, sum

333 Linear Electronics I (3:3:0). Prerequisite: Grade of C or better in ECE 280 and in PHYS 262 (formerly 352) or equivalent. ECE 334 is normally taken concurrently with ECE 333. Principles of operation and application of electronic devices and linear circuits. Topics include semiconductor properties, diodes, bipolar and field effect transistors, biasing, amplifiers, frequency response, operational amplifiers, and analog design. fs, sum

334 Linear Electronics Lab I (1:0:3). Prerequisite: PHYS 261 or 265 (formerly 351 or 353) or permission of instructor; corequisite: ECE 333. Lab associated with ECE 333. fs, sum

410 Introduction to Signal Processing (3:3:0). Prerequisites: A grade of C or better in ECE 320 and STAT 344. 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. f

421/SYST 421 Classical Systems and Control Theory (3:3:0). Prerequisite: 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. fs, sum

422 Digital Control Systems (3:3:0). Prerequisite: ECE 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. s

429 Control Systems Lab (1:0:3). Prerequisite: ECE 421; corequisite: ECE 422. Laboratory experiments for topics in control systems analysis, design, and implementation with an emphasis on the use of microcomputers. s

430 Principles of Semiconductor Devices (3:3:0). Prerequisite: 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. s

431 Digital Circuit Design (3:3:0). Prerequisite: 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; non-regenerative and regenerative circuits; TTL, ECL, IIL, NMOS, and CMOS technologies; semiconductor memories; VLSI design principles; and SPICE circuit analysis. fs

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. fs

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. fs

435 Digital Circuit Design Laboratory (1:0:3). Prerequisite: ECE 334; corequisite: ECE 431. Lab experiments for topics covered in ECE 431. fs

436 Introduction to Photonics (3:3:0). Prerequisites: ECE 305 and ECE 431. Introduction to optical and optoelectronic devices for sensing, communications, storage, processing, and display of information. Topics covered are lasers, detectors, CCD arrays, holograms, fibers and fiber sensors, optical disk storage, and liquid crystal display devices. f
437 Principles of Microelectronic Device Fabrication (3:2:3). Prerequisites: ECE 333 or ECE 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 or 301. 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, introduction to VHDL, and behavioral modeling of computer organization.

447 Single-Chip Microcomputers (4:3:3). Prerequisites: ECE 332 and 445, both 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. Laboratory course providing experience in the design and fabrication of a digital computer. Course includes the specification of a computer system and the fabrication of a multichip random access memory, an arithmetic and logic unit and associated registers, input/output circuitry, and a control unit. The above entities are then combined to form a simple computer. Medium-scale integrated circuitry is used.

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 344, 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: ECE 460 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 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.

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.

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 plan of study.

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, and testing the complete system. Oral and written reports are required during the project and also at the project's completion.
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

500 Signals and Systems: Theory and Applications (3:3:0). Prerequisites: MATH 203, 213, and STAT 344; may not be applied to electrical or computer engineering degree programs. Fundamental and advanced techniques for system analysis. Course reviews Fourier series and transforms; and covers convolution, correlation, power spectrum, bandwidth; communication systems and modulation techniques; sampling and quantization; discrete-time signals and systems, Z-transform; discrete Fourier transform and FFT algorithms; and analysis and design of digital filters.

511 Microprocessors (3:3:0). Prerequisite: ECE 445 or equivalent. Introduction to microprocessor architecture and structure. Intel 8080/8085 and Z-80 architecture and programming; microcomputer bus structure; microcomputer memory; microcomputer I/O, interrupt, DMA, and interface; microcomputer development systems; and application examples are covered. Course introduces 16-bit microprocessors of the Intel x86 and Motorola M68000 families.

512 Real-Time Microprocessor Systems (3:3:0). Prerequisites: ECE 421 and 511 or equivalent. Real-time microprocessor systems with emphasis on control, interfacing techniques, real-time operating systems, and related applications. Topics include basic input-output operations, interfacing of the peripheral analog circuitry, operating systems, programming techniques, process control with microcomputers, and microcomputers for communications. Course includes a simulation and design project.

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.

516 Advanced Microprocessors (3:3:0). Prerequisite: ECE 447 or 511 or equivalent. 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.

520 Applications of Analog and Digital Integrated Circuits (3:3:0). Prerequisites: ECE 433 and ECE 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.

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.

528 Random Processes in Electrical and Computer Engineering (3:3:0). Prerequisites: ECE 320 and STAT 344 or equivalent. Study of topics including random signals and noise in communications, stationary and ergodic random processes, spectral analysis, Gaussian processes, Brownian motions, mean square estimation, Kalman and adaptive filtering, Markov processes, and Poisson processes. Applications are drawn from computer, communication, control, and signal processing.

535 Digital Signal Processing (3:3:0). Prerequisites: ECE 320 and ECE 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 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 narrowband 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.
266 Electrical & Computer Engineering (ECE)

543 Cryptography and Computer Network Security (3:3:0). Prerequisites: ECE 331 and CS 211. Topics covered include need for security services in computer networks, basic concepts of cryptology, historical ciphers, modern symmetric ciphers (DES, IDEA, RC5), Advanced Encryption Standard (AES), 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.

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.

564 Modern Optical Engineering (3:0:0). Prerequisites: ECE 305 and 320. Introduction to optical physics from a wave propagation perspective. Topics included are coherence, interference and diffraction, polarization, birefringent materials, coherent and incoherent imaging systems, Fourier optics, and holography.

565 Introduction to Optical Electronics (3:3:0). Prerequisites: ECE 305 and ECE 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.

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, p-n 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. 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 333 and ECE 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.

588 VLSI Test Concepts (4:3:3). Prerequisite: ECE 331, 431, and 435. 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, IDDQ test, boundary scan and related standards, test synthesis, diagnosis and failure analysis, automated test equipment, embedded core test.

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.
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 Estimation, Identification, and Adaptive Control (3:3:0). Prerequisites: ECE 521 and 528, or permission of instructor. Fundamentals of signal estimation, system identification techniques, and adaptive methods in systems control and signal estimation. Topics are selected from linear systems with random inputs, Kalman Filtering, continuous and discrete-time systems identification, and basic adaptive algorithms such as LMS, RLS, and stochastic approximations. Also included are adaptive control methods such as the Self-Tuning Regulation and Model Reference Adaptive Control with process control applications.

622 High-Frequency Electronics (3:3:0). Prerequisite: ECE 305 and 433, or permission of instructor. Study of devices and circuits used in high-speed communications systems. Topics include microwave bipolar transistors, GaAs MESFETs, and high-speed integrated circuits; and the design of linear and power amplifiers using S-parameter techniques and computer simulation.

624 Computer 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.

631 Digital Communications (3:3:0). Prerequisite: ECE 630 or equivalent. Digital transmission of voice, video, and data signals. Course covers signal digitization, 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.

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.

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.

634 Digital Speech Processing (3:3:0). Prerequisite: ECE 535. Parametric models of speech. Topics include digital representation of the speech waveform, speech bandwidth compression, homomorphic speech processing and linear predictive coding, human-machine communication, speech and speaker recognition, and speech synthesis.

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 algorithm; noise perturbed search and misadjustment; sequential regression algorithm and convergence issues; recursive least squares algorithm and forgetting factor; frequency-domain algorithms; adaptive equalization; pseudo-random binary sequences and system identification; adaptive interference cancellation; adaptive beam forming and adaptive arrays. Simulation of the adaptive algorithms.

637 Spread Spectrum Communications (3:3:0). Prerequisite: ECE 631. 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.

638 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 algorithms, multirate processing of digital signals, spectral estimation, adaptive filtering, parallel and pipeline computational arrays, and mapping of signal processing algorithms into systolic arrays.

639 Satellite Communications (3:3:0). Prerequisite: ECE 631 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.

640 Massively Parallel Computers (3:3:0). Prerequisite: ECE 546 or permission of instructor. Topics include basic concepts of parallelism, two-dimensional computation schema, 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 546 or equivalent. 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.

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642 Design and Analysis of Computer Communication Networks (3:3:0). Prerequisites: ECE 542 and ECE 528 or equivalent. Introduction to queueing 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 or equivalent. Architectures and algorithms for the analysis and processing of pictorial information. Topics include various 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 desegmentation, object thinning, real-time orthogonal transformations, and applications. Course includes a design project.

650 Robotics (3:3:0). Prerequisite: ECE 521 or permission of instructor. Introduction to robotics and advanced automation from an 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.

651/CS 685/SYST 672 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, operations 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 adaption to the environment.

662 Microwave Electronics (3:3:0). Prerequisites: ECE 513 and 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 Optical Signal Processing (3:3:0). Prerequisites: ECE 564 and 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.

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.

670/SYST 680 Principles of Command, Control, Communication, and Intelligence (C3I)—Part I (3:3:0). Prerequisites: ECE 528 and 542, or equivalent. See SYST 680. See SYST 681.

671/SYST 681 Principles of Command, Control, Communication, and Intelligence (C3I)—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.

684 MOS Device Electronics (3:3:0). Prerequisite: ECE 584 or permission of instructor. Study of Metal-Oxide-Semiconductor (MOS) based device theory, characteristics, models, and limitations. Topics include MOS capacitor, MOSFETs, CMOS, charge coupled devices, scaling, hot carrier effects, latchup, radiation effects, and isolation techniques.

689 Semiconducting Materials (3:3:0). Prerequisite: ECE 521 or permission of instructor. Course on semiconducting materials that are of interest for present and future device applications. Topics include crystal and electronic structure, carrier statistics, carrier transport (drift and diffusion), and carrier generation/recombination, and specific properties of elemental and compound semiconductors. Relevant characterization techniques are also briefly reviewed.

698 Independent Reading and Research (3:3:0). Prerequisites: Course on semiconductor. 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 Multivariable and Robust Control (3:3:0). Prerequisite: ECE 620 or 621. 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 Nonlinear Systems (3:3:0). Prerequisite: ECE 620 or 621. 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.

728 Random Processes in Electrical and Computer Engineering II (3:3:0). Prerequisite: ECE 630 or equivalent 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, Lebesgue integration, conditional mean on a sigma-field, convergence of random variables, limit and ergodic theorems, Markov processes, and Martingales.

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 signalling 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 modem, and high-density data storage design are presented.

734 Detection and Estimation Theory (3:3:0). Prerequisite: ECE 630. Introduction to detection and estimation theory, detection of known signals in Gaussian noise, signal parameter estimation, linear waveform estimation, and Wiener and Kalman filters.

735 Data Compression (3:3:1). Prerequisite: ECE 528 and 535 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.


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 High-Speed Networks (3:3:0). Prerequisite: ECE 642. 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 Multimedia Networking and Communications 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). Prerequisites: ECE 511 and 644. 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). Prerequisites: ECE 684. Study of Ultra-Scale-Integration (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.
749 Neural Networks for Control (3:3:0). Prerequisites: ECE 549 and either ECE 620 or 621. 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 flare and touchdown, and neural network control of autonomous vehicles.

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.

Elementary/Secondary Education (EDCI)
Graduate School of Education

500 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. Concrete science materials and experiences to foster development of quantitative thinking in geometry, measurement, graphing, and whole number arithmetic are used. 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. Stresses 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). Studies 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. Play is examined 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. Emphasis is on the director's role in staff recruitment, hiring, development, and evaluation. Leadership and management techniques are examined.

516 (formerly EDUC 532) 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 implications for the classroom.

517 Bilingual Education (3:3:0). Examines the historical, legal, and legislative foundations of bilingual education, with analysis of theory, research, and current educational programs for language minority students, including English as a Second Language (ESL) programs.

518 Multicultural Education (3:3:0). Examines the historical and theoretical foundations of multicultural education through focus on the concept of cultural pluralism in an ethnically, linguistically, and culturally diverse society. Emphasis is on developing a multicultural curriculum for diverse classroom settings and the verbal and nonverbal communication skills necessary for cross-cultural functioning. Field experience in public schools is required.

519 Methods of Teaching in Bilingual/English as a Second Language Settings (3:3:0). Prerequisite: EDCI 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: EDCI 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: EDCI 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 primary 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 GSE. 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. Both factors that facilitate development and factors that may place children at developmental risk are examined. Students learn about various disabilities and the way in which both risk and actual disability affect both 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. A variety of instructional strategies and materials are examined 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. Development of the social studies unit as the unifying core of the middle grades (4-8) curriculum is examined. Field experience in public schools is required.

549 Foreign Language Immersion in the Elementary School (3:3:0). Studies 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.

550 Teaching Foreign Languages in the Secondary School (3:3:0). Studies theories and methods of foreign language teaching, with practical application to the classroom. Field experience in public schools is required.

551 Curriculum and Instruction in Middle Education (3:3:0). Studies 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.


597 See EDUC 597.

600 See EDUC 600.

601 Applied Study of Young Children’s Language Development (3:3:0). Prerequisite: Admission to the Graduate School of Education. Focuses on analyzing the language development of preschool, kindergarten, and primary children, and on designing individual and group language experiences. Language development is studied in relation to cognitive, social, and emotional development.

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. Use of instructional technology to facilitate cognitive and social growth is emphasized.

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, developing specific problem-solving strategies useful in mathematics and science. Use of concrete materials to solve problems in mathematics and science in the primary grades is emphasized. 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. Studies children’s creative expression and psychomotor development through play, developmental stages of art in two- and three-dimensional forms, musical chants, rhythms, and instruments, listening 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. Emphasizes collecting, organizing, and interpreting data as a result of inquiry into activity-oriented explorations. This is a “hands-on” activity course in the biological, physical, and earth sciences and requires student demonstrations for the appropriate content level. Field experience in public schools is required.

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609 Problem Solving in Mathematics in Middle Education (3:3:0). Prerequisite: Admission to the Graduate School of Education or permission of program coordinator. Focuses on the development of higher order thinking skills as they are used to solve problems in grades 4-8. A variety of techniques and materials are used to develop specific problem-solving strategies. Field experience is required for those without full-time teaching experience.

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. Listening, speaking, reading, and writing are featured as the means for encoding and decoding. Books and authors are highlighted, leading to an appreciation of books and reinforcing the art and skill of written, oral, and nonverbal communication. Use of literature to nurture cognitive, personal, and social development is examined. Critical thinking permeates the course. Field experience in public schools is required.

612 Content Area Reading in Middle Education (3:3:0). Studies theory, methods, diagnostic instruments, and evaluation practices to individualize content area instruction in grades 4-8. Included are review of testing instruments, techniques for instruction, and an understanding of study skills. Field experience in public schools is required.

616 Introduction to Science in the Secondary School (3:3:0). Prerequisite: Admission to the Graduate School of Education or permission of program coordinator. Focuses on the learning processes fundamental to the development of mathematical thinking from a problem-solving perspective. Students are introduced to national (NCTM) and state (SOL) standards regarding the nature of the content and methodologies appropriate for the teaching of school mathematics. A variety of instructional strategies and materials are examined and related to the broad scope of mathematical content in the secondary curriculum. Field experience is required for those seeking initial teacher certification.

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. Students are introduced to national (NCTM) and state (SOL) standards regarding the nature of the content and methodologies appropriate for the teaching of school mathematics. A variety of instructional strategies and materials are examined and related 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. Advanced study of teaching and curriculum development based on research and current issues. Emphasis is on integrating science and technology, adapting instruction to the needs of diverse learners, and promoting safety.

674 Advanced Methods of Teaching Foreign Languages in the Secondary School (3:3:0). Prerequisite: EDCI 550 or approval of instructor. Blending of theoretical knowledge and practical application in an interactive format that gives both preservice and veteran teachers the background information and tools needed to improve classroom teaching. Advanced study of second language pedagogy and teaching trends based on current research. Emphasis is on the integration of the American Council of Teaching of Foreign Languages (ACTFL) standards, use of multimedia and other Computer Assisted Language Learning (CALL) strategies, assessment, use of portfolios, classroom management strategies, textbook evaluation, and multiple learner styles. Field experience (15 hours) is required.

675 Advanced Methods of Teaching Science in Middle Education (3:3:0). Prerequisite: EDCI 608. 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. 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.

701 Educational Program Development (3:3:0). Prerequisite: Completion of student teaching or bachelor's degree from an accredited undergraduate institution. Analyzes and applies principles and procedures essential to the planning, design, testing, evaluation, revision, and implementation of instructional programs for use in schools, community colleges, public agencies, museums, and business settings. Studies selected theory, research, and exemplary practice regarding program development, and investigates alternative strategies for developing instructional programs.

705 Instructional Design (3:3:0). Prerequisite: Teaching experience. Analyzes, applies, and evaluates the principles of instructional design to develop education and training materials spanning a wide range of knowledge domains and instructional technologies. Attention is given to 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: EDCI 608. 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.
Emphasis is on the ways in which 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 in which technology is associated with the educational reform movement, and the ways in which 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. Attention is paid to 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. Attention is paid to the relationship between technological forms and the nature and structure of human cognition, especially as it influences K-12 educational practice. In addition, the course 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. Designed to engage 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 content interests. This first course in the sequence focuses on understanding 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, thematic design, interdisciplinary/transdisciplinary approaches, and writing across the curriculum.

716 Principles of Integration (3:3:0). Corequisite: EDIT 717. Designed to engage 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 content interests and contexts. 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: EDUC 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. Attention is given to 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: EDUC 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. Attention is given to the administration and interpretation of informal and formal evaluation tools.

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 or 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.

790-A Internship in Early Childhood Education (6:6:0). Prerequisite: Admission to the Graduate School of Education; corequisite: EDUC 723. Provides intensive, supervised clinical experience of a full semester in a Virginia public school. Experiences in both kindergarten and grades 1, 2, or 3 must be included. Additional experiences are structured to meet preprofessional needs. Must be taken twice in Professional Development School (PDS) model.

790-B Internship in Middle Education (6:6:0). Prerequisite: Admission to the Graduate School of Education; corequisite: EDUC 737. Provides intensive, supervised clinical experience of a full semester in a Virginia public school. Provides experiences in both upper grades of an elementary school and in a middle school. Additional experiences are structured to meet preprofessional needs. Must be taken twice in PDS model.

790-C Internship in Secondary Education (6:6:0). Prerequisite: Admission to and completion of all additional course work in the secondary education licensure program, and/or permission of instructor and advisor. Provides intensive, supervised clinical experience of a full semester in an approved Virginia secondary school.

797 See EDUC 797.

895 Emerging Issues in Curriculum and Instruction (3:3:0). Prerequisite: Admission to the Ph.D. program or permission of instructor. Studies 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.

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Engineering (ENGR)  
School of Information Technology and Engineering

107 Engineering Fundamentals (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. f,s

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. f,s

209 Material Science (3:3:0). Introduction to the macroscopic structure of engineering materials and effects on macroscopic properties. Topics include crystalline and amorphous structures and defects, semiconductors, ceramics, metals, and polymers.


307 Engineering Thermodynamics (3:3:0). Prerequisites: MATH 213 and PHYS 350. 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.


390 Engineering Economy (3:3:0). Prerequisites: ENGR 107 and MATH 114. Introduction to economic decision process in engineering design and analysis. Topics include methodology to select alternatives, measures of investment worth, income and cost evaluation, depreciation methods, benefit-cost and cost-effectiveness techniques, and applications of decision trees to capital investment. f,s

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 six 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 six credits if the topics are substantially different.

English (ENGL)

English

Three credits of a 100-level English course are prerequisite to all 200-level courses; three credits of a 100-level English course and six credits of 200-level English 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 101 instead of ENGL 101. Students may not receive credit for both ENGL 100 and ENGL 101.

100 Composition for Nonnative 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). ENGL 101 (or 100) is prerequisite to all 200-level and above English courses. 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 Texts (3:3:0). Close analysis of texts, including but not limited to poetry, fiction, and drama. Emphasis upon 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 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), (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 in modern English.

302 Advanced Composition (3:3:0). Prerequisites: Completion of 45 credits, three credits of composition, and up to six 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.

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309 Independent Writing (3:3:0). Not to be taken concurrently with ENGL 489. Advanced practice in analyzing and writing such nonfiction forms as the essay, memo, article, and technical and scientific reports, 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 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.

326 See LING 326.

327 Introduction to Cultural Studies (3:3:0). Introduction 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, folktale, 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. First semester emphasizes histories and comedies; second semester, 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 with permission of department.

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.

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 the course content is different.

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 with permission of department.

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 once for credit when subtitle is different, with permission of department.

370 Foundations of African American Literature (3:3:0). Beginning with the poetry of Phillis Wheatley and such texts as David Walker's Appeal (1829), this course is a study of significant voices of the 19th century in African American literature, such as Frederick Douglass, Harriet Jacobs, Harriet Wilson, William Wells Brown, Charles Chesnutt, Frances Harper, and Paul Laurence Dunbar.

371 African American Literature of the 20th Century (3:3:0). Significant works of poetry, fiction, drama, autobiography and non-fiction written by African American writers in the 20th century that illustrate the aesthetic and stylistic concerns and the cultural political issues that have shaped the work of such writers as Toomer, Hughes, Hurston, Wright, Baldwin, Brooks, Ellison, Baraka, Morrison, Naylor, and Walker.

380 Recent American Fiction (3:3:0). American short story writers and novelists from World War II to the present, with emphasis on Mailer, Barth, Hawkes, Cheever, Oates, Gass, and Kosinski.

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, Wilbur, Brooks, Rich, Dickey, Lowell, Merwin, Kinnell, and Ammons.

396 Introduction to Creative Writing (3:3:0). Introduction to the theory and practice of creative writing. Assignments will 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 conference 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.
276  English (ENGL)

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. Emphasis on works of Dryden, Defoe, Swift, and Pope.

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, biography, and poetry. Emphasis on Johnson, Boswell, and Blake, with some attention to several of the following: Goldsmith, Sterne, Gray, Cowper, Frances Burney, Burke, William Godwin, and Mary 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 literature; or permission of the Extended Studies program. 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 seminars 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. Course gives students who wish to write an English honors thesis the guidance in literary research methods, while allowing them the opportunity to share and critique one another's work-in-progress in a workshop format. Students take the thesis seminar concurrently and in coordination with a second literature course offered by the English Department. 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 literature 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.

421 Topics in Film History (3:3:0). Prerequisite: ENGL 332 or permission of instructor. Advanced studies of the development of film language, both as a cultural 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). Prerequisite: ENGL 332 or permission of instructor. Advanced studies of theories of 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, and Poe.

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 subtitle 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, Dostoyevski, Tolstoy, and Chekov.

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, Yourcevar, Beauvoir, 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 Oriental 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, 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). English and/or Irish drama from Yeats to the present. Plays by authors such as Yeats, Synge, O’Casey, Osborne, Wesker, Pinter, Friel, Churchhill, and Gems.

447 American Drama of the 20th Century (3:3:0). American drama of the 20th century with special attention to playwrights such as Susan Glaspell, Eugene O’Neill, Jane Bowles, Arthur Miller, Megan Terry, Tennessee Williams, Irene Fornes, and Edward 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 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 Defoe, Richardson, Fielding, Sterne, Smollett, Scott, 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, E. Bronte, Eliot, Trollope, Meredith, and Hardy.

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. 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).

461 Selected 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 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). Prior credit for ENGL 309 recommended. May not be taken concurrently with ENGL 309. Workshop course. Intensive practice in advanced nonfiction writing, with 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). Prerequisite: ENGL 332 or permission of instructor. 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 folk life 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 they intend to register. 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) and the concentration is announced in the department's Course Description Booklet before preregistration. Intended for students already writing original creative work. (By permission of instructor, may be taken a second time for credit; the additional three credits, however, may not be counted toward requirements for the English major. No more than a combined total of nine credits may be taken in ENGL 464, 458, 497.)

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.)

503 Theory and Practice of Editing (3:3:0). Prerequisite: Six credits of English courses numbered above 300, including one advanced writing course—309, 311, 396, 397, 398, 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 (3:0:0). 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, flyers, newsletters, and small magazines. Course work includes readings, writing papers, and producing and editing copy and original publications.

507 See LING 507.

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 once with permission of department.

514/CL 514 Theories of Comparative Literature (3:3:0). Prerequisite: 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 See LING 520.

521 See LING 521.

522 See LING 522.

523 See LING 523.

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 must submit a typed manuscript of original poetry at least one week before they intend to register. 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 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 must submit a typed manuscript of original fiction at least one week before they intend to register. 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 See LING 581.

582 See LING 582.

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.

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 included 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). Course for students in the professional writing and editing concentration in the M.A. in English. Students work as ethnographers, studying selected sites where people write professionally and analyze the ways in which the production and reception of writing both contribute to and result from the local culture of each site.

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. Not repeatable 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) Prerequisite: ENGL 565, which may be taken concurrently, and permission of instructor, except for MFA 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 566, 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., the essay, playwriting, film writing, children's literature, travel literature, autobiography, the gothic novel, translation); the concentration is announced in the department's Course Description Booklet. Intended for students already writing original creative work. May be repeated once 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 twice 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.

686 See LING 686.

690 See LING 690.

691 See LING 691.

692 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, but no more than six credits in ENGL 695, EDUC 695, and/or ENGL 699 may be applied toward a master's degree in English.

696/EDUC 696 Northern Virginia Writing Project Teacher/Research Seminar (3:0:0). Prerequisite: ENGL 695/EDUC 695 or NVWP 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 615, 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 6 credits in ENGL 699 may be applied toward a master's degree in English.

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 See LING 785.

786 See LING 786.

787 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 (3:0:0). Prerequisite: Open only to degree students who have completed 15 credits including ENGL 701 and have preregistered. 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 798 for graduation, but no more than 3 of these may count towards 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 upon 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 6 credits for ENGL 799 upon completion of the thesis.

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.

**Environmental Science (EVSC)**

**Chemistry**

203 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.

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.

**Environmental Science and Public Policy (EVPP)**

**Biology**

505 Selected Topics in Environmental Science (1-4:1-3:0-6). Prerequisites: A course in ecology or permission of instructor. Topic depends on instructor's specialty.

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 impact the environment and the effectiveness of plan implementation; means of assessing environmental impact; and administrative approaches for minimizing environmental impact.

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 governmental agency, consulting firm, industry, or other acceptable organization.

991 Advanced Seminar in Environmental Science (2:2:0). Prerequisite: Eight 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.

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. See additional coursework under Biology (BIOL), Chemistry (CHEM), Public and International Affairs (PUAD), The Institute of Public Policy (PUBP), and Geography and Earth Systems Science (GEOG, GEOL).

**Executive Master of Business Administration (EMBA)**

**School of Management**

600 Managerial Economics (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.

610 Financial Reporting (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.

612 Managerial Accounting (3:3:0). 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.

630 Managerial Statistics (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.

635 Operations Management (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.

641 Financial Management (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.

650 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 interaction 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.

670 Marketing Management in a Global Environment (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.

715 Special Topics in Accounting (1-3:1-3:0). In-depth examination of advanced topics in accounting.

720 Law and Ethics for Managers (3:3:0). Examines interrelationships between organizations, their external environment, and the regulatory process. Emphasis placed on legal and ethical issues as well as their managerial implications.

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.

750 Business Strategy (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.

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 multi-business 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.

Exercise, Fitness, and Health Promotion (EFHP)

Health, Fitness, and Recreation Resources

Prerequisite to all courses: Graduate standing and/or permission of instructor.

500 Workshop in Exercise, Fitness, and Health Promotion (1-3:0:0). Concentrated full-time workshops, weekend seminars, and workshops dealing with selected topics in exercise, fitness, and health promotion. May be repeated. No more than six 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, 125 (or their equivalents), and permission of instructor. Familiarity and proficiency in the anatomy of the neuromuscular and musculoskeletal systems of the body, which relate directly to sports related injuries. At course completion, the student will be fully informed regarding the anatomy competencies as outlined in the National Athletic Trainers Association Competencies in Athletic Training.

524 Physiology for the Athletic Trainer Including the Pharmacology of Sports Injuries (3:2:1). Prerequisites: BIOL 124, 125 (or their equivalents) and permission of instructor. It is recommended that this course be taken concurrently with EFHP 522. Familiarity and proficiency in the assessment and physical examination of sports-related injuries. At course completion, the student will be fully informed regarding the physiology competencies as outlined in the National Athletic Trainers Association Competencies in Athletic Training.

526 Athletic Training Perspectives: Evaluation and Prevention of Sports Injuries (3:2:1). Prerequisites: BIOL 124, 125 (or their equivalents) and permission of instructor. It is recommended that this course be taken concurrently with EFHP 522. Familiarity and proficiency in the assessment and physical examination of sports-related injuries. At course completion, the student will be fully informed regarding the assessment and intervention competencies as outlined in the National Athletic Trainers Association Competencies in Athletic Training.

528 Athletic Training Perspectives: Treatment and Rehabilitation of Sports Injuries (3:2:1). Prerequisites: BIOL 124, 125 (or their equivalents); EFHP 526; and permission of instructor. Familiarity and proficiency in the assessment and intervention of the neuromusculoskeletal system and other systems of the body that relate directly to sports-related injuries. At course completion, the student will be fully informed regarding the assessment and intervention competencies as outlined in the National Athletic Trainers Association Competencies in Athletic Training.

598 Special Topics (1-6:0:0). Projects related to exercise, fitness, and/or health promotion. May be repeated with no more than six credits earned.

599 Independent Study in Exercise, Fitness, and Health Promotion (1-3:0:0). 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 three 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). Lecture, demonstration, and seminar experiences in the application of research findings to the understanding of physiological function and the effects of exercise on people.

http://catalog.gmu.edu
611 Fitness Assessment: Theory and Practice (3:2:2). Familiarity and proficiency with the methods and instrumentation used in assessing individual fitness and establishing a base for exercise and other lifestyle alternatives to improve fitness.


615 Epidemiology and Environmental Health (3:3:0). 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.

618 Exercise and Sport Psychology (3:3:0). Psychological and social-psychological antecedents and consequences of exercise, physical activity, and sports participation. Theory and research on personality, motivation, arousal, cognition, attributions, attitudes, self-efficacy, leadership effectiveness, and group dynamics are emphasized.

621 Elements of Statistical Reasoning (3:3:0). Introduction to practical and applied aspects of both descriptive and inferential statistics in exercise science and health.

623 Research Design and Statistical Reasoning (3:3:0). Introduction to 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). Exercise and health program development related to fitness and health of adult populations. Three to six hours of field experience.

660 Management of Exercise, Fitness, and Health Promotion Organizations (3:3:0). Advanced study in management and administration of organizations dedicated to human development and improvement of quality of life. 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). Qualitative and quantitative research methods are presented 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). Formulation of a coherent framework for ascertaining the good, right, and just, and for assessing evidence and reason underlying positions and arguments. Examination of current ethical issues in exercise, fitness, and health promotion.

799 Thesis (1-6:0:0). Exploration of an exercise, fitness, and health promotion problem using appropriate research methodology under 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. 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.

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 201, 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, summer

302 Financial Analysis and Forecasting (3:3:0). Prerequisite: FNAN 301. 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. f,s

311 Principles of Investment (3:3:0). Prerequisite: FNAN 301. 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. f,s

321 Financial Institutions (3:3:0). Prerequisite: FNAN 301. 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. f,s

351 Principles of Real Estate (3:3:0). Prerequisite: FNAN 301. 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. f,s
401 Advanced Financial Management (3:3:0). Prerequisite: FNAN 301. 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. ir

411 Investment Analysis and Portfolio Management (3:3:0). Prerequisite: FNAN 311. 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). Prerequisite: FNAN 311. 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). Prerequisite: FNAN 321. 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

423 Commercial Bank Management (3:3:0). Prerequisite: FNAN 321. Introduction to the management of commercial banks. Emphasis is placed on the management of deposits, cash and liquidity, lending, investing, trust services, capital structure and adequacy, international operations, and current banking laws and regulations. Includes a discussion of bank-holding companies, interstate banking proposals, and regulatory agency proposals for expanding banking powers. ir

440 International Financial Management (3:3:0). Prerequisite: FNAN 301. 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. ir

451 Real Estate Finance (3:3:0). Prerequisites: FNAN 301 and 331. 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

491 Seminar in Finance (3:3:0). Prerequisites: FNAN 311, 321, and 401. Seminar in contemporary developments in finance including financial management, financial institutions, financial markets, and investment management. Lecture, discussion, simulation, computer-assisted research. ir

499 Independent Study (1-3:0:0). Prerequisite: Finance majors with at least nine upper-level finance credits. Research and analysis of selected problems or topics in finance. Must be arranged with an instructor and approved in writing by the undergraduate program director before registration. Written report required. May be repeated for a maximum of six credits if topics vary.

700 Applied Macroeconomics (3:3:0). Prerequisite: FNAN 650 or MBA 643. Application of general equilibrium economic analysis to business management and government economic policy. Topics include the use of national economic statistics, the interpretation of economic trends and developments, and the practice of forecasting as applied to current economic problems.

711 Corporate Financial Policy (3:3:0). Prerequisite: FNAN 650 or MBA 643. Analysis of capital budgeting and long-term asset financing. Capital budgeting and financing techniques for the fixed asset portion of balance sheet are considered.

717 International Finance (3:3:0). Prerequisite: FNAN 650 or MBA 643. 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 Investment Analysis (3:3:0). Prerequisite: FNAN 650 or MBA 643. Analysis of equity securities and debt instruments given the implications of the efficient market hypothesis and modern capital market theory.

731 Financial Markets (3:3:0). Prerequisite: FNAN 650 or MBA 643. Allocation of funds process accomplished by financial markets. Money and capital markets, including the organization, relative efficiency, and interaction between market segments.

741 Current Topics in Finance (3:3:0). Prerequisite: FNAN 650 or MBA 643. Topics of interest in finance including industrial, governmental, international, or institutional applications. Techniques and methods of financial practice and influences of new legislation.

796 Independent Study and Directed Readings (3:0:0). Prerequisite: FNAN 650 or MBA 643. By special arrangement with professor and approval from the director of Student Services.

Foreign Languages (FRLN)

Modern and Classical Languages

431/ENGL 431 and 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 Problems 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). Various themes, periods, or genres vary from semester to semester. The 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.


571 The Role of Grammar in Language Learning and Teaching (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 centuries-old debate about explicit grammar teaching. Readings focusing on current positions and their theoretical grounds lead to a variety of other theories, pedagogical perspectives, and new approaches.

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). Prerequisites: 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.

645 (545) The Study and Teaching of Literature (3:3:0). Current methodologies of literary analysis. Emphasis on role of literature in foreign language programs and on providing students with various methods of teaching literature. May not be taken by students who have completed FRLN 545.

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.

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 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 102 or 109. Lab work required.

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 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 discriminating French phonemes and allophones and in transcribing in 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 "Nouveaune Theater." French poetry from Symbolism to contemporary poets. May be taken toward fulfillment of the general requirement in literature for baccalaureate degrees.

451 Writers of French-Speaking Africa and the Caribbean (3:3:0). Prerequisite: 18 credits of French or permission of instructor. Study of selected poems, plays, tales, and novels expressing the culture and aspirations of the peoples of Africa and the Caribbean. May be taken toward fulfillment of the general requirement in literature for baccalaureate degrees. May also be taken to meet the non-Western requirement.

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.

460 Advanced Oral and Written Expression (3:3:0). Prerequisite: 18 credits of French or permission of instructor. Intensive course designed to help students obtain fluency in oral and written French. Development of conversational skills and mastery of vocabulary. Class discussions, 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 of various stylistic processes. Development of writing skills through readings, discussion, and composition.

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 3.0, and 3.0 in the major field. Students who meet these requirements are admitted to candidacy upon 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.


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, 551 Special Topics (3:3:0), (3:3:0). Specialized topics relating to French culture and literature. Content varies. 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 upon completion of the thesis. Students who do not take FREN 798 receive six credits for FREN 799 upon completion of the thesis.

800 Studies for the Doctor of Philosophy in Education (varied credit). Prerequisite: Admission to the Ph.D. in Education program to study in French. Program of study designed by the student's discipline director and approved by the student's doctoral committee that prepares the student to do research and writing in the current area of interest of the discipline. Enrollment may be repeated as required.

See also FRLN course listings.
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 GIS. Discusses basic GIS functionality and GIS applications in various fields.

315 Geography of the United States (3:3:0). 
Prerequisite: Six 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: Six 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: Six 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: Six credits of geography and/or courses related to Middle East or permission of instructor. Environmental, economic, social, and cultural 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: Six 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 both as an independent force and as 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). Prerequisites: 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 spaceborne 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.

480 Internship in Geography (1-3:0:0). Prerequisite: Open only to authorized majors with 90 credits and GPA of 2.5 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. Directed research paper is required.

503 Problems in Environmental Management (3:3:0). Prerequisite: Six credits of geography, including GEOG 102. Case studies of the impacts of human activities on atmospheric, hydrologic, geomorphic, and biotic processes.

505 Transportation Geography (3:3:0). Prerequisite: Six 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 Mapping Foundations (3:3:0). Prerequisite: Graduate standing or permission of department. Only for students without previous course work in cartography. Basic principles of mapping human and physical spatial patterns and of using maps. Includes sources of spatial information such as existing maps, field work, and aerial photographs; techniques of cartographic compilation; map construction and design, and the analysis of spatial data.

551 Thematic Cartography (3:3:0). Prerequisite: GEOG 550 or permission of department. Analysis of the nature of perceptual organization and visual systems in thematic map communication portrayal, graphic handling, and data analysis.

553 Geographic Information Systems (3:3:0). Prerequisite: GEOG 550 or permission of department. Sources of digital geographic information, methods of storage and processing for cartographic display, and geographical analysis.

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.

560 Telecartography (3:3:0). Prerequisite: GEOG 550 or permission of instructor. Examines the emerging linkages between digital cartography, telecommunications, and the digitization of society. Emphasizes new knowledge and skills needed for cartographic practice and collaboration using Internet resources.

562 Photogrammetry (3:3:0). Prerequisite: GEOG 550 or permission of department. Treatment of photogrammetric problems, including least squares adjustments, image coordination refinements, colinearity equation, resection, relative orientation, and analytic aerotriangulation.

563 Geographic Information Systems Applications (3:3:0). Prerequisite: GEOG 553 or permission of department. Concentrates on use of geographic information systems 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. To manage water resources successfully, one must understand their nature and occurrence in space and time, and their relationship to earth's other physical and environmental systems. This course aids in that understanding by exploring three areas of water resources geography: climate and hydrology, physical and biological interactions, and water resources planning and management. Both surface and ground water are studied. Important regional and topical issues are highlighted. Student is familiarized with water resources research techniques, analytical tools, and data sources.

579 Remote Sensing (3:3:0). Prerequisite: GEOG 550 or a course in aerial photography or permission of instructor. Examines use of various types and combinations of electromagnetic energy to obtain spatial information. Concentrates on nonphotographic and spaceborne remote sensing platforms and sensors. Examines essential operational parameters for existing and future systems and strategies for visual extraction of features.

580 Digital Remote Sensing (3:3:0). Prerequisite: GEOG 416 or 579 or permission of department. 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.

581 World Food and Population (3:3:0). Prerequisite: Graduate standing. Topics include maldistribution 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.

585 Quantitative Methods (3:3:0). Prerequisite: Previous course work in statistics; GEOG 550 or permission of instructor. Survey of quantitative methods commonly used in geographic research. Emphasis on spatial analysis techniques.

590 Selected Topics in Geography and Cartography (3:3:0). Prerequisite: Permission of department. Students analyze topics of immediate interest. Content varies.

595 Environmental Impact Analysis (3:3:0). Prerequisite: Degree candidacy or permission of department. Analysis of factors and patterns of location of economic activity and environmental systems. Case studies emphasized.

600 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.

684 Advanced Economic Geography (3:3:0). Prerequisite: GEOG 585 or permission of instructor. Historical development of geographic thought and the current philosophy of geography. Analysis of the rationale for the discipline's various subfields. Geographic research techniques and methods of analysis.

689 Directed Readings and Research (1-6:0:0). Prerequisite: Permission of 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.

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.

785 Geographic Fieldwork (3:3:0). Introduction to the nature, scope, and objectives of geographic field method 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.

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.

799 Thesis (1-6:0:0). Prerequisites: Degree candidacy and departmental approval of thesis proposal.
Geology (GEOL)

Geography and Earth Science

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.

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.

206 Topics in Geology I (1-3:1-3:0). Discussion of a particular topic in geology. May include field trips.

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.

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 and CHEM 103 or 211. Composition, classification, physical properties, and origin of soils. May include field trips.

308 Igneous and Metamorphic Petrology (4:3:3). Prerequisite: 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/BIOI. 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.

310 Geological Field Studies (2:0:0). Prerequisites: GEOL 101, 102, and 302. One or more field trips to an area to be specified in the class schedule. Students must pay costs including transportation fee.

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. Geologic 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). Prerequisite: Grade of C or better in GEOL 101 and 102, or six credits in GEOG including 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, CHEM 211, and 212. Stable isotope geochemistry, crystal geochemistry, geochronology, water geochemistry, organic geochemistry, and the geochemistry of rocks.


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 Topics in Geology III (1-3:1-3:0). Prerequisites: Geology major with 80 credits and permission of department chair. Discussions of a particular topic in geology. May include field trips.

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 the preparation of a research proposal.

411 Geological Research (3:0:3). Prerequisite: GEOL 410. Geologic research including data collection and reduction, interpretation, preparation of a written report, and oral presentation of results.
### Geology (GEOL) • German (GERM)

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<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Prerequisites</th>
<th>Description</th>
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<tbody>
<tr>
<td>417 Geophysics (3:3:0)</td>
<td>Geophysics</td>
<td>GEOL 101, MATH 113, one year of physics, or permission of instructor.</td>
<td>Basic principles of geophysics including gravity, magnetism, and seismic reflection/refraction.</td>
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<tr>
<td>500, 501 Selected Topics in Modern Geology (1-3:1-3:0), (1-3:1-3:0),</td>
<td>Prerequisite: Baccalaureate degree in geology or permission of instructor. Lecture/lab/field trip. Topic designated in the class schedule.</td>
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<tr>
<td>503 Special Topics in Earth Science (1-6:1-6:0),</td>
<td>Prerequisite: Employment or anticipation of employment as an earth science teacher. Inservice course designed to strengthen and update a teacher's knowledge of earth science. May include field trips.</td>
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<tr>
<td>800 Studies for the Doctor of Philosophy in Education (variable credit),</td>
<td>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 students. Enrollment may be repeated.</td>
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#### German (GERM)

**Modern and Classical Languages**

**Placement:** See the Academic Testing section in the Admission chapter.

All 300- and 400-level courses in German literature may be taken toward fulfillment of the general requirement in literature for the baccalaureate degree.

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<tr>
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<tr>
<td>101 Elementary German I (3:3:1)</td>
<td>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.</td>
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<tr>
<td>102 Elementary German II (3:3:1)</td>
<td>Prerequisite: GERM 101 or permission of department. Continuation of GERM 101. Lab work required.</td>
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<tr>
<td>105 Review of Elementary German (3:3:1)</td>
<td>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 or 109. Lab work required.</td>
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<tr>
<td>109 Intensive Elementary German (6:6:2)</td>
<td>Equivalent to GERM 101 and 102 taught in a single semester. Recommended for students who desire an intensive introduction to German. May not be taken for credit in combination with GERM 101, 102, or 105. Lab work required.</td>
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<tr>
<td>201 Intermediate German I (3:3:1)</td>
<td>Prerequisite: GERM 102, 105, 109, 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.</td>
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<tr>
<td>202 Intermediate German II (3:3:1)</td>
<td>Prerequisite: GERM 201, appropriate placement score, or permission of department. Application of skills to reading, composition, and discussion. Lab work required.</td>
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<tr>
<td>209 Intensive Intermediate German (6:6:2)</td>
<td>Prerequisite: GERM 102, 105, 109, appropriate placement score, or permission of department. Equivalent to GERM 201 and 202 taught in a single semester. May not be taken for credit in combination with GERM 201 or 202. Lab work required.</td>
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<tr>
<td>301 Culture and Civilization (3:3:0)</td>
<td>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.</td>
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<tr>
<td>310 Conversation and Composition (3:3:0)</td>
<td>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.</td>
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<tr>
<td>316 German for the Business World (3:3:0)</td>
<td>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.</td>
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<tr>
<td>318 Translation of Texts (3:3:0)</td>
<td>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.</td>
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<tr>
<td>325 Major Writers (3:3:0)</td>
<td>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.</td>
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<tr>
<td>340 Survey of German Literature (3:3:0)</td>
<td>Prerequisite: GERM 202 or equivalent, or permission of instructor. Required for German majors. Overview of the history of German literature from its beginnings to 1880.</td>
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<tr>
<td>355 Readings in Poetry (3:3:0)</td>
<td>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 with permission of department when subtitle is different.</td>
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<tr>
<td>365 Readings in Narrative Prose (3:3:0)</td>
<td>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 with permission of department when subtitle is different.</td>
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<tr>
<td>375 Readings in Drama (3:3:0)</td>
<td>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.</td>
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<tr>
<td>415 Advanced Grammar and Style (3:3:0)</td>
<td>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.</td>
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http://catalog.gmu.edu
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 Enlightener, 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.

490, 491 Independent Study (1-3:0:0), (1-3:0:0). Prerequisites: Students in the German concentration with 90 credits and permission of chair. 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 requirements in the concentration.

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 postunification 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.

799 Thesis (1-6:0:0). Students who take GERM 798 and then elect the thesis option receive three credits for GERM 799 upon completion of the thesis. Students who do not take GERM 798 receive six credits for GERM 799 upon completion of the thesis.

800 Studies for the Doctor of Philosophy in Education (variable credit). Prerequisite: Admission to the Ph.D. in Education program to study in German. 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 in the discipline. Enrollment may be repeated.

Also see 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 nations; 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 Political Analysis (3:3:0). 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.

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.
Government & International Politics (GOVT)

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. Their ability to enable citizens to influence or control government and to 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 the topic is different and 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.

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. May be repeated for credit when the topic is different and with the permission of department. 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.

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 policies 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; the interplay of industrialization and ethnic awareness; 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 USSR 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, 149, or permission of instructor. Introduction to International Political Economy (IPE). Examines the interplay of economics and politics and applies these to different issue areas 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, as it encourages development of critical thinking, group, and oral presentation skills.

348 Competencies for the Global Arena (1-3:0:0). Prerequisites: 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.

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 policy 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 or 341, 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. Students gain competency in the methods of research and data analysis used in research about politics. The course examines ways to design research to answer questions, to select appropriate techniques for data collections, and to 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.

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.

412/COMM 412 Politics and the Mass Media (3:3:0). Prerequisite: GOVT 103. Responsibilities and freedoms of the mass media in a democracy. Influence of media on citizens' opinions, on elections, and on decisions of public officials is explored.

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 tapes 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, including pluralism, elite theories of democracy, and empirical political theory.

421 Contemporary 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 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 and Procedural 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 ethnic 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." The course analyzes and critiques 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 Comparative Elections (3:3:0). Prerequisite: GOVT 133. Comparative study of the role and nature of elections in presidential and parliamentary democracies, one-party states, and other regimes since 1989. Examination of selected current elections as case studies. Examination of growing influence of global forces (e.g., economy, media, culture) in national 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 the topic is different and 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.

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. May be repeated for credit when the topic is different and with permission of department. Examples include environmental policy, government regulation, federal mandates, state policy, and regional policy.

480 Internship (3-6:0:0). 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 program. Subject varies. Readings, individual or group projects, and discussions of seminar papers constitute the content and format.

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.

Health Education (HEAL)

Health, Fitness, and Recreation Resources

110 Personal Health (3:3:0). Individual and family well-being through the integration of such topics as fitness, nutrition, human sexuality, consumer health, drug education, and mental health.

205 Principles of Accident Causation and Prevention (4:3:0). Investigation of safety-related problems; emphasis on fire, home, occupational, and vehicle safety; violent and property crime prevention.

220 Dimensions of Mental Health (3:3:0). Integration of behavioral and sociocultural factors in the study of mental health.

305 Teaching Methods in Health Education (K-12) (3:3:0). Content, methodology, and resource materials in teaching health education for physical education teaching majors.

310 Drugs and Health (3:3:0). Analysis of drug use, with emphasis on its positive aspects; alternatives to drug misuse and abuse.

312 Health and Wellness Choices (3:3:0). May be taken by nonmajors. Designed to actively involve students in becoming managers of their personal health and well being throughout the life span. Consistent with Healthy People 2000 goals for the nation. Emphasis placed on lifestyle activity and fitness, behavioral change, and maintenance.

323 Program Implementation and Evaluation in Health, Fitness, and Recreation Resources (3:3:0). Prerequisite: PROF 110 or permission of instructor. Focus on the implementation and evaluation of health education, fitness, and recreation resources programs. Students use computer technology while studying the evaluative aspects of program planning and administration.


430 Seminar on Contemporary Health Problems (3:3:0). Overview of contemporary and often controversial health issues with analysis of selected problems of current concern to society.

450 Epidemiology (3:3:0). Study of the incidence, distribution, and causes of diseases and injuries in human populations. Emphases are on essential diagnostics and planning for community health problem solving.

480 Special Topics (1-3:0:0). Selected health issues and/or problems are presented. Application of information to education programs receives special attention.

490 Internship (12:0:0). Directed experience to observe and participate in health promotion and exercise science activities 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 department. Study of a problem area in health education research, theory, or practice under faculty direction. May be repeated but no more than three total credits may be earned.

Health Science (HSCI)

College of Nursing and Health Science

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). Prerequisites: BIOL 124 and 125. Introduction to sound nutritional practices in improving health care in clinical and community settings. Designed to give students a working knowledge of the science of nutrition and how it influences health and disease. Nutritional needs throughout the life cycle area are addressed including special considerations during pregnancy and lactation. Problem solving and critical thinking methodologies are used in group presentations of micro nutrients, emphasizing nutrition deficits and excesses. Students use computer-based diet analyses to evaluate personal dietary intakes with a view to using acquired skills in recording nutrition assessments.

302 Health Care Finance (3:3:0). Introductory course on 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). Introductory course on explaining 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.

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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). Gives students 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.

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 components and subsystems of the 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/HSCI 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.

405 Care and Management of Persons with Alzheimer's Disease and Related Disorders (3:3:0). Focuses on the care of persons with dementing illness in acute, community, and long-term care settings. Strategies for managing family caregivers and allied health personnel are discussed.

436/NURS 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.

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)

495 Health Systems Management Practicum (2:10-15:20-30). Capstone course consisting of a two hour weekly seminar and 24 hour 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 Today's Society (3:3:0). Interdisciplinary lecture/discussion course examining the magnitude of the problem of violence globally and more specifically within the United States. Case studies, guest speakers, drama, and small group discussion augment the lecture/discussion format and 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.

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.

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.

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.

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.

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.

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 care data, incorporating computing skills for using specific software packages.

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.

659 Nursing and Health Care of Aging Persons and Persons with Chronic Illness (3:3:0). Focuses on the biological, psychological, and sociocultural aspects of aging and chronic illness. Seminar and discussion emphasize examining the functional capacity of persons and capacity for self-care.

670 Quality Management in Health Care (3:3:0). 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.

678 Introduction to the U.S. Health System (3:3:0). 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. HealthCare 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 System.

698 International Health Care: Theoretical and Practical Dimensions (3:3:0). 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.

699 Practicum in International Health Care (3:1:8). 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.

701 Quantitative Decision Making in Health Systems Management (3:3:0). 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 care systems management are also included.

702 Managerial Accounting in Health Care Organizations (3:3:0). 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.

703 Financial Management of Health Systems (3:3:0). Prerequisites: HSCI 555 or admittance to a graduate nursing degree program (M.S.N. or Ph.D.) or Health Systems Management degree program (M.S. in New Professional Studies), 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 sources of funds and the application of financial decision instruments and their effect on operational management and market value of the entity is covered.

704 Contemporary Issues in Health Systems Leadership and Management (3:3:0). Analysis of 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.

705 Strategic Management and Marketing in Health Care (3:3:0). 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.

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706 Integrated Health Systems Management (3:3:0). 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.

707 Health Care Management Policy, Law, and Ethics (3:3:0). 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 references 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.

708 Operations/Quality Management of Health Services (3:3:0). 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.

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.

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 judgement 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 fit, 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 shapes 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). Co- or prerequisites: 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 adminis-
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tration, health care policy, and health care ethics within the scholarship of discovery, integration, application, and teaching. Computer analysis is required.

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.

960/NURS 955 Philosophical Bases of Inquiry (3:3:0). Prerequisite: Admission to nursing doctoral program or permission of 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 is examined.

History (HIST)

History and Art History

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 100 and 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 100 and 101 or 102.

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 100 and 101 or 102.

121 Formation of the American Republic (3:3:0). Social, political, economic, and intellectual growth of American institutions from colonization through Reconstruction.

122 Development of Modern America (3:3:0). History of the United States since 1877.

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.

251, 252 Survey of East Asian History (3:3:0). HIST 251 is a survey of the history of China and Japan from prehistoric times to ca. 1600. HIST 252 is a survey of the history of China and Japan from early modern times (ca. 1600) to the present.

261, 262 Survey of African Civilization (3:3:0). HIST 261 is a survey of African history from earliest times to the decline of western Sudanic states in the 16th century. HIST 262 is a survey of African history from the beginning of interaction with Europe in the 15th century to the recent emergence of new states.

271, 272 Survey of Latin-American History (3:3:0). HIST 271 is a survey of 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).

300 Introduction to Historical Method (3:3:0). Prerequisite: ENGL 302; history majors with 60 credits or permission of instructor. 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.

301 Classical Greece (3:3:0). Political, social, economic, and cultural history of classical Greece from development of the city-state through the 5th century.

302 Classical Rome (3:3:0). Political, social, economic, and cultural history of classical Rome from founding of the city through 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 (1648).

308 Nineteenth-Century Europe (3:3:0). History of Europe from Congress of Vienna to outbreak of World War I.

309 Contemporary Europe (3:3:0). Survey of major political changes in Europe since 1914 with emphasis on broad patterns of ideological conflict.

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 century through the 20th. 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 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 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.

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 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.


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.

379 History of Canada (3:3:0). Introduction to history of Canada from French settlement to present. Emphasis on Canada's historical position in the British Empire and commonwealth, its unique relations with the United States, and issues related to its French-speaking minority.

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.


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.

431/ENGL 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 are 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 credits COMM or HIST. 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.

462 Women in Islamic Society (3:3:0). Prerequisite: Six credits of history or permission of instructor. Survey of the historical presence of women in the 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.

463 Ancient India and Pakistan (3:3:0). History of Indo-Pakistan subcontinent with special reference to Indus Valley people, Hindus, Jains, Buddhists, and Muslims from ancient to medieval times.

464 Modern India and Pakistan (3:3:0). Political history of the Indo-Pakistan subcontinent from the mid-18th century to the present. Background of earlier cultures of Hindus and Muslims as prelude to developments in modern periods.

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. These are linked, individualized courses, normally given by the same instructor. HIST 490 involves directed readings, and 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 internship coordinator. Approved work-study programs in cooperation with specific organizations including area museums; 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, or permission of instructor. 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.

525 Problems in Latin American History (3:3:0). Analysis of selected problems in Latin American history. Emphasis on reading and discussion of historical interpretations and development of bibliography. 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.


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 posing 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.

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 studies, 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.

635 Problems in European History (1-6:3:0). Concentration on the intellectual, cultural, and social and cultural history of selected problems in the history of Europe. Surveys the history and historiography of the revolutionary era. With particular emphasis on the social and ideological developments, France, Austria, and Germany, 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.

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. Examines 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, 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 in 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 as well as for assistance to 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.

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 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.

751 Research Seminar in Comparative World 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.
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 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 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 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 (3-6:0:0). Prerequisites: Three credits of applied history in 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 of the course 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.

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.

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 (3:3:0). Introduces students to basic research and writing skills that will be required in every course in the curriculum. Questions such 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). 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, 225 Analysis and Solution of Quantitative Problems I, II (3:3:0). Discusses real-world modeling and problem solving techniques and, in conjunction with the computer and tools introduced from the mathematical sciences, applies these to the analysis and solution of a variety of quantitative problems in the natural and social sciences as well as the business environment.

130 Conceptions of Self (3:3:0). Drawing from appropriate works in the social sciences, arts, and humanities, examines different conceptions of the self characteristic of different cultures.

131 Contemporary Society in Multiple Perspectives (3:3:0). 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.

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). Enables students to broaden cultural horizons and to understand human behavior by studying in depth a society different from their own.

240 Reading the Past (3:3:0). 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). Analyzes the emergence and impact of specific technologies on contemporary culture in the United States. It explores such technologies as the television, the automobile, newspapers, and the Internet, from historical, scientific, political, economic, and global perspectives.

Information and Software Engineering (INFS) Information and Software Engineering

310 Program Structure and Design for Business Applications (3:3:0). Focus on business applications. Prerequisite: MIS 201, or CS 161 or CS 103. Course teaches programming using the COBOL language to focus on fundamental concepts of software design and software development methodologies for database management. Computing lab is included. f,s

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. f,s

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. Credit does not count toward the requirements for a major in computer science.

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 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.

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). Prerequisites: 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.

501 Discrete and Logical Structures for Information Systems (3:3:0). Prerequisite: Six credits of undergraduate mathematics. Study of discrete and logical structures 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. Credit cannot be applied toward any graduate degree in School of Information Technology and Engineering.

513 Introduction to Telecommunication Systems (3:3:0). Prerequisites: Admission to M.A. in Telecommunications program, or permission of instructor. Study of essential technologies underlying modern telecommunications systems, and their integration into information systems. Transmission and transmission media, communication techniques, widearea networks, local area networks, integrated service digital networks, personal communication systems. Open-systems interconnection, and distributed systems. Network management and security. Credit is not applicable toward any M.S. in School of Information Technology and Engineering.

515 Computer Organization (3:3:0). Prerequisite: 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 toward any graduate degree in School of Information Technology and Engineering.

590 Program Design and Data Structures (3:3:0). Prerequisite: Undergraduate courses or equivalent knowledge in structured programming in a high-level language. A study of the fundamentals of data structures and algorithms applied in programming solutions to application problems. Course stresses structured programming in a modern high-level language. Laboratory is required. Credit cannot be applied toward 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 Data Communications and Distributed Processing (3:3:0). Prerequisites: INFS 501, 515, and 590, or equivalent. Concepts and applications of telecommunications technologies, networks, and distributed information systems. Topics include regulatory issues, network pricing, and management. Case studies are presented.

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 included.
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 all required courses in the EC Certificate program. 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; groups therefore selected to have multiple skills. Projects selected from public sector, medical, or industrial applications.

650 Object-Oriented Applications for Information Systems (3:3:0). Prerequisites: INFS 501, 515, 590 and 601; or equivalent. Principles and applications of object-oriented methods in information systems. 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-based 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. Electronic commerce projects 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.

750 Application Frameworks for Windowed Information Systems (3:3:0). Prerequisite: INFS 601 and INFS 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 are illustrated using a variety of information systems applications. Programming projects.

755 Decision Support Database Systems (3:3:0). Prerequisites: INFS 614 or equivalent. Course covers techniques to design and maintain data warehouses and to mine large databases in order to discover useful trends and patterns. Topics include the multidimensional nature of data and the usage of the star schema, maintenance of warehouse views in the presence of updates to the operational data, and the concept of On-Line-Analytical Processing (OLAP) as a decision support tool. Datacube compression and approximate query answers in the datacube are studied, as well as the concept of data mining as a decision tool. Mining techniques covered emphasize scalability over large datasets.

760 Advanced Database Management (3:3:0). Prerequisite: INFS 515, 601, or equivalent. 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 Security Principles (3:3:0). Prerequisites: INFS 601, 612, and 614; 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.

763 Applied Cryptography (3:3:0). Prerequisites: INFS 762 or permission of instructor. Review of classical and modern cryptography such as secret key systems, public key systems, digital signatures, message digests; cryptographic protocols such as objectives, design and analysis techniques, pitfalls and failures; cryptographic algorithms and cryptanalysis; secret sharing schemes; zero-knowledge protocols; key escrow; case studies.

764 Object-Oriented Database Systems (3:3:0). Prerequisite: INFS 623 or equivalent. Object-oriented programming principles in the design of object-oriented (OO) database systems. 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 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.
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Prerequisite/Notes</th>
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<tbody>
<tr>
<td>766</td>
<td>Internet Security Protocols (3:3:0).</td>
<td>Prerequisite: INFS 762 or permission of instructor.</td>
</tr>
<tr>
<td>767</td>
<td>Secure Electronic Commerce (3:3:0).</td>
<td>Prerequisite: INFS 640 and INFS 762; or permission of instructor.</td>
</tr>
<tr>
<td>770</td>
<td>Methods for Information Systems Engineering (3:3:0).</td>
<td>Prerequisite: INFS 622.</td>
</tr>
<tr>
<td>790</td>
<td>Information Systems Policy and Administration (3:3:0).</td>
<td>Prerequisite: Completion of all core courses, preferably taken in final semester before graduation.</td>
</tr>
<tr>
<td>796</td>
<td>Directed Readings (3:3:0).</td>
<td>Prerequisite: Graduate standing in information systems with at least 12 credits in the M.S. program.</td>
</tr>
<tr>
<td>797</td>
<td>Advanced Topics in Information Systems (3:3:0).</td>
<td>Prerequisite: Permission of instructor.</td>
</tr>
<tr>
<td>798</td>
<td>Research Project (3:3:0).</td>
<td>Prerequisite: 18 credits applicable toward M.S. Research project chosen under the guidance of a full-time graduate faculty member, resulting in a written technical report.</td>
</tr>
<tr>
<td>799</td>
<td>Thesis (1-6:0:0).</td>
<td>Prerequisite: 18 credits applicable toward M.S. Original or compulsory work evaluated by a committee of three faculty members.</td>
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**Information Technology (INFT)**

**School of Information Technology and Engineering**

Graduate courses listed under the Departments of Computer Science, Electrical and Computer Engineering, Information and Software Engineering, Systems Engineering, Systems Engineering and Operations Research, and Applied 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, and motivation for continued, enthusiastic learning in the area of IT.

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. 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 class number 112 or higher. Introduction, using both lecture and laboratory practice, to the nature and uses of computers. Widely used computer applications, including work processing, spreadsheets, databases, presentation software, and computer communications and networking are studied. Laboratory projects are required in these areas. Additional lectures address computer systems organization, legal and ethical considerations, security, artificial intelligence, and the Internet.

108 Programming Fundamentals (3:2:1). Prerequisite: Knowledge of high school algebra. Introduction to programming fundamentals for non-technical majors. Software development process is presented. Students learn to write programs in a high level language. Students may not receive credit for both INFT 108 and CS 112.

500 Quantitative Foundations for Information Systems Analysis (3:3:0). Prerequisite: MATH 108 or an equivalent one-semester undergraduate introductory calculus course covering both differential and integral calculus. Provides a common background in basic quantitative areas focused on decision making and information processing. Topics include a review of basic calculus, matrix algebra, problems in optimization, and the calculus of probabilities.

746/CSI 776 Calculus of Random Signals (3:3:0). Prerequisite: STAT 652 or ECE 630 or 632. Introduction to modern theory of stochastic calculus such as stochastic integrals, martingales, counting processes, diffusion processes, and Ito-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
776/CSI 778 Real Analysis and Statistics (3:3:0). Prerequisite: 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, matrices, 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.

811 Principles of Machine Learning and Inference (3:3:0). Prerequisite: CS 580, 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.

813 Seminar: Intelligent Tutoring Systems (3:3:0). Prerequisite: CS 689. Current research topics in intelligent tutoring systems and learning environments, including case studies in selected domains, such as medicine and foreign language. Relevant recent advances in closely related subfields of artificial intelligence are presented. Topics may include semantically constrained exploration, student modeling, example generation, formalization of pedagogical decision-making, and evaluation strategies. May be repeated for credit with a change in topic.

814/CSI 801 Foundations of Computational Science (3:3:0). Prerequisite: CS 735 or equivalent. Investigation methods for scientific questions in the presence of teraop 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 INFT 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). Prerequisite: 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.

818 Topics in High Performance Computer Systems (3:3:0). Prerequisites: CS 571 and 635, or permission of instructor. Discussion of current research topics in high-performance computer systems. Topics vary according to student and faculty interest. Possible topics include mass storage systems for supercomputers, distributed file systems, operating systems and system software for massively parallel computers, and heterogeneous distributed computing.

819 Computational Models for Probabilistic Inference (3:3:0). Prerequisite: SYST 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: SWSE 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/SWSE 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: SWSE 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 examination 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.

830 Detection and Estimation Theory (3:3:0). Prerequisites: ECE 528 and 734, or permission of instructor. Introduction to detection and estimation theory with communication applications. Topics include M-hypotheses, Bayes, minimax, Neyman-Pearson criterion, detection of signals in AWGN and ACGN, Bayes estimation, ML

833 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 onboard processing, integrated service digital satellite networks, and satellite transponder, ground stations, packet switching, and optical satellite communications.

834 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 scalespace; 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 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 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.

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.

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.

844 Pattern Recognition (3:3:0). Prerequisite: ECE 528; 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 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.

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 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.

850 Seminar: Topics in Systems Integration Engineering (3:3:0). Prerequisite: SYST 720 or equivalent. Analysis of the Systems Integration life cycle and the tools, techniques, and methods that contribute to the design, development, application, and evaluation of approaches to systems integration. Reviews the current technological advances that support systems integration methods, including functional and nonfunctional SI requirements, risk assessment and risk management, internal protest avoidance mechanisms, and protest management. May be repeated when the topic is different.
851 Seminar: Topics in Software Requirements (3:3:0). Prerequisite: SWSE 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 652 or INFT 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).

857 Automated Planning and Problem Solving (3:3:0). Prerequisite: CS 580. Introduction to automated planning and problem solving in artificial intelligence. Students learn a broad set of techniques in automated planning and heuristic searching along with strategies for implementing automated problem-solving systems using these methods. Topics include heuristic search, predicate calculus, nonmonotonic logic, action planning, adversarial planning, multiagent planning, and logic models for reasoning about action and time.

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 nonresolution 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: SWSE 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 Formal Models for Computer Security (3:3:0). Prerequisite: INFS 762. Study of formal mathematical models for computer security. Mathematical properties of these models are identified and analyzed. Models are compared with respect to formal and pragmatic criteria and include lattice-based models, noninterference models, models based on propagation of access rights, multilevel data models, integrity models, and miscellaneous models such as the n-tree model for group authorization.

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 fundamental elements 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 762 or permission of instructor. A detailed study of network and distributed systems security. Reviews 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.

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.

876/CSI 876 Measure and Linear Spaces (3:3:0). Prerequisite: INFT 776/CSI 778. 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/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-dimensional Euclidean geometry, projective geometry, and numerical analysis procedures. Also included may be Hilbert spaces, 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.

881 Numerical Methods for Mathematical Optimization (3:3:0). Prerequisites: OR 641, 642, 643, or 644. Study of computational issues related to the solution of linear, integer, networks, and nonlinear programming problems. Topics may include the use of list processing, heuristic techniques, parallel processing, efficient inversion techniques, and numerical analysis procedures. Also included may be complexity analysis and the structure of algorithms, recent results relating to the worst case and average case performance of algorithms, and a survey of leading software. Students use, alter, and develop software throughout the course. May be repeated for credit when topics are distinctly different.

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, 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 Spectral Estimation (3:3:0). Prerequisite: ECE 535 or STAT 652 or permission of instructor. In-depth study of spectral analysis and its application to statistical signal processing. Topics include Fourier analysis, wavelets, and functional analysis, including normed linear spaces, Banach and Hilbert spaces, and reproducing kernels. Topics include wavelets, applications to stochastic processes, and nonparametric functional inference.

886 Information Theory (3:3:0). Prerequisite: ECE 630 or STAT 644 or equivalent or permission of instructor. 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 Distributed Estimation and Multisensor Tracking and Fusion (3:3:0). Prerequisite: ECE 528 or SYST 611. Centralized and distributed estimation theory, hierarchical estimation, tracking and data association, multisensor multtarget 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: USE 660, 560 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: USE 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: USE 601. Special topics and recent developments in environmental and water resource 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, USE 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: INFT 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: INFT 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.

934 Advanced Topics in Detection and Estimation Theory (3:3:0). Prerequisite: INFT 830. Advanced topics in detection and estimation theory of current research interest. Areas may include adaptive array processing, direction-finding techniques using eigenspace techniques (e.g., MUSIC, ESPRIT), spectral estimation, and underwater acoustics applications.


940 Advanced Topics in Control and Robotics (3:3:0). Prerequisites: ECE 620, 621, 624, and 650. 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 and 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: INFT 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 Advanced Topics in Microelectronics (3:3:0). Prerequisite: INFT 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: INF5 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.

951 Software Productivity (3:3:0). Prerequisite: INFT 821 or 851. Analysis of technologies and methodologies of the systems approach to software engineering theory and application, decision support and knowledge-based systems for enhancing software productivity. Covers macro-enhancement approaches to increasing the effectiveness and efficiency of software development with particular emphasis on requirements specifications.

958 Basic and Applied Decision Support Systems Technology (3:3:0). Prerequisite: STST 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.

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960 Expert Database Systems (3:3:0). Prerequisites: CS 580 and INFS 614. Study of the concepts, tools, techniques, and architectures of expert database systems, which support the specification, design, prototyping, production, and maintenance of applications requiring knowledge-directed processing of shared information stored in large databases.

961 Topics in Distributed Database Management (3:3:0). Prerequisite: INFT 861 or permission of instructor. Current topics of advanced research in distributed database management. Topics include transaction management, concurrency control, deadlocks, replicated data management, query processing, and reliability.

962 Advanced Topics in Computer Security (3:3:0). Prerequisite: INFT 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.

973/CSI 973 Mathematical Statistics II (3:3:0). Prerequisite: INFT 972. Continuation of INFT 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.

976/CSI 976 Statistical Inference for Stochastic Processes (3:3:0). Prerequisite: INFT 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.

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 eigenvalue processing, nonlinear 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 queuing 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: INFT 741. Continuation of optimization topics, including recent developments in optimization theory and computation. 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 INFT 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.

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 INFT 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 & Culture I (3:3:0). An inquiry into the major forms of language, how individuals draw on their structures to learn about the world, and how this approach influences our perceptions of children as learners. In this unit, individuals study the value of making sense of their own experience, writing narratives and autobiographies, studying them as objects of thought, critiquing them from different interpretative theoretical frameworks (e.g., Vygotsky, Brice-Heath, Baratz), and using them as a basis for conceptualizing research.

751 Studies in Language & Culture II (3:3:0). An examination of how we can study the world through novels and stories, how the languages of disciplines can be understood, and how meaning can be created and critiqued with different structures. The teacher as a technician and as an artist, and what a curriculum might be if conceived as a work of art, are examined. Different forms of dialogue and conversation are examined as a way to assist children to understand their own world, especially through such forms as theater.

752 Research in Practice: The Team Project (9:3:0). Each school team works throughout the first year in refining the topic of its proposal. At the beginning of the second year, this proposal is formally submitted and approved, having been built on the preparatory and continuing research training offered. The design of the work plan must contain a detailed strategy, preferably involving children as partners rather than subjects in research. The product of the project must be a substantial piece of work, especially as a vehicle for hearing children's and teachers' voices, together with a plan for its dissemination in the school community.

753 Teaching and Learning (3:3:0). The culminating unit of the program, taken as an exit requirement during the third summer workshop. Three main themes are presenting the team project; constructing an individual portfolio of work, including the journal and a summative evaluation of an individual's career; and mentoring through the team structure of teachers enrolled in the new program.

Instructional Technology (EDIT)

Graduate School of Education

504 Introduction to Educational Technology (3:3:0). Prerequisites: Admission to the Graduate School of Education or senior standing, and permission of instructor. Examines uses of and issues in educational technology, explores curriculum integration of technology, and focuses on learning and using commercially available applications software.

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. Techniques for effective curriculum integration of software within a wide range of classroom settings are explored, as well as the means to gauge effective software use to support instructional objectives.

561 Teaching with Telecommunications (1:1:0). Designed to assist students in exploring and developing expertise with the various aspects of telecommunications tools as well as to model the ways in which these tools can be used for personal learning and for integration into the teaching/learning process. The course addresses e-mail, the Internet, the World Wide Web, and online databases.

562 Teaching with Databases (1:1:0). Designed to assist students in exploring and developing expertise with the various aspects of databases as well as to model the ways in which databases can be integrated into the teaching/learning process. The course 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). Designed to assist students in exploring and developing expertise with the various graphic programs available for constructing visual images. The course 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). Designed to assist students in exploring and developing expertise with social, cognitive, and learning implications of film, video, and television as well engage students in the process of planning, storyboarding, and filming with video.

565 Teaching with Educational Software (2:2:0). Designed to assist students in exploring and developing 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. Emphasis is placed on the ways these programs support the K-12 teaching/learning process.

566 Teaching with Multimedia/Hypermedia (2:2:0). Prerequisite: EDIT 563. Designed to assist students in exploring and developing expertise with a variety of hyper-text/hypermedia and multimedia tools. Emphasis is placed on students' ability to use hypermedia/multimedia tools and then to teach others to use these tools. Attention is paid to the ways in which the integration of hypermedia/multimedia tools in the K-12 curriculum can support learning, and to the difference between hypermedia and multimedia.

567 Teaching with Desktop Publishing (2:2:0). Prerequisite: EDIT 563. Designed to assist students in exploring and developing expertise with a variety of publishing tools to include word processors, desktop publishers, and idea processors. Emphasis is placed on using these tools to communicate. Attention is paid to design and layout principles, the appropriate use of images to facilitate communication, and the ways in which K-12 teachers can design opportunities for students to learn these concepts.
571 Tools for Visual/Graphic Design (1:1:0). This course is designed to teach the basic knowledge of the tools available for integrating graphics and visual design into computer-based instruction. Students will be exposed 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). This course is an overview of digital video and audio software programs and considerations for using these tools in the instructional design process. Participation in this course is intended to give 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). This course is designed to teach the basic knowledge of the tools available for managing computer-based multimedia and hypermedia projects. Students will be exposed to the latest tools available for the management, planning and tracking of large-scale projects. Issues related to project management of multimedia will also be discussed.

574 Networking Tools (1-3:1:3-0). This course is designed to teach the basic knowledge of current networking and telecommunications devices used to enhance the instructional design process. The course will cover local area networks, telecommunications, and teleconferencing and distance education technologies.

575 Authoring Tools (1-3:1-3-0). Students will be introduced to 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 will be customized to the particular software tool presented.

575A Authoring Tools: Authorware (1-3:1-3-0). Learn the basic fundamentals of the Authorware program. Program can be very complex and the only essential functions of the program will be used as a basis for this course. Students develop a basic self-directed design module that will include the major components of the software covered. This course will provide 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.

575B Authoring Tools: Toolbook (1-3:1-3-0). Introduction to object-oriented construction and authoring with Asymetrix's Multimedia Toolbook. Through hands-on lab instruction, student will learn Toolbook's interface—buttons, fields, palettes, viewer's hotwords, etc. Advanced concepts of importing video and audio clips, resource management, object linked and embedding and path-based animation will be learned. An introduction to basic scripting theories will prepare students for the next level of Toolbook authoring. Students may use 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 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. Broad educational technology issues are addressed, as well as resource and facilities management, staff development, curriculum integration, and planning for new technologies.

699 Information Tools for Personal and Organizational Productivity (1:1:0). Introduces graduate students to the instructional and database management uses of microcomputers. Emphasis is on study and exploratory application in laboratory classes of selected concepts of computer usage to achieve objectives common to a variety of formal educational settings.

704 Instructional Technology Foundations and Theories of Learning (3:3:0). This course is designed to review the practical and pedagogical issues related to the design and development of technological instruction. Emphasis will be placed on 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.

711 Teaching with Technology I: Telecommunications and Databases (3:3:0). Corequisite: EDCI 710. Designed to assist students in exploring and developing expertise with the various aspects of telecommunications and databases as well as to model the ways in which these tools can be used for personal learning and for integration into the teaching/learning process. The course addresses e-mail, the Internet, the World Wide Web, and online and multimedia databases. In addition, the course focuses on strategies for searching, sorting, creating, and communicating with information, much of which is 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. Designed to assist students in exploring and developing 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. The course addresses draw and paint programs, scanning and editing of images, and use of visual communication to support K-12 learning. It explores the social, cognitive, and learning implications of film, video, and television as well as engages students in the process of planning, storyboarding, and filming with video. Last, the course 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.

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715 Teaching with Technology III: Publishing and Computational Tools (3:3:0). Corequisite: EDCI 714. Designed to assist students in exploring and developing expertise with a variety of publishing tools to include word processors, desktop publishers, and idea processors. Emphasis is placed on using these tools to communicate. Attention is paid to design and layout principles, the appropriate use of images to facilitate communication, and the ways in which K-12 teachers can design opportunities for students to learn these concepts. In addition, the course assists students in exploring and developing 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. Designed to assist students in exploring and developing expertise with a variety of hyper/hypermedia and multimedia tools. Emphasis is placed on students’ ability to use hypermedia/multimedia tools and then to teach others to use these tools. Attention is paid to understanding the difference between hypermedia and multimedia. In addition, the course 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 (2:2:0). Examines how educational technology can provide an infrastructure for creating, managing, and evaluating innovative types of teaching/learning environments. New assumptions about learning, instructional technology, and organizational development are explored as a foundation for planning how schools can use technology to evolve beyond conventional approaches.

730 Analysis and Design of Multimedia/Hypermedia Environments (3:3:0). Prerequisites: EDIT 530 and EDCI 705, or permission of instructor. 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). Prerequisites: EDIT 530, EDCI 705, and EDIT 730, or permission of instructor. Capstone course of a three-course sequence on the theory and practice of instructional design. Students apply the ideas developed in prior courses to complete a major instructional design project. Leading-edge ideas in the evolution of instructional design are also discussed.

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 within the next three to eight years. The potential of these emerging technologies to improve practice and to alter the mission and content of education are assessed, and skills in strategic planning are developed.

752 Design and Production of Multimedia & 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.

Examination of user needs, information models, structure, and media selection and use inform the design and production of the final project.

771 Introduction to Multimedia/Hypermedia (2:2:0). This is an overview of the issues and tools used within the field of instructional design. The course focuses on the development of skills necessary to implement hypermedia/multimedia ideas into the production process.

772 Web-Based Instructional Tools (2:2:0). This course is an overview of web page development tools. Participation in this course is intended to give students an opportunity to develop designing principles and skills for publishing documents on the World Wide Web. Students will interact with a variety of web publishing software programs and will work 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 adviser. 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). Corequisite: EDIT 704 and EDIT 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 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 See EDUC 797.

895 Emerging Issues in Instructional Technology (3:3:0). Prerequisite: Admission to the Ph.D. program or permission of instructor. Studies 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. Original research endeavor related to the student's M.A.I.S. program concentration. Research must result in a document meeting M.A.I.S. and university standards.

International Commerce and Policy (ITRN)

The Institute of Public Policy

500 Approaches to International Commerce and Policy (3:3:0). 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 (3:3:0). 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 (3:3:0). 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.

504 Trade and Microeconomics for International Commerce (3:3:0). 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, 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). Focuses on the activities and roles of financial institutions in the international financial system. This course examines basic concepts of international finance; international, regional, and national financial organizations; and financial markets. Key policy issues such as the environment and externalities, equity issues and sectoral imbalances, the international debt crisis, and financial challenges facing the new and developing states are discussed. A variety of financial instruments are examined, and case studies of particular transactions are explored. This course provides a conceptual foundation for understanding global financial issues, as well as a practical understanding of the financing sources for international transactions.

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. The roles of science and technology as economic drivers are assessed, and the strategies employed by companies and governments to link research and development to economic growth and competitiveness are explored. The research and development systems and technology-related trade policies of the United States, Japan, Europe, major developing countries, and selected newly industrialized economies are examined, with an emphasis on policies affecting trade and technology. Specific cases involving interactions between science, technology, and international trade are explored.

605 International Commerce and Culture (3:3:0). 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 by institute or adjunct faculty 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.

709 International Business Transactions: Marketing and Distribution (3:3:0). Introduces students to the terminology and techniques of marketing, producing, and distributing products and services overseas. The course covers key issues in market identification, product development, sales and promotion, channels of distribution and logistics, and contract negotiation. Concepts of financing, documentation, and limitation of contingent liability are introduced.

710 International Business Transactions: Finance and Investment (3:3:0). Focuses on techniques for financing of trade and on payment methods, including letters of credit, countertrade, and other approaches. Issues of direct concerns 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 Regulation of International Transactions (3:3:0). Prerequisite: ITRN 614 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, their powers, and their authorities. Tariffs and customs regulations; product safety and environmental restrictions; intellectual property, copyright, trademark and patent regulations; and licensing rules are covered. The course also covers special restrictions that may be imposed because of political considerations such as embargoes, munitions controls, and antibribery and antiboycott regulations.

713 U.S.-Foreign and Economic Decision Making (3:3:0). Identifies and assesses the foreign and economic policy processes in the United States and the roles of institutions and individual leaders. Students examine both historical and simulated cases, with particular attention to the roles of private and government actors.

715 Global Environment and the World Economy (3:3:0). Examines the growing relationship between environmental interdependence and the developing world economy. The course assesses the globalization of environmental and health issues with a focus on their impact on international trade and transactions. The relationship of scientific findings on the environment to political and economic institutions, and the tensions between free trade, economic competitiveness, and regulation of potential dangers to the environment are emphasized.

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 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.

718 Japan's International Trade and Technology (3:3:0). Examines the interrelationship of international trade and economic development in post-war Japan. Focuses on the importance of technology in Japan's domestic and international trade policies. Emphasizes current business and political issues in the context of the global trading system.

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 institutions. Emphasizes the changing nature of these organizations in relation to nation states and the relationship of international organizations to U.S. national security and economic interests.

730 Information Technology Fundamentals for International Business and Trade (3:3:0). Deals with technology and issues relating to the emergence of computing, information, and telecommunications technologies in the mainstream of society. The aim is to provide a general understanding and facility with technologies of contemporary interest.

731 Business to Business Marketing in International Commerce (3:3:0). Provides students with an understanding of the concepts of the international marketing process and the international environment within which companies operate.

732 International Commodities Transactions (3:3:0). Provides students with a framework for understanding the design and valuation of derivative securities and their use in managing financial risk. Students are familiarized with the instruments and institutions of U.S. financial markets, focusing particularly on "derivative" markets.

733 Global Trade Policy (3:3:0). Focuses on globalization and U.S. trade policy. It considers the GATT and the WTO in relation to national sovereignty, dispute resolution, substantive agreements, and U.S. legal aspects. Telecommunications, financial services, intellectual property rights, and information technology are examined.

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.

735 International Trade Law & Regulation (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.

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

dological development, and salient political issues.

737 World Trade in Semiconductors & Information Tech­

ologies (3:3:0). Examines bilateral and multilateral
approaches to world trade in technology products. The U.S.-
Japan Agreement on Semiconductors and its successor agree­
ments 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 commercial transactions.

740 ABCs of Exporting and Importing (3:3:0). Acquaints
students with legal, regulatory, and practical issues that arise
in 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.

741 International Competitive Strategies (3:3:0). Ana­
yzes and compares business and national strategies; iden­
tifies commonalities and differences; and investigates how
different organizations are responding to modern chal­

lenges. The course reviews classical and contemporary strat­
egies of nations and of companies, the extent to which new

technologies alter strategy, and the extent to which man­
gagement science contributes to national strategy.

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 covered are technological factors in
the planning horizon and domestic policy and international
strategy affecting the Internet trajectory; and new
horizons for Internet applications.

743 Global Policy and Business Scenarios (3:3:0). Scen­
ario planning is a rational way of laying out a broad range
of future opportunities and then systematically preparing
for them. This class focuses on learning the methodology of
scenario planning through the use of a challenging case study.

744 The Politics of International Competitiveness (3:3:0).
An inquiry into the governance problems of public managers
and political leaders as they cope with global competi­
tiveness in the post-industrial era. The course focuses on the
integration of the public and private sectors worldwide, with
special emphasis on the U.S. role and how it influences such
areas as technology transfer, 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 examines 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 Hemis­

phere (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 atten­
tion 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 compara­tive
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.

753 State and Local Strategies for Trade and Develop­
ment (3:3:0). Examines the legislative and institutional
structures of the Commonwealth of Virginia for promotion
of international business activity as an example of how states
and local governments can foster economic growth through
trade. State economic development policies, the structure
of state agencies, and the services available to domestic
exporters and foreign investors contemplating direct invest­
ment are also examined. Students develop a specific export
marketing plan for a particular firm or industry.

754 International Commercialization of Space (3:3:0).
Examines the international market for space activities and
services, including launch and satellite operations. The roles
of space technology and the legal, political, and business
environments in which space activities take place are
emphasized. The course includes study of technological,
financial, legal, and regulatory issues.

Examines the impact of globalization and changes in the
international economic and political systems on concepts
of national security. The nexus of economic and security
concerns in the post-cold war era, with particular attention
to emerging issues, including trade and economic security,
proliferation of advanced military technology and control
of weapons of mass destruction, international drug traf­
ficking, and defense conversion, is emphasized. The focus
is on the implications of changing security requirements
on U.S. defense and economic policy and activities.

757 Transnational Business Planning (3:3:0). Provides
students with an introduction to planning international
business activities, including licensing agreements, joint
ventures, acquisitions, and divestitures. Using a step-by­
step planning methodology, students 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. Current customs and import-export control regulations and documentation requirements for international transactions are reviewed. The course is designed for students who need a practical and detailed understanding of rules and documentation for international business transactions.

760 International Environmental Polities (3:3:0). Examines the growing concerns related to global environmental issues, and problems that 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, EU policies and programs, and the European Union’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. Issues and trends that affect U.S.-Latin American political, business, and trade relations, particularly recent political and economic reforms, are emphasized. 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.

768 Global Intellectual Property Rights and International Trade (3:3:0). Examines national, regional, and international systems for the protection of intellectual property. The course addresses the current international system and the ongoing multilateral efforts to strengthen intellectual property protection worldwide. Regions and countries that pose special challenges for intellectual property, and U.S. policy and law related to these challenges, are examined.

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. 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, are examined.

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 adviser 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 adviser 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.
Latin (LATN) • Social & Organizational Learning (LRNG) 323

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 and development of reading skills, and introduction to Latin literature and 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 classical studies concentration 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 study of origin and development of Latin literature.

202 Intermediate Latin II (3:3:0). Prerequisite: LATN 201 or equivalent. Study of advanced grammatical constructions and patterns of usage. Reading of selections from various Latin authors who flourished during the late Republic and early Empire of Rome, and study of the cultural and political background of classical Latin authors.


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 and its themes and literary techniques. 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 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). Prerequisite: LATN 351/352 or equivalent, or permission of instructor. Focus on a single Latin author or literary genre, approaching its subject from a variety of interpretive perspectives and using secondary literature as well as primary texts. Topics and authors vary. Sequence may be repeated for credit.

Social and Organizational Learning (LRNG)
Public and International Affairs

492, 592 Special Topics in Social and Organizational Learning (1-3:1-3:0). 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.

514 Introduction to Ethnography (3:3:0). Aimed at preparing a student to conduct qualitative empirical research in the applied social sciences. Included are ideas about and practice in field work, interviewing, participant observation, and the preparation of research reports. Covers the theoretical underpinnings of qualitative research (symbolic interactionism and phenomenology) as well as the various methodological phases of the research process.

551 Economics of Discourse (3:3:0). Application of economic and literary theory to the process of verbal communication, whether spoken, written, or otherwise. The transformation of literary criticism from the New Criticism toward post-structuralism is examined with the use of theories from literary criticism itself, as well as from the field of economics. Examines the possible effects of changing technological conditions of production, or of changing composition of market demand conditions, or other economic circumstances, in the supply and demand of literary texts.

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). Exposure to groupware systems such as Lotus Notes, the World Wide Web, and Fadio 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). A five-week, one-credit minicourse taught via the Internet and video, which provides Internet competency for distance learning initiatives across the George Mason University curriculum including concepts, skills, and software to read, search, and write hypertext for the web, and to participate 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.

http://catalog.gmu.edu
596 Independent Study (1-12:0:0). Research, analysis, and/or implementation within the realm of social and organizational learning. Work with a member of the program faculty. May be repeated for credit.

601 Organizational Learning (3:3:0). 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 team work, 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.

612 Economics, Technology, and the Regulatory Process (3:3:0). Conveys some fundamental economic principles useful for understanding and analyzing the regulation of industries that are undergoing rapid technological change, with a special focus on the telecommunications industry. Topics include the history of economic regulation, the theory of natural monopoly, economic efficiency and the First Amendment, competitive contracting, cost analysis, and principles of efficient regulation. Places a special emphasis on using economics to understand and interpret current technological and regulatory trends.

672 Organizational Learning Laboratory (3:3:0). 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). 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.

681 Economics for the Professional (3:3:0). Introduction to economics for graduate students who need to make sense of economic processes and problems, but do not require the theoretical treatment of a graduate economics program. Emphasis is on a practical understanding of economic problems, issues, and policies. The aim is to help students gain comfort and confidence with economic tools of thought. Reading and writing assignments are done in Folio Views software, which supports collaborative learning. Not for economics credit.

692, 792 Special Topics in LRNG (1-3:1-3:0). 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, and Computational Modeling of Social Learning, 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 organization 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.

720 Market-Based Management (3:3:0). Use of concepts from market process economics to explore nonauthoritarian forms of business organization and management. Topics include the difficulty of centralized planning, the evolution of management theory, corporate culture, teamwork, internal markets, incentives, and organizational learning. Relies heavily on students' discussion and research to apply economic concepts to practical organizational problems.

731 Advanced Object-Oriented Technology (3:3:0). A sequel to SWSE 631. The term object orientation is defined to include a far broader range of encapsulation and binding opportunities than programming languages usually provide. Object-oriented design is approached as a matter of making intelligent choices between the radically different kinds of objects and binding mechanisms at different levels of a heterogeneous architecture. This provides the basis for deploying commonly available software development tools in combination: from tightly coupled, fabrication-intensive tools such as C++ to loosely coupled, assembly-intensive ones such as Smalltalk.

761 Computational Modeling of Social Learning (3:3:0). Exploration of 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. 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 inough to which the entities modeled have both the capacity of volition and varying interpretations of and strategies for dealing with their environments.

770 Pricing Strategy and Tactics (3:3:0). 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, which will 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 discussion of current events that show how to apply the techniques developed in the class.

781 Interpretive Social Theory (3:3:0). An advanced, philosophical study of the interpretive school of economics sometimes known as the "Austrians." 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 to text and provides a practical way of demonstrating and appreciating the value of interpretive social theory.

796 Independent Study (1-12:1-12:0). Research, analysis, and/or implementation within the realm of social and organizational learning. Work with a member of the program faculty. May be repeated for credit.

868 Business, Government, and the International Economy (3:3:0). 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). 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, for 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, for its responses to the inevitable crises of history and the forces of change. In this context, Western culture is seen to be but one of many such constructions in transition, one of many ways of being in the world, more or less successful according to culturally determined conceptions of success itself.

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


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, supplying students with 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.

507 Fieldwork in Applied Linguistics (3:0:0). Prerequisite: LING 326, 520, 521, or 582. Contact the English Department one semester prior to enrollment. Fieldwork provides experience working in a language-teaching program or an educational research organization.

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.
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 effective considerations.

686 Special Topics in Linguistics (3:3:0). Prerequisite: Varies with topic. Detailed advanced study of selected areas 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 non-linear 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 non-linear 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 to context. Topics include reference, lexical semantics, logic, quantification, truth conditions and sentential meaning, presuppositions, and speech acts.

786 Syntax I (3:3:0). The nature and form of a syntactic theory, and an examination and analysis of the properties of several major natural language syntactic structures.

787 Syntax II (3:3:0). Prerequisite: LING 786. A theoretical treatment of syntactic phenomena that in the past few years have emerged as standard problems for syntactic analysis. Problems include binding, extraction, and quantification. Extensive reading in the primary theoretical literature.

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.

302 Organizational Behavior and Administration (3:3:0). Prerequisite: Completion of at least 48 credits including COMM 100, 101, 220, or 260. Review and application of major theoretical issues in organizational behavior. Analysis and critique of research methods used in the field. Particular emphasis on microfactors and their application to development of effective managerial styles.

312 Principles of Management (3:3:0). Prerequisite: MGMT 302. Discussion of principles of management, emphasizing managerial functions. Emphasis on internal management of organizations with advanced, in-depth study of theoretical and behavioral concepts as applied to practical management problems.

321 Human Resource Management (3:3:0). Prerequisite: MGMT 302. Presentation of principles and procedures related to recruitment and selection of a labor force, job analysis, employee evaluation, and legislation. Emphasis is on their relationship to management.

331 Employee-Management Relations (3:3:0). Examination of American trade unions and unionism. Topics include the labor contract, the bargaining processes, the philosophy of unionism, the use of bargaining techniques for nonwage issues, the legal context of labor-management relations, and the responsibilities and duties of unions and management.

391 Special Topics in Management (3:3:0). Prerequisite: MGMT 302. 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). Prerequisite: MGMT 302. Study of complex organizations from the perspective of developing theoretical models and applied research designs. Emphasis on systems approach as an integrative framework. Organization development techniques for effective management of change are provided through analytical and experimental exercises.

421 Current Issues in Human Resource Management (3:3:0). Prerequisite: MGMT 321. Examination of more complex areas of human resource management: noneconomic compensation, health and safety, wage and salary administration, management development and employee training, and internal communication.

431 Employee-Management History and Issues in Industrial Relations (3:3:0). Examination of employee relations throughout U.S. history, up through the present day. Supplemented with videos and guest speakers, this course looks at causes and effects of past and present employee-management issues and conflicts.

491 Seminar in Management (3:3:0). Prerequisites: MGMT 312. 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.

492 Field Experience in Management (3:3:0). Prerequisites: MGMT 312. Faculty-governed field experience in a Northern Virginia business. Teams of students, matched with client firms through the Entrepreneurship Center, propose action plans relating to a major problem or opportunity faced by the company.

493 Management of Technology (3:3:0). Prerequisites: MGMT 302, MKTG 301, and DESC 301. Cross listed as DESC 493. Technology development and implementation is a key to business success in the 21st
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Management (MGMT) • Management Information Systems (MIS) 327

century. Course examines issues involved in managing technology, including technological lifecycles, sourcing technology (internal or external development), choosing to lead or to follow in innovation, and designing the innovative organization.

498 Business Strategy and Policy (3:3:0). Prerequisites: Degree status, final semester (senior standing) and DESC 301, FNAN 301, MGMT 302, and MKTG 301.

Capstone course designed to acquaint the student with the nature of strategic management and the shaping of business policy. Emphasis on managerial decision making as it relates to business strategy formation and implementation in large, medium, and small enterprises, both domestic and international.

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 undergraduate program director before registration. Written report required.

711 Organization Theory (3:3:0). Prerequisite: MGMT 500 or MBA 653. Survey of the theoretical and empirical literature in organization theory, including organizational/environment relationships, organization structure, organization design, and dynamic processes in organizations. Focus is on understanding theory, evaluating research, and recognizing factors that influence organizational effectiveness.


751 Small Business Ventures and the Entrepreneur (3:3:0). Prerequisite: MGMT 600 or MBA 653. Small business and its economic, competitive, and social environment. Lectures, case studies, and research illustrate and develop solutions to potential problems of initiating, organizing, and managing a small business.


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.

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.

201 Introduction to Computer-Based Management Information Systems (3:3:0). Corequisite: MIS 102. An introduction to the components of the management information system (MIS) and their integration for managerial control and decision support. Analysis, design, and implementation of MIS software. Microcomputing lab for database and spreadsheet applications.

310 Introduction to Database Management Systems (3:3:0). Prerequisite: MIS 201, degree status. Introduction to the principles of designing, maintaining, and manipulating databases. Emphasis is 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.

403 Computer Systems Analysis and Design (3:3:0). Prerequisites: MIS 201, 310, degree status: a programming course is recommended. Treatment of 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. Term project required. Computing lab.

411 Management and Control of Information Systems (3:3:0). Prerequisites: MIS 201 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.

420 Business Data Communications (3:3:0). Prerequisite: MIS 201, degree status. Broad introduction to technology components used in modern networks. Emphasis on the use of networks to facilitate business processes. Term project.

440 Business Applications of Artificial Intelligence (3:3:0). Prerequisites: MIS 201, degree status: a programming course is recommended. Broad introduction to applications of artificial intelligence. Emphasis on the use and application of expert systems and natural languages in business and public sector organizations. Term project.

491 Seminar in Management Information Systems (3:3:0). Prerequisites: MIS 201, 310, 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.

492 Field Experience in Management Information Systems (3:3:0). Prerequisite: Senior standing. Faculty-governed field experience in a Northern Virginia business. Teams of students, matched with client firms through the Entrepreneurship Center, propose action plans relating to a major problem or opportunity faced by the company.

499 Independent Study in Management Information Systems (1-3:3:0). Prerequisite: Information resource management majors with at least nine upper-level MIS and/or INF5 credits. Research and analysis of selected problems or topics in information resource management. Must be arranged with an instructor and approved in writing by the undergraduate program director before registration. Written report required. May be repeated for a maximum of six credits if topics vary.
720 Business Systems Development (3:3:0). Prerequisite: MIS 600 or MBA 663. Study 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.

740 Business Applications of Telecommunications (3:3:0). Prerequisite: MIS 600 or MBA 663. Introduction to telecommunication technology and its applications in business, including LANs, PBXs, voice services, mobile communications, and ISDN. Applications in manufacturing and service sectors, along with regulatory issues and impact of globalization.

760 Human Engineering Issues in Computer Systems Design (3:3:0). Prerequisite: MIS 600 or MBA 663. Surveys the various human factors and ergonomic aspects of computer systems, including hardware and information displays as well as human factors principles of software design. Return on investment in alternative human factors decisions examined in applied settings. Cases and laboratory.

792 Topics in Management Information Systems (3:3:0). Prerequisite: MIS 600 or MBA 663. Significant information resource management topic is selected for detailed coverage. Examples of such topics are computer security, life cycle management of EDP systems, and electronic commerce. Term project.

796 Independent Study and Directed Readings (3:3:0). Prerequisite: MIS 600 or MBA 663. By special arrangement with professor and approval from the graduate program director.

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.

301 Principles of Marketing (3:3:0). Prerequisite: Completion of at least 48 credits including ACCT 201 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.

311 Sales Management (3:3:0). Prerequisite: MKTG 301. Examination and evaluation of the sales effort as it relates to the consumer and participants within the marketing channel.


313 Advertising Management (3:3:0). Prerequisite: MKTG 301. In-depth study and application of advertising and its role in marketing planning. Study includes identification of relevant data to analyze the advertising situation, development of product position, marketing and advertising objectives, creative strategy, media planning, and evaluation.

332 Retail Management (3:3:0). Prerequisite: MKTG 301. Comprehensive view of retailing as it relates to the total marketing process. Emphasis is on retail decision alternatives used when formulating retail strategy.

333 Industrial and Governmental Marketing (3:3:0). Prerequisite: MKTG 301. In-depth description, analysis, and evaluation of industrial and governmental marketplaces. Emphasis on marketing procedures practiced and available to decision makers when considering pricing, promotion, and channels of distribution.

351 Marketing Research Techniques and Applications (3:3:0). Prerequisites: DESC 210 and MKTG 301. 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. 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). Prerequisite: 90 credits including MKTG 312, MKTG313, and MKTG 351. Discussion of the managerial aspects of marketing, emphasizing development of marketing strategies and plans and integrating specific elements of the marketing process. Emphasis on case analysis.

481 Marketing in the Nonprofit Sector (3:3:0). Prerequisite: MKTG 301. 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. Lecture, discussion, and case analysis.

491 Special Topics in Marketing (3:3:0). Prerequisite: Nine credits of marketing. 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 assistant dean.

724 Promotional Strategy in Marketing (3:3:0). Prerequisite: MKTG 650 or MBA 623. Promotion activities as applied to both profit and nonprofit organizations. The approach is to develop basic issues in promotional strategy and then focus on managerial issues and problems as encountered by promotion executives.
725 Marketing Research (3:3:0). Prerequisite: MKTG 650 or MBA 623, DESC 650 or MBA 638. Concepts, theories, principles, techniques, and models underlying the marketing research process.

726 Advanced Consumer Behavior (3:3:0). Prerequisite: MKTG 650 or MBA 623. Advanced study of the concepts and propositions that compose consumer decision processes. Examines extant literature and stresses research applications for marketing strategy and public policy. Lecture and case analysis.

765 Marketing Decision Systems (3:3:0). Prerequisite: MKTG 650 or MBA 623. Appreciation for the capabilities that exist today for the marketing function in the modern corporation. Manner in which information technology has an impact on marketing and how information technology can be strategically deployed to alter marketing. Marketing decision making, the integration of databases (internal as well as syndicated), statistical techniques, modeling, and optimization to provide enhanced decision support for marketing managers. Explores present and future role of expert systems.

775 Theory and Policies of International Business (3:3:0). Prerequisites: FNAN 650 or MBA 643, MKTG 650 or MBA 623, and MGMT 600 or MBA 653. Introduces the theory, environments, and practices of international business. Emphasis on international entry strategies and environmental risk assessment. Lecture, cases, and discussion.

777 International Market Planning Practicum (3:3:0). Prerequisites: MKTG 650 or MBA 623. Small groups of students act as unpaid consultants to local businesses to study problems related to foreign market expansion. Culminates in formal written report and presentation to senior management of firm.

791 Seminar in Current Marketing Issues (3:0:0). Prerequisite: MKTG 650 or MBA 623. Selective analysis of contemporary marketing issues.

796 Independent Study and Directed Readings (3:0:0). Prerequisite: MKTG 650 or MBA 623. By special arrangement with professor and approval from the graduate program director.

Master of Business Administration (MBA)

School of Management

603 Managerial Economics and Decisions of the Firm (3:3:0). Prerequisite: Admission to Fast Track M.B.A. program. Provides a fundamental understanding of how microeconomic concepts are used to manage 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). Prerequisite: 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 Fast Track 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 accounting method choices on financial reports, and financial statement analysis.

623 Marketing Management (3:3:0). Prerequisite: Admission to Fast Track 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 Fast Track 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 for Competitive Advantage (3:3:0). Prerequisite: Admission to Fast Track 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 (3:3:0). Prerequisite: Admission to Fast Track 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.

663 Introduction to Information Technology and Management (3:3:0). Prerequisite: Admission to Fast Track M.B.A. program. Examines computer- and telecommunications-based technologies and their interrelationships with business processes. Organizational issues in the management of these technologies for competitive advantage. Use of these technologies for organizational decision making at different levels. Competitive impacts of information and telecommunications technologies.

673 Legal Environment for Management (1.5:1.5:0). Prerequisite: Admission to Fast Track 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 Policy (3:3:0). Prerequisite: Admission to Fast Track 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.

723 Cases in Marketing Management for Non-Profit Organizations (3:3:0). Application of theoretical and practical aspects of marketing in charitable, social, health organizations, trade associations and government enterprises. Emphasis on case analysis, discussion and a research project.

**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 ethos 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.

**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, 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).

**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 enormous potential for enhancing the way organizations, not merely professionals, can learn, notably through the development of Internet literacy, and the skills in using differing Internet navigation tools are examined in detail. The course is rooted in applying technology to real-world problems in different professional work-sites, offering in-depth training in the use and the development of groupware applications. In all other courses, there will be requirements for the use of technology in learning.

**704 Research Methodologies in the New Professionalism (3:3:0).** 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 Friere, McKeon, and Janowitz, with a practical team activity in which students will study an organization or aspects of it, using ethnography, field study, or any appropriately defensible research methodology.

**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 Practica. The theme of this module is communication, collaboration, and interaction in organizations. After an initial one and a half day workshop, MNPS candidates will meet with all faculty once a month as a readings group, to do 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 successful completion of Math Placement Test given by the Testing Center, 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 Concepts of Mathematics (3:3:0).** Important ideas in mathematics and their development.

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108 Introductory Calculus with Business Applications
(3:3:0). Prerequisite: Successful completion of Math Placement Test given by the Testing Center, 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). 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 Finite Mathematics (3:3:0). Elementary set theory, probability, and statistics.


113 Analytic Geometry and Calculus I (4:4:1). 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. 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). 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 modelling.

215 Vector Calculus (3:3:0). Prerequisite: 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 sets, logic, systems of numeration, whole numbers and integers, operations with integers, equations, and inequalities. Intended for school educators; does not count toward a major in mathematics.

272 Mathematics for the Elementary School II (3:3:0). Continuation of MATH 271; MATH 271 is recommended before enrolling in MATH 272. Topics include elementary number theory, rational and real numbers, intuitive geometry, and measurement, including the metric system. 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, 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 or 216. 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.


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 216 (or MATH 203 and MATH 214) and MATH 315. 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 534 and either MATH 351 or STAT 344. Two-semester sequence covering the material for the 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.

611 Intermediate Analysis (3:3:0). Development of the number system; review of the highlights of calculus, sequences, and series of functions. Credit not applicable toward the 30 credits required for the M.S. in Mathematical Sciences, but can be counted toward the M.Ed.

612 Intermediate Algebra (3:3:0). Linear algebra, vector spaces, linear independence, linear transformations, and matrix operations. Credit not applicable toward the 30 credits required for the M.S. in Mathematical Sciences, but can be counted toward the M.Ed.

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.

623 Algebraic Coding Theory (3:3:0). Introduction to the mathematical theory of error-correcting codes including linear block codes such as Hamming, Golay, BCH, and Reed-Muller. Also included are the MacWilliams equations and t-designs.

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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.


637 Non-Euclidean Geometry I (3:3:0). Affine, projective, hyperbolic, elliptical, differential geometry; transformations and elementary combinatorics.

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 355 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.

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.

685 Numerical Analysis (3:3:0). Prerequisite: Computer literacy, including some programming experience. Computation 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.

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)

Biology

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 (6-8:0:0). 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 hemopoiesis 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 (5-7:0:0). 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. Clinical lab procedures that involve antigen-antibody reactions and the theoretical bases of such procedures. Includes both diagnostic and blood bank techniques. Not offered on campus.

405 Clinical Microbiology (4-8:0:0). 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 (6-10:0:0). 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 Leadership Skills I (0:2:2). Introduces the student to the organizations, missions, customs, and traditions of the U.S. Army and national defense establishment. Includes a laboratory in applied leadership, common military tasks, and physical fitness.

101 Leadership Skills II (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 III (0:2:2). 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 (0:2:2). Prerequisite: MLSC 100, 101, 200, 202, veteran status, or permission of instructor. 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 or permission of instructor. 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, or permission of instructor. 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, or permission of instructor. 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.

499 Senior Advanced Military Studies (SAMS) (0:2:2). Prerequisite: Leave of Absence (LOA) status, or permission of instructor. Individual study course designed to promote advanced knowledge and continued learning in military science for students who cannot enroll in one of the other MLSC courses. Intended for students with a contractual commitment to the ROTC program. The SAMS course may be taken for one or two semesters with tailored requirements to include assigned staff and leadership positions in the cadet corps. Students enroll in the LAB 201 section and attend physical fitness training.

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 Tuesdays, 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.).

Music (MUSI)

Music

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 or 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, harp, harpsichord, horn, koto, oboe, organ, percussion, piano, saxophone, string bass, trombone, trumpet, tuba, viola, viola da gamba, violon, and voice.

Undergraduate Private Music Instruction (1-3:0:5-1).
Prerequisite: For the one- and two-credit level, an audition is required (or portfolio of compositions for private composition); for the three-credit level, students must have eight credits on the major instrument and approval by the appropriate concentration audition committee. To earn one credit per semester, a student takes 14 half-hour private music lessons; to earn two or three credits per semester, a student takes 14 one-hour private lessons. The following amount of practice (or composing) is expected each day: one credit/50 minutes; two credits/one hour and 40 minutes; and three credits/two and one-half hours. As part of the repertoire requirement for two or three credits per semester, each student must attend a minimum of 12 performances/arts events each semester (six during the summer). The 12 performances must be distributed as follows: three student recitals (departmental, junior, senior, music education, or graduate), seven other musical events (including student recitals), and two dance or theater performances or art gallery visits. Students earning one credit per semester must attend six performances in a distribution similar to the one mentioned above.

Graduate Private Music Instruction
Prerequisite: Audition or portfolio of compositions for private composition. To earn two or three credits per semester, a student takes 14 one-hour private music lessons. The three-credit sequence is designed for students working toward the M.A. degree with a concentration in performance (single instrument), composition, or conducting.

Junior, Senior, and Graduate Recitals (1:0:0).
Corequisite: Concurrent enrollment in the appropriate three-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. Graduate 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.

Music Education Recital (0:0:0).
Prerequisite: A minimum of eight credits in private music instruction in the major instrument; corequisite: Concurrent enrollment in the appropriate two-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 Music Appreciation (3:3:0). Can be taken by music majors as a free elective only. Introduction to music appreciation through formal and aesthetic principles. Elements of music are examined separately and combined in various musical forms.
103 Folk and Traditional Music of the World (3:3:0). Can be taken by music majors as a free elective only. Study of musical structure and cultural setting of folk music among diverse peoples, with an introduction to traditional art music of India, China, and Japan. 

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). 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. 

231 Survey of World Music (3:3:0). Prerequisite: MUSI 215 or permission of instructor. Survey of music literature in the four major theoretical systems of the world. Emphasis on influences of non-Western systems on Western music. 

251 The Art of Teaching Music (3:3:0). Prerequisite: Admission to a music major or music 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. 

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. 

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. 

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 Literature in History I (3:3:0). Prerequisite: MUSI 116 or permission of instructor. Historical survey of music literature from Greek times through the period of Haydn and Mozart, with emphasis on specific musical genres and the composers who developed them. Instruction is conducted by means of lectures, recordings, and video. The learning process is enhanced by reading, writing, and analytical assignments. 

332 Music Literature in History II (3:3:0). Prerequisites: MUSI 215 and 331 or permission of instructor. Historical survey of music literature from Beethoven through the 20th century, with emphasis on specific musical genres and the composers who developed them. Instruction is conducted by means of lectures, recordings, and video. Learning process is enhanced by reading, listening, writing, and analytical assignments. 

351 Keyboard Pedagogy (3:3:0). Prerequisites: MUSI 114, 216, 273, and eight 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. ay

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. ay

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. ay

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, instrument selection, and reed adjustment. Three clock hours per week are spent studying oboe and bassoon. One clock hour per week is spent in Laboratory Ensemble. ay

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. ay

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. ay

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. ay

368 Class Voice (1:0:4). Prerequisite: Introduction 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. ay

371, 372 Techniques of Accompanying I, II (1:0:3). Prerequisite: Successful audition on a keyboard instrument for admission to a music degree program, four 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 Improvisation (1:0:2). Prerequisites: MUS/114, 216, and 273, or permission of instructor. Application of improvisational techniques used in various periods of music history on the student's major instrument.

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. fs

381 University Chorale (1:0:3). Prerequisite: Audition. Performance of works from the choral repertoire. Public concerts are given. Fs

382 Piano Ensemble (1:0:3). Prerequisite: Audition and four credits in private music instruction Piano. Study and performance of original four-hand works for one and two pianos. Public performances. fs

383 Symphonic Band (1:0:3). Prerequisite: Audition. Performance of works from the band repertoire. Public concerts are given. Fs

384 Symphonic Chorus (1:0:3). Prerequisite: Audition. Performance of major works from the choral repertoire. Public concerts are given. Fs

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. fs

387 Symphony Orchestra (1:0:3). Prerequisite: Audition. Performance of works from the symphony orchestra repertoire. Public concerts are given. Fs

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. Fs
390 Improvisation Ensemble (1:0:3). Prerequisite: Audition. Ensemble experience designed to promote exploration of new sound sources inherent in each instrument voice. Emphasis on group interaction and sensitivity to musical texture, timbre, and tonal resources through aural awareness. 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.

392 University Gospel Choir (1:0:3). Prerequisite: Audition. Provides practical experience in performance of gospel music. Participation in rehearsals, performances, and special presentations is expected. Public concerts are given.

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 of nine 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.

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.

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 the secondary public school music 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 Selected Topics in Music (1-3:1-3:0). Prerequisite: 90 credits in a music degree program or permission of instructor. Topics of practical interest to music majors in such areas as composition, music history and literature, and performance practices. May be repeated for credit.

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 nine 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 nine 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 subject not otherwise provided for in the curriculum.
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 degree 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 study 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.

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 1, 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 interests 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 rhythmics analysis as a guide to score interpretation in music of all periods. Maximum of six credits may be earned.
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 three-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 six 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 topically organized 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 Arts in Music. May be taken for a maximum of six 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 three-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.

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.
differences are covered using text, film, plays, social science research methods, and writing. Credit distribution: art (1), literature (3), and social sciences (4).

Division II Courses

Learning Communities: Special Topics (6-15:6-15:0).
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 6 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 in order 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 (3-15:3-15:0).
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 (3-15:3-15:0).
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.

Open to New Century College students who were admitted with a GPA of 3.300 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 Deans Honors Seminar (1:1:0).
Prerequisite: Students must have entered New Century College with a GPA of 3.300 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.

260 Myths in Religion and Paradigms in Science (3-15:3-15:0).
How do people determine what is real and what is an illusion? Course concentrates on how this is done by appeal to the religious myths or to the scientific models of reality that underlie the belief system of a community.

275, 375, 475 Special Topics (3-15:3-15:0).
Studies topics of special interest to undergraduates. May be repeated once for credit if subject is different.

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 tugs 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 nine 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.

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304 Social Movements and Community Activism (3-15:3-15:0). Explores community activism by looking at social movement case studies and engaging in direct social action. Students learn about grass roots movements, the rhetorical strategies used to attract group members, and how movements evolve into viable organizations and institutions.

305 Conflict Resolution and Transformation (3-15:3-15:0). 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). Formerly NCLC 203 Sustainable Alternatives. Students and faculty work together to model patterns of life that fit within the planets ecological means. Involves the study of "environomics," introductions to urban systems and planning, and studio work to actually create models of alternative growth.

307 Narrative of Nature (3-15:3-15:0) Course begins with the individuals 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 immigrations 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 (3-15:3-15:0). 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: Ecosystem Destruction in America (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, to understand where they might go to find information for developing options, and to 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 Deans 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 Deans Honors Seminar (1:1:0). Prerequisite: Students must have maintained an overall GPA of 3.300 or better 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.

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). Formerly NCLC 250. 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.
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337 Polities, the Arts, and History (3-15:3-15:0). 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.

349 The Internet: Literacy, HTML Tools, and Virtual Community (3-15:3-15:0). Explores the history and evolution of the Internet, the World Wide Web, and virtual communities. Basic and intermediate HTML scripting and web page design skills, including web-based multimedia, are developed through group projects and problem-solving scenarios.

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 comprise 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 Washington metropolitan area.

370 The Romantic Road: Literature and the Arts in the 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.

380 Alternative Therapies in Health and Illness: New Age Meets Hippocrates (3-15:3-15:0). 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, WWW home pages, art exhibits, and many film and video presentations provide the basis for in- and out-of-class activities.

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 Institutions Conservation and Research Center in Front Royal to study with nationally known experts.

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 (3-15:3-15:0). 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 non-profit.

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 7-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 Deans Honors Research/Thesis (3-3:0) Research related to an aspect of your specialization or BIS Project. Course will require analysis, quantitative interpretation, and a minimum 15 page thesis to be presented in written and oral form.

430 Historical Cemeteries (3-15:3-15:0). Explores monuments and historical sites. Students learn to survey, record, and analyze historical data.

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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 psycho-social 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.

491 The Senior Capstone Experience (1-15:1-15:0) Designed for students completing the final NCC portfolio and senior exposition. Information on issues related to professional development (i.e. interviewing skills, resume development, career strategies, and alumni opportunities) will be provided.

Division III Courses
Specialization. Designed by student and faculty mentor. Students have the flexibility to major in interdisciplinary studies or design their own major (B.A. or B.S.) with a specialization in a traditional discipline. 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.

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 (1-18:1-18:0).
Prerequisite: Sophomore standing and permission of instructor. Internship credit may be applied toward 12 credits required in experiential learning. 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 students academic 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.

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.

Nursing (NURS)

College of Nursing and Health Science

254 Introduction to Professional Nursing (3:3:0). Enrollment restricted to Saudi-U.S. University Project 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 Saudi-U.S. University Project 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.

318 Concepts of Health, Groups and Family (3:3:0). Enrollment restricted to Saudi-U.S. University Project students only. Prerequisite: NURS 262; corequisites: NURS 254, 319, 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 Saudi-U.S. University Project 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 Saudi-U.S. University Project 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 Saudi-U.S. University Project students only. Prerequisites: NURS 254, 262, 318, 319, 320, and 455; 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/HSCI 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 Pharmacology (3:3:0). Prerequisite: Successful completion of NURS 330, 331, 332, or 333, or permission of associate dean. Provides the student with the opportunity to study the actions and interactions of selected pharmacological agents, pharmacokinetics, pharmacotherapeutics, and nursing responsibilities related to drug administration.

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 asepsis 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 all 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 (6:0:0). 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.

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 Saudi-U.S. University Project 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 Saudi-U.S. University Project 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 Saudi-U.S. University Project students only. Prerequisites: NURS 254, 262, 318, 319, 320, 450, 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. fs

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, 426, 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. s

430 Community Health Theory (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, 426, and 455. Addresses community- and population-focused health care. Emphasis is on large group concepts. Principles of epidemiology, at-risk populations, and primary, 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). Co- or prerequisites: NURS 441 and NURS 451. 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. fs,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. fs

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. fs

442 Nursing as a Health Service III Seminar (1:1:0). Corequisite: NURS 441. Meets every other week for two hours. Examines nursing care related to acute and chronic illness with individuals, families, and large groups in the community and population-focused care with emphasis on health promotion and disease prevention, and on policy, ethical, and legal implications. fs

450 Health Assessment (3:2:2). Enrollment restricted to Saudi-U.S. University Project 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, 453. 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. fs

452 Nursing as a Health Service IV Seminar (1:1:0). Corequisite: NURS 451, 453. Meets every other week for two hours. Provides an opportunity for students to integrate complex nursing care with culturally diverse and vulnerable populations. fs

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 nursing and health science research in clinical practice.

455 Advanced Technologies in Nursing (1:0:2). 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 Saudi-U.S. University Project students only. Prerequisites: NURS 254, 262, 318, 319, 320, 419, 426, 430, 450, and 453; 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 Saudi-U.S. University Project 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 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.

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.

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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 in 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 Today's Society (3:3:0). Interdisciplinary lecture/discussion course examining the magnitude of the problem of violence globally and more specifically within the United States. Case studies, guest speakers, drama, and small group discussion augment the lecture/discussion format and 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 comparing the nature, process, and outcomes for baccalaureate and graduate students guided by the objectives.

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.

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.

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 Assessment and Management of Health Deviations (5:3:1). Corequisite: HCS 206. Students must be admitted to the nurse practitioner track. Common health deviations are analyzed in the physiologic and pathophysiologic aspects of systems functioning across the life span. Systematic assessment and management of health deviations foundational to clinical decision-making for nurse practitioners as advanced practice nurses in primary care are presented. 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.

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 which 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 RN First Assistant. This individually designed practicum is taken after completion of NURS 580 to give the experienced operating room nurse 120 hours of practicum experience as a surgical first assistant working under the supervision of a surgeon preceptor.

594 Special Topics in Nursing (3:3:0). Presents selected topics analyzing specialized areas in nursing. Content varies. Lecture, seminar, laboratory/workshop.

610 Curriculum Development (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 cross-cultural 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 Family Primary Care (3:2:1). Core course. Prerequisite or corequisite: NURS 735. Analyzes the scope of the nurse practitioner role in managing common family primary health care problems through advanced biopsychosocial assessment for health maintenance and promotion. Lecture, seminar.

625 Entrepreneurial Nursing Practice (3:3:0). Presents an overview of designs for independent practice and their conceptual frameworks. Problems inherent in pioneering a private nursing practice are delineated with opportunities to explore innovative approaches and alternatives for independent nursing practice.

640 Interpersonal Dimensions in Nursing (3:3:0). Examines interpersonal relationships in which nurses are involved in various aspects of nursing leadership and advanced professional practice. Relates theoretical foundations to the effective development of relationships within the framework of the nursing process.

650 Health Care and Law (3:3:0). Introduces students to the impact of courts and legislatures on rights and responsibilities of health care consumers and health care providers. Focuses on definitions of standards of care, legal theories of liability, and legally effective consent.

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 management as related to business plan development, program budget planning, and control.

657 Perspectives in Nursing Education (3:3:0). Prerequisite: Admission to the graduate nursing program or post-master's studies. Uses a seminar discussion approach to focus on philosophy and history of nursing education, principles of teaching and learning used in nursing, and current issues, trends, and research in nursing education.

658 Practicum and Seminar in Nursing Education (3-6:2:7). Prerequisites: Admission to the graduate nursing program or post-master's status; NURS 657, NURS 610, or EDCI 701. Uses a seminar/discussion approach and practicum experience to analyze the role and functions of the nurse educator. 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). Examination of 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.


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 but the total credit hours earned may not exceed three.

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 childrearing 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). Prerequisite or corequisite: NURS 623. Demonstration 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.

755 Theoretical Foundations Related to Nursing (3:3:0). Prerequisite: Admission to graduate nursing program. Examines assumptions, concepts, and propositions inherent in selected nursing and related discipline theories.
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759 Approaches to Data Analysis in Nursing Research (3:3:0). Prerequisite: Admission to the graduate nursing program. Examines univariate 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

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. f

765 Practicum in Nursing Administration I (3:1:8). Prerequisites: Admission to the graduate nursing program and NURS 775. 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. f

766 Administrative Strategies in Nursing (3:3:0). Prerequisite: NURS 763. Explores roles and functions of the nurse in management and develops patterns of nursing care, articulating nursing education, and nursing service. s

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. s

773 Advanced Clinical Nursing I (3:3:0). Prerequisite: Admission to the graduate nursing program. Prerequisites or corequisites: NURS 350 and 755. Presents foundational theory relevant to the practice of specialized advanced clinical nursing in a variety of health care settings. Focus is on nursing practice issues and concepts influencing care of adults and their families with existing or potential long-term health problems. f

775 Advanced Specialty Practice I (3:2:7). Prerequisites: Admission to the graduate nursing program and NURS 755. Prerequisite or corequisite: NURS 773. Gives the opportunity to apply the nursing process as it relates to the care of individuals and families with existing or potential long-term health problems in a selected clinical setting. Lab arranged. Students in the Medicare Bridge Program have concentrated clinical experience. f

776 Advanced Clinical Nursing II (3:3:0). Prerequisite: NURS 775. Expands selected content in long-term care as it relates to advanced clinical nursing practice. Collaboration with other health care providers in groups and communities is examined. Emphasis is on evaluation of nursing care and advanced standards of practice. s

778 Advanced Specialty Practice II (3:2:7). Prerequisites: NURS 773 and 775. Prerequisite or corequisite: NURS 776. Gives the opportunity to apply role of an advanced nurse clinician in a selected clinical setting. Lab arranged. Students in the Medicare Bridge Program have concentrated clinical experience. s

780 Practicum in Gerontological Primary Care Nursing I (3:0:3). Prerequisite: 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: 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).

790 Applications in Nursing Research (4:3:1). Prerequisites: Admission to the graduate nursing program and a graduate bivariate statistics course. Students apply principles and methods of research to nursing problem identification, design, data collection, and dissemination.

794 Organization of Nursing and Health Care Delivery Systems (3:3:0). Admission to graduate nursing program. Provides a foundational overview of U.S. nursing and health delivery systems. Surveys the key concepts, frameworks, processes, and structures related to health care delivery organizations. Lecture/discussion.

800 Qualitative Research Methods in Nursing and Health Care (3:3:0). Qualitative methods used in nursing and health care research will be examined 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). Consideration of structure and process of public health policy formulation, policy analysis, and research methods within the scholarship framework of discovery, implementation, 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. Examination of 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. Analysis and application of 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). Co- 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.  

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 960 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: NURS 993. 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.  

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.  

HCS 206 Clinical Decision Making (2:2:0). Corequisite: NURS 552. 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 nonpharmacologic therapies are discussed in conjunction with the theoretical basis for selecting specific therapies.  

Operations Research (OR)  

School of Information Technology and Engineering  

435 Discrete Systems Simulation Modeling (3:3:0). Prerequisites: A course in probability and statistics and a scientific programming language. An introduction to the basic concepts of modeling complex discrete systems by computer simulation. Topics include Monte-Carlo methods, discrete-event modeling, a specialized simulation language, and the statistics of input and output analysis.  

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 215, 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 (1-3:0:0). Prerequisite: 60 credits; must be arranged with an instructor and approved by the department chair before registration. Directed self-study of special topics of current interest in operations research. May be repeated for a maximum of six 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 six 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 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 STAT 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.

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 Large-scale decomposition methods are covered. 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 and 542 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 knowledge of a scientific programming language. 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, queueing and inventory systems, reliability theory, and stochastic networks. Emphasis is on applications in practice as well as analytical models.

647 Queueing Theory (3:3:0). Prerequisite: OR 542, STAT 544, or permission of instructor. A unified approach to queueing 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 size reorder type; inventory 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 six credits if the topics are substantially different.

651 Military Operations Research I: Cost Analysis (3:3:0). Corequisites: OR 541 or 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 OR 542. Examines the modeling underlying the procurement and development of military defense systems. This course stresses applications that are relevant to decision making in defense, where modeling is extremely important because wars occur rarely and have large uncertainties and complexities. Topics considered include target acquisition, engagement, and damage assessment; simulation of military systems; war gaming; cost effectiveness analysis; optimization modeling; homogeneous combat modeling; heterogeneous combat modeling; threat assessment and analysis of strategic stability issues.
671/SYST 671 Judgment and Choice Processing and Decision Making (3:3:0). Prerequisite: STAT 610 or STAT 554 or equivalent. A study of 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 554 or equivalent. 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.

677/STAT 677/SYST 677 Statistical Process Control (3:3:0). Prerequisite: STAT 610, STAT 554, or equivalent. 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.

680 Project Course in Operations Research, Systems Engineering and Computational Modeling (3:3:0). This course is designed to be the capstone course for both the Masters 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 Masters 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.

681/DESC 744 Controversial Issues in Decision Analysis (3:3:0). Prerequisite: OR 542 or DESC 611. 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.

682/CSI 700 Computational Methods in Engineering and Statistics (3:3:0). Prerequisite: MATH 203 and MATH 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.

683 Principles of Command, Control, Communication, and Intelligence, Part I (3:3:0). Prerequisites: STAT 544, 610. Fundamentals of C3I are developed from descriptive, theoretical, and quantitative perspectives. Topics include C3I process, quantitative models for combat, sensing, data fusion; individual and team decision making, organizational theory, tools for modeling C's systems, and evaluations of C3's systems.

684 Principles of Command, Control, Communication, and Intelligence, Part II (3:3:0). Prerequisite: SYST 680/ ECE 670 or equivalent. Technology required for C3 systems is developed. Technology areas include sensors, communications, and computer-based systems. The C3I required for mission areas such as strategic, theater, and tactical are developed and analyzed. Electronic warfare and counter-C3I is discussed.

741 Advanced Linear Programming (3:3:0). 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.

750 Advanced Topics in Operations Research (3:3:0). Prerequisites: OR 541 or 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.

Organizational Learning—See LRNG

Parks, Recreation, and Leisure Studies (PRLS)

Health, Fitness, and Recreation Resources


310 Program Design and Marketing in Health, Fitness, and Recreation Resources (3:3:0). Fundamental principles and techniques of the planning process for health, fitness, and recreation services programs. Specifying an area of need: goals, objectives, and a mission statement; generating solutions; and selecting a program design. Strategic marketing planning as a mechanism for identifying strengths and building programmatic strategies for the future.

315 Therapeutic Recreation for Selected Populations (3:3:0). Explores the role of leisure in human development with specific focus on the leisure needs, leisure demand, and leisure services for the aged and people with physical challenges. Basic concepts associated with leisure, aging, physical challenge, targeting leisure services, research, and public policy presented.

316 Outdoor Recreation and Education (3:3:0). Promotion of health and fitness via noncompetitive and informal outdoor recreation activities. Safety and comfort in outdoor pursuits. Sustainable use, conservation, and stewardship of outdoor recreation resources.
Prerequisite: PRLS 210 or permission of instructor. 
Explores theories of play and recreation behavior with emphasis on learning, effectance, and arousal theories. 
Empirical research evidence of antecedents to and consequences of play and recreation involvements, motivation for and satisfaction from play and recreation activity.

402 Human Behavior in Natural Environments (3:3:0). 
Prerequisites: PRLS 210 or permission of instructor and 60 credits. Application of social and behavioral theories to management of recreation users of land and water resources. 
Deterioration and pollution of land and water, noise, crowding, and conflicts among users are examined. Strategies for mitigation of deleterious impacts and deprecatory behaviors, as well as attitudes toward resource preservation, protection, and use are discussed.

405 Planning, Design, and Maintenance of Leisure Facilities (4:3:2). Prerequisites: PRLS 310 or permission of instructor and 60 credits. Quantity, location, and design standards for facilities. 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. Space relationships. Includes field study of local facilities.

Communications, organizational marketing, and evaluation research. Budgeting and finance.

415 Leisure, Wellness, and Special Populations (3:3:0). Prerequisite: 60 credits. Introduction to therapeutic recreation for HFRR students and interested students from other disciplines. 

450 Research Methods (3:3:0). Prerequisite: 60 credits. Development of empirical research designs for both practical and theoretical problems in health, fitness, and recreation resources management. Literature review of hypothesized relationships and formulation of research proposals.

460 Sport and Recreation Law (3:3:0). Prerequisite: 60 credits. Emphasis on safety, liability, risk, and insurance. 
Legal jurisdictions, apparatus, and decision making. Current issues for administrators of park, recreation, fitness, and school facilities and programs.

490 Internship (12:0:0). Paid or voluntary work experience in a park and recreation agency. Minimum period of 10 to 12 weeks of full-time employment. Application of 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. Graded Pass/Fail.

499 Independent Study (1-3:0:0). 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. Through case studies of recent court decisions, examines selected contemporary 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.

503 Legal Issues and Disabilities: Access and Accommodation in School and Recreation Settings (3:3:0). Provides an overview of several major law and policy issues related to provision of community recreation services to special populations. 
Primary focus is the Americans with Disabilities Act (ADA) and related federal legislation, such as Section 504 of the Rehabilitation Act and the Architectural Barriers Act. The ADAAA related federal legislation is defined through readily available information resources on the Internet, including judicial opinions, legislation, regulations, administrative education, and consent decrees.

526 Environmental Education and Resource Interpretation (3:3:0). Prerequisite: PRLS 402 or permission of instructor and 60 credits. 
Concepts and techniques for communication and dissemination of information pertaining to preservation and conservation, use of recreation resources. 
Design and implementation of programs to enhance understanding and appreciation of cultural, historical, and natural resources.

535 Evaluating Recreation Outcomes (3:3:0). Application of quantitative and qualitative research methods to the evaluation of programs provided to visitors and users of public lands for outdoor recreation; needs assessment; application of meaningful measures for formative and summative evaluations; and exceeding requirements of the Government Performance and Results Act.

National Forest Lands Management Courses

542 Foundations of Federal Land Management (1 credit). History of national land policy and nature of management activities on federal lands. Policies, trends, and management needs are examined. 
Intra- and interagency integration of land management programs. Course is available on the Internet (http://dlp.gmu.edu) without charge. Registration and payment is required for academic or agency credit.

Coordination and administration of special uses and integration with land and resource management plans. Includes agriculture, industry, community, aviation, water, treasure, and cultural uses.

644 Linear Uses and FERC Licenses on Federal Lands (3 credits). Legislation, regulation policies, and directives governing linear uses. FERC licensing of hydroelectric power generation and distribution. Rights-of-way for oil, gas, and electric transmission, railroads, communication, trams, conveyors, roads, and trails. FERC consultation, exemption, and licensing.

645 Valuation and Land Ownership Adjustment (5 credits). 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.

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646 Right-of-Way Acquisition (3 credits). Authorities and procedures for right-of-way acquisition from public agencies and private landowners. Planning coordination and project scheduling requirements. Steps in the acquisition process. Cooperative development and use of roads.

647 Land Status, Boundaries, Claims, and Withdrawals (3 credits). Land survey and status records system; programs for maintaining and managing boundaries; handling of claims and encroachments; the land status record system and Bureau of Land Management master title plat system.

648 American Indian Rights and Claims (3 credits). American Indian sovereignty, Alaska Native corporations, colonization; treaties, rights, and claims; cultural resources and Indian laws and consultation with tribal governments. The course is available on the Internet at http://dlp.gmu.edu.

Natural Resource Recreation Management Courses

531 Natural Resources Recreation Planning (3 credits). Origins and evolution of recreation use philosophy, policies, and service of public estate management. 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). Motivation of resource-based recreation participants. Visitors' expectations and perceptions with emphasis in implication for service quality, staff training, and other management responsibilities. Use and user conflicts and placement. Information and interpretive service. Human and other interpretive service resources.

560 Liability and Risk Management (3 credits). Facility and program design to prevent accidents and injuries and to minimize health hazards for visitors and employees. Liability and risk. Jurisdictions, legal apparatus, and decision making. Analysis of resource-based recreation case law.

635 Recreation Special Uses and Appeals (3 credits). Management of extensive and varied commercial and non-commercial demands on federal lands. Policies and procedures used by federal land managers. Implementation, effects, and problems of permit systems: appeal provisions.

Philosophy (PHIL)

Philosophy and Religious Studies

100 Introduction to Philosophy (3:3:0). Introduction to the nature of philosophical reasoning and to some of the main problems of philosophy.


111 Introduction to Social and Political Philosophy (3:3:0). Examination of philosophical foundations of some of the major concepts and institutions in social and political thought.

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.

173 Introduction to Logic (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). Course can count for literature as well as philosophy credit. Philosophic significance of psychiatry, existentialism, and Marxism and their expression in 20th-century literature in the stories of Mann, Kafka, Hesse, Camus, Sartre, Koestler, Bellow, and Pynchon. Themes include paradox, alienation, absurdism, narcissism, totalitarianism versus democracy, art and neurosis, sexuality, symbolism, freedom, and authenticity.

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.

300/EUST 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.

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-Marxian socialist theory and practice.

326 Contemporary Theories of Justice (3:3:0). Prerequisite: Three credits of philosophy or permission of instructor. Examination of alternative theories of justice, focusing on recent work by a major libertarian philosopher and recent work by a major egalitarian philosopher.

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. They open up a new philosophic horizon with the concept of the creative powers of the self, the intertwining of self and society, the subordination of truth to the will of the artist or the group, and madness as the terror of modernity.

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 overarching 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 (SOC1 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 calculus, 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 (3:0:0), (3:0:0). 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: 3 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 will lay the groundwork for reflection on specific issues such as abortion, euthanasia, capital punishment, divorce, child care, health care, etc.

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; 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: 90 credits or graduate standing, and three credits in philosophy plus a combined total of nine additional credits in philosophy and sciences, 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: 90 credits or graduate standing and minimum of three credits in philosophy or permission of instructor. 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 Current Issues in Philosophy of Psychology (3:3:0). Prerequisite: Combined total of at least 12 credits in philosophy or psychology, at least 3 of which must be in philosophy at the 300 level or above, or permission of instructor. Careful examination of some issue or issues of current interest to both philosophers and psychologists. 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.”
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**656 Happiness and the Quality of Life (3:3:0).** Prerequisite: Graduate standing or permission of instructor. Examination of the role of 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)

#### Health, Fitness, and Recreation Resources

**108 Weight Training and Body Conditioning (1:1:0)**

**118 Senior Lifesaving (1:1:0)**

**140 Golf (1:1:0)**

**150 Intermediate Swimming (1:1:0)**

**201 Developmental Motor Patterns (3:3:0).** Analysis of motor skill development and prescription of activities from immature to mature stages. Content areas include educational games, gymnastics, and dance.

**202 Teaching Skillful Movement (3:3:0).** Planning and presenting lessons on numerous motor skills using varied teaching strategies in a peer teaching setting.

**203 Teaching and Supervising (1:1:0).** Prerequisite: PHED 202. Required experiences in elementary (seven weeks) and secondary (seven weeks) school settings. Includes skill analysis and peer group teaching. Twenty-hour field experience required.

**210 Advanced Techniques of Physical Education (3:3:0).** Prerequisite: PHED 305. Includes study of skills in basketball, soccer, and other team sports and related activities. Includes skill analysis and peer group teaching. Twenty-hour field experience required.

**300 Kinesiology (3:3:0).** Prerequisites: BIOL 124 and 125 or permission of instructor. Anatomical and mechanical study of human movement.

**301 Professional Dimensions of Health, Recreation, and Physical Education (3:3:0).** Introduction to the professional practice of health, recreation, and physical education.

**304 Sport, Culture, and Society (3:3:0).** Prerequisite: PHED 303 or permission of instructor. Sport and fitness viewed from political, economic, and cultural perspectives.

**307 Motor Learning (3:3:0).** Prerequisite: Permission of instructor. Learning theory, processes, and conditions as they affect movement.

**308 Adapted Physical Education (3:3:0).** Prerequisites: At least 60 credits and BIOL 124. Introduces PHED majors to disabilities in public schools. Designed to provide theory, principles of normalization, integration, and mainstreaming. Assessment tools, IEP, and developmental activities are presented for students with challenges. Requires 30 hours of field experience.

**310 Prevention and Care of Athletic Injuries (3:3:0).** Prerequisites: BIOL 124 and 125. Preventive, rehabilitative, and medical management of athletic injuries.


**365 Measurement and Evaluation of Physical Fitness (3:3:0).** Selection, administration, evaluation, and construction of measurements and evaluation instruments and techniques in physical education; statistical analysis of data and survey of selected instruments.

**373 Individual Sports in Physical Education (3:3:0).** For physical education majors to improve their skills and knowledge through in-depth study of basic skill progressions and drills for teaching tennis, golf, and other individual sports. Includes skill analysis and peer group teaching. Twenty-hour field experience required.

**375 Team Sports in Physical Education (3:3:0).** For physical education majors to improve their skills and knowledge through in-depth study of basic skill progressions and drills for teaching basketball, soccer, and other team sports. Includes skill analysis and peer group teaching. Twenty-hour field experience required.

**383 Elementary School Instruction in Physical Education (3:3:0).** Prerequisites: PHED 201, 202, 372 and 373. Designed to provide theory and practice of teaching K-6 physical education. Requires 15 hours of field experience.

**384 Middle and High School Instruction in Physical Education (3:3:0).** Examination of school curriculum, assessment, content, and teaching practices for middle and high school physical education programs. Requires 15 hours of field experience.

**385 Social/Psychological Aspects of Health and Fitness (3:3:0).** Research, trends, and techniques in the study of health and fitness from a behavioral perspective.

**385 Student Teaching in Physical Education (15:0:0).** Prerequisite: Completion of all courses in the approved program; acceptance in student teaching. Supervised clinical experience of a full semester in approved Virginia schools. Required experiences in elementary (seven weeks) and secondary (seven weeks) school settings. Includes participation of one week in school preservice workshops and related activities and weekly seminar sessions.

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358 Physical Education (PHED) • Physics (PHYS)

441 Practicum in Athletic Training (1-3:0:0). Prerequisites: PHED 330 and permission of instructor. Application of techniques and procedures in the care and prevention of athletic injuries in a selected environment under certified 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. Supervised professional practice in a selected area of interest. Student may repeat this course, but no more than three 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. 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. Study of a problem area in physical education research, theory, or practice under the direction of faculty. May be repeated, but no more than three 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 will include two-dimensional motion, forces, conservation of energy, and momentum in the application to sports. Sports to be included are football, basketball, baseball, swimming, and tennis.

103, 104 Principles and Development of Modern Physics (4:3:3). PHYS 103 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.

106, 107 Physics for the Life Sciences (3:3:0), (3:3:0). Prerequisite: One year of college mathematics; PHYS 106 is prerequisite to 107. Topics include mechanics, properties of fluids and gases, sound, heat, electricity, light, the atom, the nucleus, and radiation. Basic principles of physics emphasizing applications to biological sciences.

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.


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 3.00 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.) Prerequisites: 60 credits or one year of college-level science and one semester of college-level mathematics, or permission of instructor. PHYS 243 is prerequisite to 245. 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, atomic and nuclear physics are discussed.

244, 246 College Physics Lab (1:0:2), (1:0:2). 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, thermal physics, and electricity.

261 University Physics II Laboratory (1:0:2). Corequisites: MATH 213 and PHYS 260. Experiments in mechanics, electricity, and magnetism.

262 University Physics III (3:3:0). (One hour recitation) Prerequisite: PHYS 350; corequisite MATH 214. Electromagnetism, optics, and modern physics.

263 University Physics III Laboratory (1:0:2). 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; Co-requisite: MATH 213. Motion of a particle in one, two, and three dimensions; systems of particles; non-inertial 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 semiconductor processing. 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 428 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. May not be included for credit by physics majors within the 45 credits of physics courses required for the B.S. degree.

402/PHYS 502 Introduction to Quantum Mechanics and Atomic Physics (3:3:0). Prerequisites: PHYS 303 and 361 or permission of instructor. Experimental basis of quantum mechanics; the wave function; systems in one, two, and three dimensions.

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, 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.

409 Physics Internship (3:0:0). Prerequisites: 75 credits, PHYS 303, 305, 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.

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. Seismological and gravitational theory and application to an understanding of the earth's interior. Geology requirement may be waived for physics and engineering students with sufficient background.

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-Euclidean 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 1 (3:3:0). Prerequisites: PHYS 303, 305 and FORTRAN or C++ programming. Study of the computational aspects of continuous media with emphasis on the application of various numerical algorithms and techniques for solution. Includes physical perspective, mathematical formulation, and computer solution of problems in physics and astrophysics concerning ideal and non-ideal fluids, waves in fluid media, shock formation, and magnetohydrodynamics. Some knowledge and experience in programming and PC operation desirable.

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/CHM 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.

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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 (1-6:0-6:0). Inservice 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. Introduction to basic physical and chemical processes that operate in the earth's atmosphere. Emphasis on concepts that provide a global description of the current atmospheric state and processes that relate to global change and atmospheric evolution.

Primary topics include equilibrium structure, radiative transfer models, thermodynamics of various atmospheric layers, and the various processes defining these atmospheric layers. Other topics include cloud formation, atmospheric dynamics, waves and turbulence, ozone photochemistry, solar-terrestrial relationships, the greenhouse effect, Gaia hypothesis, atmospheric circulation, modeling, predictability, and climatic change.

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, non-integral systems, rigid body dynamics, and normal modes of vibration.

711/CHEM 711/CSI 782 Statistical Mechanics (3:3:0). Formerly PHYS 511. 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, multipole, 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). Formerly PHYS 514. 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.

Psychology (PSYC)

100 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.

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 with faculty 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 100 (grade of C or better) 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.

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.

305 Memory and Cognition (4:3:2). Prerequisite: PSYC 300 (grade of C or better) or permission of instructor. Experimental methodology within the context of cognition, discrimination, concept formation, verbal learning, psycholinguistics, and memory.

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.

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.

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 some research techniques including interviewing, survey analysis, and process analysis.

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). Prerequisite: 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.

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362 Psychology (PSYC)

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 6 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 used toward the psychology major.

328 Psychology in the Community Laboratory (1:0:0). Prerequisite: Psychology major with a minimum of 6 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 used toward 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). Prerequisite: 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. Review 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 Psychological Perspective (3:3:0). Prerequisite: PSYC 230; prerequisite or corequisite: PSYC 320 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 instruction, 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: 18 credits of psychology including PSYC 305 (grade of C or better), a 2.5 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 specialized areas. Announced in advance.

465 History and Systems in Psychology (3:3:0). Prerequisite: 18 credits in psychology including PSYC 305 (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.

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. S (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, 305, and 490. Introduction to advanced statistics, research methodologies, statistics packages, computing and information technology, library technology, etc. 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). Prerequisites: Psychology major with 90 credits, an experimental psychology lab course, 3.0 GPA in psychology, PSYC 460, permission of instructor, and prior approval of thesis proposal. Directed research on a topic agreed upon 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.

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 (4:3:3). Prerequisite: Completion of 60 credits including PSYC 372, or BIOL 213 and 303. Functional anatomy of the brains of mammals, with emphasis on human neuroanatomy. Introductory lectures on cellular, developmental, evolutionary, and physiological neurobiology are followed by regional and systems neuroanatomy. Anatomy is correlated with material from clinical neurology where possible.


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 equivalent. Overview of the biological effects of substances of 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.

561 Behavioral Biology of Substance Abuse (3:3:0). Prerequisite: PSYC 372 or equivalent. Overview of the biological effects of substances of 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 MA students in psychology. Independent reading or research on a topic agreed upon by student and faculty member. May be repeated for a total of no more than 6 credits. A maximum of 9 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.

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.

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, utilizing 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 Developmental Psychology (3:3:0). Prerequisites: PSYC 611-612 and six credits of graduate developmental psychology. Examines techniques for measuring developmental change across the life-span.

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). Prerequisites: PSYCH 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: PSYC 300. Social 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 by 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.

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.
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<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Prerequisites/Notes</th>
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<tbody>
<tr>
<td>709</td>
<td>The Measurement of Intelligence (4:3:2)</td>
<td>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 adult intelligence tests, with emphasis on individual tests. Development of IQ tests; theories of intelligence; and current trends and developments in intellectual assessment.</td>
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<tr>
<td>710</td>
<td>Psychological Assessment (4:3:2)</td>
<td>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.</td>
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<tr>
<td>722</td>
<td>Advanced Child Assessment (4:3:2)</td>
<td>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 diagnostic assessment of children with various handicapping conditions such as brain dysfunction, learning disabilities, retardation, and emotional disturbances.</td>
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<tr>
<td>730</td>
<td>Practicum in Applied Psychology (1-6:0:0)</td>
<td>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. Ph.D. students may repeat this course for a maximum of 15 credits; M.A. students for a maximum of 6 credits. Course is graded S, NC.</td>
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<tr>
<td>731</td>
<td>Motor Skills and Human Performance (3:3:0)</td>
<td>Prerequisite: PSYC 530, graduate experimental course in psychology, or PSYC 701. Seminar in motor skills and human performance focusing on issues and topics of interest to human factors students (e.g., feedback, motor programs, tracking, discrete and sequential movements, etc.).</td>
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<tr>
<td>732</td>
<td>Attention and Performance (3:3:0)</td>
<td>Prerequisite: PSYC 530, graduate experimental course in psychology, or PSYC 701. Human factors seminar focusing on theories, concepts, issues, methods, techniques, and research in the area of attention and performance.</td>
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<tr>
<td>733</td>
<td>Issues in Personnel Psychology (3:3:0)</td>
<td>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.</td>
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<tr>
<td>734</td>
<td>Seminar in Human Factors and Applied Cognition (3:3:0)</td>
<td>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.</td>
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<tr>
<td>735</td>
<td>Psychological Perspectives on Organizational Development (3:3:0)</td>
<td>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 fieldwork.</td>
</tr>
<tr>
<td>736</td>
<td>Research in Human Performance Assessment (3:3:0)</td>
<td>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.</td>
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<tr>
<td>737</td>
<td>Psychology of Human-Technology Interaction (3:3:0)</td>
<td>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.</td>
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<tr>
<td>738</td>
<td>Simulation and Training (3:3:0)</td>
<td>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.</td>
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<tr>
<td>739</td>
<td>Seminar in Industrial/Organizational Psychology (3:3:0)</td>
<td>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.</td>
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<tr>
<td>741</td>
<td>Psychology of Work Motivation (3:3:0)</td>
<td>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.</td>
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<tr>
<td>750</td>
<td>School Psychology Practicum (1-6:0:0)</td>
<td>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.</td>
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<tr>
<td>754</td>
<td>Quantitative Methods III: Psychological Applications of Regression Techniques (3:3:0)</td>
<td>Prerequisites: PSYC 611 and 612. Psychological applications of regression techniques are reviewed in a variety of contexts including experimental, field, and survey settings.</td>
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<tr>
<td>755</td>
<td>Statistical Packages for Psychology (3:3:0)</td>
<td>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.</td>
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<tr>
<td>756</td>
<td>Quantitative Methods IV: Multivariate Techniques in Psychology (3:3:0)</td>
<td>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.</td>
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</table>
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 666 and 669 or permission of instructor. Examines how developmental theory, knowledge base, and methodology can be used to promote the health and welfare of individuals across the life-span. Topics include research in natural contexts, developmental assessment, and design and evaluation of developmental interventions.

786 Assessment and Treatment in Gerontology (3:3:0). Prerequisites: 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 three credits according to placement. Students enrolled in PSYC 799 are not required to complete the practical research project.

792 Practicum in Developmental and Physiological Psychology (1-6:1:0). Prerequisites: Three credits of graduate developmental or physiological psychology. Open to degree students in developmental or physiological M.A./Ph.D. programs. Interested students must apply to the area coordinator 60 days before registration. Provides supervised experience in developmental or physiological settings, either within or outside the university.

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 6 credits of 798 and 799 may be applied to the master's degree. A minimum of 9 credits of 798, 799, 597 or 792 may be applied toward the master's degree.

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.

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 Behavior 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 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 and family functioning as well as current approaches to group and family psychotherapy. In addition to formal course work, students engage in experiential group exercises.

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 practica focus on community mental health theory, consultation, prevention, program planning and evaluation, and human service management.

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/interactional 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 (3:0:0). 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. Course is graded S-NC. May be repeated for credit.

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.

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.

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 coactors 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 placed on the board/executive relationship and the value of establishing and maintaining a nonprofit organization's reputation.

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 to 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 relationship 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). Prerequisite: Graduate standing or permission of instructor. 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.
368 Public Administration (PUAD)

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 Administration in the Commonwealth of Virginia (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.

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.

670 Personnel Administration in the Public Sector (3:3:0). Prerequisite: PUAD 502. Public and private personnel management and the historical development of the civil service. Emphasis is on processes involved in selection and management of personnel in public organizations. Selected problems and their impact on public personnel systems are 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.

681 The Community, Media Relations, and Fund Raising (3-1:3:0). The interface between the nonprofit organization and the community is critical to the organization's success. Focuses on marketing and communications issues as they apply to the nonprofit's identification of its market, ability to raise money, and reputation and image within the community. Crisis management, public writing and speaking, building of positive relationships with the media, and development of external funding sources are discussed.

700 Ethics and Public Administration (3:3:0). To be taken in the final two semesters of the M.P.A. program. 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 inequalities among nations and regions.

702 Nonprofit Law, Governance, and Ethics (1-3:3:0). Overview of 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.

720 Performance Evaluation for Managers (1-3:3:0). 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.

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). Prerequisite: PUAD 502 and 9 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). Prerequisite: 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). Prerequisite: 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). Prerequisite: 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 Changing Patterns of Governance (3:3:0). Prerequisite: PUAD 502 and nine graduate credits. Examination of broad trends in governance, including both the theory and practice of various governance choices. These 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). Prerequisite: 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.

794 Internship (1-6:0:0). Prerequisite: 21 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 (1-3:3:0). Prerequisites: 21 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.

804 Conduct of Social Inquiry I: Research Design (3:3:0). Assumptions and logic of different research designs and data collection techniques and research as an exercise in theory building. Designed to enable candidates to do original research and to critique the research of others.


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.

824 Models of Policy Design and Implementation (3:3:0). Prerequisite: Permission of instructor or advisor. Approaches to the analysis of public policy, including the role of values in policy analysis, assumptions in modeling policy problems, the organizational context of policy studies, and institutions for designing and implementing policies.

825 Doctoral Seminar: Current Issues in Public Management (3:3:0). Prerequisite: Permission of instructor and advisor. Major issues confronting public management, such as restructuring organizations, strategic management, leadership, and performance reviews. Analysis of current proposals for reform of public management.

840/PUBP 840 Research Seminar in Policy Governance I (2:2:0) to (4:3:1) (variable credit). Prerequisite: Admission into Ph.D. Public Policy program. 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 (2:2:0) to (4:3:1). This course is the second of a two-semester sequence (PUBP 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)

The Institute of Public Policy

550 Topics in Public Policy (1-3:3:0). Selected topics in public policy not covered in fixed-content public policy courses.

601 Theory and Practice of Regional Economic Development (3:3:0). A focus 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). An introduction to the role of technology in economic development policy and practice. Examination of the processes of technological development and change in enterprises and collaboration among industry, government, and academic institutions through case studies.

701 Analysis for Public Decision Making (3:3:0). Prerequisite: Proficiency in advanced statistical and quantitative methodology. Includes cost/benefit and cost/effectiveness analysis, as well as constrained optimization.

702 Advanced Statistical Methods in Policy Research (3:3:0). Prerequisite: Proficiency in advanced statistical and quantitative methodology. An introduction to some of the most popular quantitative approaches to management with a focus on economic analysis and decision making. Examination of the principles and applications of several quantitative techniques, noting especially the opportunities for their use in public policy analysis.

703 Multivariate Data Analysis in Public Policy (3:3:0). Prerequisite: Proficiency in advanced statistical and quantitative methodology. Explores multivariate techniques of contingency table analysis, reliability and validity assessment, factor analysis and scaling, multivariate regression and analysis, and the analysis of variance and covariance. Emphasis is on applying multivariate techniques to real social science databases using sophisticated statistical packages.

704 Managerial Economics and Policy Analysis (3:3:0). Prerequisite: Proficiency in advanced statistical and quantitative methodology. A focus on the application of microeconomics theory in analyzing public policy issues. The course is intended to provide the student with the capability to understand economic literature and theories.

705 Rational Choice and Uncertainty: Modeling Judgment (3:3:0). An introduction to the basics of decision analysis. Examination of quantitative modeling of judgment to aid evaluation of perplexing or controversial options involving conflicting objectives or uncertain outcomes. The course includes assessing uncertainty about events and quantities, directly and indirectly; changing uncertainty in the light of new evidence; gathering information before making a decision; and combining alternative ways of making the same judgment. Application to public policy, personal, legal, medical, and other decisions.

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.

710 Topics in Public Management and Policy (1-3:3:0). Taught workshop style. Most class meetings involve an initial presentation by the professors or visiting speakers, followed by a one-hour forum exploring the implications of the presentation for leadership in contemporary society. Presentations range from disciplinary perspectives on leadership to the examination of different leadership styles. The workshop explores diverse aspects of leadership, especially as it applies to regional economic development. The course is highly interactive and involves regular participation by several faculty and students.

740 Topics in Public Policy: Science and Technology (1-3:3:0). Selected topics in public policy not covered by fixed-content public policy courses. Selected topics relate to science and technology.

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.
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.

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, water-fronts, and surplus military bases.

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.

800 Culture and Policy (2:2:0 to 4:3:1). A focus on the comparative analysis of the United States and Canada. The course seeks to illustrate the value of comparative analysis in the social sciences, of looking at the way two cultures, societies, and polities deal with the same needs and institutions. These two nations are highly similar, a fact that facilitates isolating the factors responsible for differences between them. A discussion seminar and a laboratory are required in the four-credit version of this course.

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 macro environment 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 of 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. A course also discusses professional practice issues.

805 Public Policy Systems and Theory (1-4:3:0). 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.

808 Education Policy: Process, Context, and Politics (3:3:0). Prerequisite: Advanced graduate standing in education or public policy. Explores the emerging field of education policy and politics and the extricable nature of policy and policy and politics in education through study of policy as process at the local, state, and federal arenas. Its primary focus is upon policy questions of compulsory schooling, curriculum and testing, governance, and finance, as well as value tensions of quality, efficiency, equity, and choice.

810 Theory and Methods in Regional Policy I (2:2:0 to 4:3:1). An introduction and a critique of 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. Development of research papers that investigate some element or aspect of regional policy. In this seminar, students identify and develop topics 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.

814 International Trade Policy (2:2:0 to 4:3:1). A focus on institutions of international trade management, and the trade management choices facing the United States. After reviewing international trade theories, the course explores some recent writing on these institutions and choices. Then, students become involved in individual research into international economic issues, sharing methodologies and funding, and developing conclusions with the class. The four-credit version of this course requires a discussion section and a research laboratory.

817 Policy Research Topics: Transportation Policy (2:2:0 to 4:3:1). A research workshop examining the development of policy research and relevant methodologies linked directly to faculty and student interest. The course identifies cutting-edge policy concerns, and executes 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. Literature relevant to science and technology policy is covered. 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. A research laboratory and special colloquia attendance are required of the four-credit version of this course.
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. In this seminar, 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. Discussion meetings, a research laboratory, and colloquium attendance are required of the four-credit version of this course.

833 Topics in Public Policy (1-4:3:0). 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). A survey of the major institutions that formulate and implement public policy in the United States. The seminar examines linkages between 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. The division of responsibilities among the several levels of government and between the public and private sectors is studied. The seminar focuses upon 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. The seminar features a variety of speakers from universities, government, and nonprofit sectors. 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). An introduction to 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). An emphasis on 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). 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 organizations; shaping of 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. An introduction to the modern vertically and horizontally integrated organization. Focus is on the modern managerial policy aspects of creating, integrating, and managing modern information technology-enabled public and private sector organizations.

998 Research/Proposal for Dissertation (1-9:0:0). 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). 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

500 See EDUC 500.

559 Teaching Developmental Reading in the Elementary School (3:3:0). Advanced course in the study of foundations of reading. Examines principles, techniques, and materials for developmental reading programs.

597 See EDUC 597.

611 Remedial Reading (3:3:0). Prerequisite: EDRD 559 or 614. Includes nature and causes of reading difficulties, organization of remedial reading programs, use of remedial techniques, teacher aids and learning centers, psychological and health services, and innovative methods and materials.

613 Diagnostic and Evaluative Techniques in Reading (3:3:0). Prerequisites: Admission to graduate program in reading, EDRD 611, and permission of advisor. Presents historical review of assessment of reading problems. Procedures in testing, scoring, and evaluating standardized and informal tests, individual and group tests, alternative assessment, and techniques of reporting test results are studied.

614 Teaching Reading in the Secondary School (3:3:0). Emphasizes reading-writing in content areas; reading problems: causes, classroom diagnosis, 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, a review and analysis of management techniques, and the development of skills necessary to implement reading programs.
790 Practicum in Reading (3-6:0:0). Prerequisites: Completion of the graduate program in reading, except for practicum, or enrollment in the final semester of the program; and permission of advisor. Provides supervised practice in the Educational Study Center working with individuals and small groups using a variety of reading techniques. Participation in scheduled group sessions is required.

797 See EDUC 797.

Religious Studies (RELI)

Philosophy and Religious Studies

100 The Human Religious Experience (3:3:0). Examination of the primary forms of expression that belong to religion and of the nature and functions of religion. Topics considered may include the idea of ultimate reality; religious interpretations of nature; the person and the need for salvation; symbol, parable, and myth; magic and ritual; functions of religion in society; and mystical experience. Addresses the general question of the nature of religion and considers modern as well as classical interpretations of religious ideas. May not be taken by students who have taken RELI 132.


231 Religion in America (3:3:0). Religious heritage in American culture; growth of denominations and sects; and interrelationship of religion and sociopolitical life.


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. 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.

352 Judaism between the Old and New Testaments (3:3:0). Prerequisite: Three credits of RELI 251 or 252, or permission of instructor. Survey of Jewish religion, culture, and history in the period between the Old and New Testaments. Developments in Intertestamental Judaism crucial to the formation of later Judaism and Christianity are examined.

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.

370 Judaism: Life and Thought (3:3:0). Prerequisite: RELI 211 or RELI 251, or permission of instructor. Study of Judaism from biblical times to contemporary American developments, with a focus on medieval and modern Judaic life and thought.

371 History of Western Christian Thought I: Classical and Medieval (3:3:0). Prerequisite: Three credits in religious studies or philosophy or permission of instructor. Development of Christian doctrine from the close of the New Testament period to the Reformation. Relationship between Greek, Roman, and Medieval philosophy and the theological expressions of belief.

372 History of Western Christian Thought II: Modern (3:3:0). Prerequisite: Three credits in religious studies or philosophy or permission of instructor. Development of Christian doctrine from Reformation to present. Effects of scientific empiricism, existentialism, and linguistic analysis on Protestant and Catholic theology.

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374 Islamic Thought (3:3:0). Prerequisite: RELI 211, 60 credits, or permission of instructor. Major components of Islamic thought and its role in regulating the various aspects of social life in the Muslim world. Emphasis on religious foundation of Islamic society and culture.

376, 377 Special Topics in Religious Thought (3:3:0), (3:3:0). Prerequisite: Three credits in philosophy or religious studies or permission of instructor. Selected topics from a philosophical perspective.

420, 421, 422, 423 Seminar (3:3:0). Prerequisite: Limited to students in the religious studies track of the philosophy major; 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: Limited to students in the religious studies track majors with 60 credits and 15 credits of religious studies and permission of department.

490 Comparative Study of Religions (3:3:0). Prerequisite: Nine credits in religious studies including RELI 211 and 212, or permission of instructor. Cross-cultural examination of the comparative aspects of religious phenomena. Examines the significance of religious phenomena from diverse religious and cultural perspectives, and investigates patterns of religious phenomena that have appeared in world cultures and civilizations.

591 Current Issues in Religious Studies (3:3:0). Special topics in religious studies that are of central interest in that field and of interdisciplinary interest as well. Topics are selected according to their current importance in the field 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 Soviet 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. 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. May be taken toward fulfillment of the non-Western culture requirement for the B.A. degree.
354 Contemporary Post-Soviet Life (3:3:0). Prerequisite: 60 credits or permission of instructor. Social life, art, economics, education, view of life, and personal aspirations of the Russian citizen today. Course work in English. May be taken toward fulfillment of the non-Western culture requirement for the B.A. degree.

380, 381 Advanced Russian I, II (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 of representative works of the major poets. Reading 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 repeated 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.

Social Work (SOCW)
New Century College

300 Introduction to Social Work (3:3:0). Course introduces students to the historical roots of the social work profession and social welfare. The social systems perspective is discussed as the framework for social work knowledge, values, and skills, and an understanding of professional values, ethics, the fields of practice, and settings of social work. The profession's commitment to the disadvantaged, social justice, diversity, and discriminated and oppressed populations is included as course content. Presentations by social work professionals, including alumni, from different fields of practice will supplement classroom discussion.

301 Laboratory in Interpersonal Communication (3:3:0). Prerequisites: SOC! 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, and attitudes to increase their ability to understand and help clients. Field service of at least 60 credits required.

323 Human Behavior in the Social Environment I (3:3:0). Prerequisites: SOC! 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.

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.

351 Social Policy and Social Justice I (3:3:0). Prerequisites: SOC! 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.

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.

357 Methods of Social Work Intervention I (3:3:0). Open to majors only. Prerequisites: SOC! 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.
358 Methods of Social Work Intervention II (3:3:0). Open to majors only. Prerequisites: SOCW 301 and 357, with a minimum grade of C in both courses; or permission of instructor; corequisite: SOCW 359. Continues a generic problem-solving model, focusing on group and macrointervention systems, settings, and skills. Emphasis on working with groups from treatment to task purposes. 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 credits required.

359 Junior Seminar (1:1:0). Prerequisite: 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 the human services professions. Topics include responsibility, competence, duty to warn, confidentiality, professional relationships, and research. Clinical strategies relevant to legal and ethical issues 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.

423 Social Work with Adolescents (3:3:0). Prerequisite: 60 credits or permission of instructor. Major needs of adolescents with their 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. Studies 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. Designed for senior social work students with an interest in pursuing community organization as a professional career specialty. Students are provided with a basic understanding of community organization and planning, with special emphasis on conducting a needs assessment in the community. Students examine the environmental context in which administrative and community practice occurs. The role of social workers as planners and agents of social change is explored.

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.

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 intrinsically involved with service delivery to aged persons. Students examine the forces that impinge upon 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.

453 Senior Practicum I (5:0:0). Prerequisites: SOCW 300, 301, 323, 324, 351, 352, 357, 358, and 359 with a grade of at least C and recommendation of faculty. Open only to social work majors. Under supervisory instruction provided by field agencies, students are involved two days per week in learning through participation in the provision of service to individual clients, families, groups and/or communities, and in activities sponsored by or involving professional social workers. Weekly seminar and periodic faculty-agency consultations.

454 Senior Practicum II (5:0:0). Prerequisites: SOCW 453, with a grade of at least C and recommendation of faculty. Field experience and weekly seminar.

455 Senior Practicum/Block Placement (10:0:0). Prerequisites: SOCW 300, 301, 323, 324, 351, 352, 357, 358, and 471; completion of all required social work courses except electives; social work major with 90 credits; GPA of 3.50 (in social work); and recommendation of the faculty and director of field instruction. Under supervisory instruction provided by field agencies, students are involved four days per week in learning through participation in the provision of service to individual clients, families, groups, and/or communities, and in activities sponsored by or involving professional social workers. Weekly seminar or individual meetings with faculty liaison, and periodic faculty-agency visits.

471 Research in Social Work (3:3:0). Prerequisites: SOCI 313 or PSYC 300; six credits of social work courses; senior standing; 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. Taken simultaneously with SOCW 453 or 454 (Senior Practicum). Opportunity to examine critically personal use of different approaches to social work intervention currently employed in practice settings. Students have an opportunity to use with clients the technical skills these approaches require. May be taken more than once for credit. Topics vary.

499 Independent Study in Social Work (1-3:0:0). Prerequisites: 90 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 assessing family support programs. Particular emphasis will be placed on vulnerable and at-risk populations.

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 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.

Sociology (SOCI)

Sociology and Anthropology

101 Introductory Sociology (3:3:0). Introduction to basic sociological concepts. Aspects of human behavior; individual and group interaction; social mobility and stratification; status and class; race relations; urbanism; crime and criminality; and social change and reform are covered.

300 Social Control (3:3:0). Prerequisite: SOC/101 or permission of instructor. 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: SOC/101 or permission of instructor. 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: SOC/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: SOC/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 SOC/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 SOC/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: SOC/101 or permission of instructor. Study of the dynamics of living together within the context of marriage and the family in contemporary America. Social systems approach provides the analytical model for the study.

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, of the meaning and control of deviance, and of the major theoretical approaches to deviance.

311 Classical Sociological Theory (3:3:0). Prerequisite: Nine credits of sociology including SOC/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: SOC/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.

325 Sociology of War and Conflict (3:3:0). Prerequisite: Six credits of sociology or permission of instructor. Study and analysis of war as a sociopolitical phenomenon in our society and in other societies. Total war and other conflict alternatives such as limited war, nonnuclear war, subversion and sabotage, terrorism, and guerrilla war are primary units of analysis.

326 Military Sociology (3:3:0). Prerequisite: Six 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: Six 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.

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, their inter-relationships 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 and 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). 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. Open to sociology majors only.

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 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.

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). Prerequisite: 12 credits of sociology including SOCI 303 and 313, or permission of instructor. Survey of research methods and techniques used in collecting and analyzing social data and techniques and methods of measuring social attitudes and opinions.

412 Contemporary Sociological Theory (3:3:0). Prerequisite: Six credits of sociology including SOCI 101 and 311, or permission of instructor. Contemporary sociological theorists such as Parsons, Merton, Mills, Berger, and Gouldner 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.

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 to 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 Fieldwork in Social Change (3:3:0). Prerequisite: Six credits of sociology or permission of instructor. In-depth investigation of planned social change through fieldwork 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 U.S.'s and the worlds 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, uninservice 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 a legal and 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), (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.

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.

495 Sociocultural Change (3:3:0). Prerequisite: 60 credits or permission of instructor. Sources, processes, and consequences of social and cultural change. Anthropological and sociological models for case analysis of social movements, culture contact and borrowing, innovation-adoption, and planned change.

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 stress 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). Prerequisite: 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 will 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 ethnic groups in the United States; racial and ethnic groups as human-social-minority groups. Factors making for minority status including personality factors, group cultural factors; reactions of racial and ethnic minorities to minority status; programs, methods, social movements, and philosophies seeking to change minority group status.

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.

599 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.
604 Sociology of Occupations and Professions (3:3:0).
Prerequisite: Graduate standing or permission of instructor.
Theories of occupations and professions. Issues include educational patterns and social mobility, occupational status and prestige, importance of the work setting, work satisfaction and alienation, and impact of the professions on society.

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.

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.

620 Design of Social Research (3:3:0). Prerequisite: Graduate standing and undergraduate statistics and research methodology, or permission of instructor. Introduction to advanced strategies of research used in the area of social policy analysis, including sample design, theory and techniques of measurement, questionnaire design, and data collection. Includes an introduction to various types of social research: survey, participant observation, case study, and evaluation research.

621 GEOG 621 Human Ecology and the City (3:3:0).
Prerequisite: Graduate standing or permission of instructor. Introduction to urban ecology. Origin and development of various types of cities, shape and structure of urban areas, inner and outer city, and spatial patterning of urban institutions.

622 Metropolitan and Regional Development (3:3:0).
Prerequisite: Graduate standing or permission of instructor. Process of social development in the context of metropolitan and regional social change. Social development is considered in the light of economic, political, demographic, and human resource dimensions.

623 The Suburban Community (3:3:0). Prerequisite: Graduate standing or permission of instructor. Systematic sociological study of the suburb: (a) its evolution and development (demographic and geographic); (b) its varied types; (c) its relation to the inner city; (d) as part of the metropolitan area and megalopolis; (e) its structure as a community including its formal and informal social groupings, organization and voluntary associations, family and social institutions, social stratification, and social mobility; and (f) social change.

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 non-experimental data. Range of topics will include logic of casual 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: PSYC 300 or SOCI 313, or equivalent. Introduction to the theory, method, and practice of survey research design and analysis. Students complete a survey research project.

Prerequisite: SOCI 620, SOCI 630, 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.

633 Special Topics in Sociology (3:3:0). Prerequisite: Graduate standing or permission of instructor.

634 Qualitative Research Methods (3:3:0). Prerequisite: Graduate standing or permission of instructor. Examination of basic research methods involving observational techniques and procedures used in description and analysis of the patterns, configurations, ethos, eidos, structures, functions, and styles typical of whole societies and cultures. Emphasis is on case studies, unobtrusive methods, participant observation, long-term residence, choices of observer status role, recording data, uses of technical equipment, key informants, interviewing techniques, and ethical considerations in employing such methods and procedures.

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 impacting 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 nonprofit 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, primary 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.

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.

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 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).

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.

Software Engineering (SWSE)

Information and Software Engineering

619 Software Construction (3:3:0). Prerequisite: SWSE foundation courses or equivalent. An in-depth study of software construction using a modern language. Concepts such as information hiding, data abstraction, concurrency, and object-oriented software construction are discussed.

620 Software Requirements and Prototyping (3:3:0). Prerequisite: SWSE foundation courses or equivalent. An in-depth study of software requirements, notations, and specification techniques for the analysis and specification of software requirements. Students participate in a group project on software requirements.

621 Software Design (3:3:0). Prerequisite: SWSE 619, or CS 540 and 571, 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, with examples of their use. Students participate in a group software design project.

623 Formal Methods and Models in Software Engineering (3:3:0). Prerequisite: SWSE 619, or CS 540 and 571, or permission of instructor. Formal mechanisms for specifying, validating, and verifying software systems. Topics include program verification through Hoare’s method and Dijkstra’s weakest preconditions; formal specifications, including initial specification and refinement toward 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.

625 Software Project Management (3:3:0). Prerequisites: SWSE foundation courses or equivalent. Life-cycle 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: SWSE 619, or CS 540 and 571; SWSE 620, 621, 623, and 625; or permission of instructor. Students analyze, design, implement, and manage a software project system. Students work in teams to develop or modify a software product, applying sound principles of software systems engineering. Both industrial and academic standards are used to assess the quality of the work products.

630 Software Engineering Economics (3:3:0). Prerequisite: SWSE 625. Quantitative models of the software life cycle; cost-effectiveness analysis in software engineering; multiple-goal decision analysis; uncertainty and risk analysis; software cost estimation; software engineering metrics; and quantitative life-cycle management techniques.
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631 Object-Oriented Software Development (3:3:0). See CS 631.

632 User Interface Design and Development (3:3:0). Prerequisite: SWSE 619, or CS 540 and 571, or permission of instructor. Principles of user interface design, development, and programming. Topics include user psychology and cognitive science, adaptive user interfaces, icon and window design, command language design, user guidance systems, and collaborative working.

637 Software Testing and Quality Assurance (3:3:0). Prerequisite: SWSE 619, or CS 540 and CS 571, 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.

699 Special Topics in Software Systems Engineering (3:3:0). Prerequisite: Permission of instructor. Special topics not occurring in the regular SWSE sequence. May be repeated for credit when the topic is different.


720 Advanced Software Requirements (3:3:0). Prerequisites: SWSE 620 and 621. State of the art and state of the practice in software requirements engineering. The course gives in-depth coverage of selected methods, tools, notations, or validation techniques for analysis and specification of software requirements. The course work includes a project investigating or applying approaches to requirements engineering.

721 Advanced Software Design Methods (3:3:0). Prerequisites: SWSE 620 and 621. A study of advanced design methods for large-scale software systems, including concurrent, real-time, and distributed systems. Course work includes a project investigating or applying software design methods.

735 Concurrent (3:3:0). See CS 735.

763 Software Engineering Experimentation (3:3:0). Prerequisites: SWSE 621 and STAT 610 (or equivalent), 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.

796 Directed Readings in Software Systems Engineering (3:3:0). Prerequisite: Permission of instructor. An analysis and investigation of a contemporary problem in software engineering. Prior approval is required by a faculty member who supervises the student's work. A written report is also required. A maximum of six hours may be earned.

799 Thesis (6:0:0). Prerequisite: Permission of advisor. A research project completed under the supervision of a faculty member, which results in a technical report accepted by a three-member faculty committee. The report must be defended in an oral presentation.

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 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 105. 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.

300 Reading Skills Development (3:3:0). Prerequisite: SPAN 202, 209, appropriate placement score, or permission of instructor. Students are guided to discover and explore different ways in which a reader can create sense out of a text. Readings include selections from newspapers and magazines, mystery novels, contemporary literary works, and others.

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.

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 either in 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
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modern Latin America. Course work in English. Credit may be earned either in 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.

351 Spanish Conversation (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.

352 Spanish Composition (3:3:0). Prerequisite: SPAN 202, 209, appropriate placement score, or permission of instructor. Development of ability in written expression on topics of current interest.

353 Spanish for the Business World (3:3:0). Prerequisite: SPAN 300 or permission of instructor. Introduction to terminology and usage of Spanish in business transactions. Practice in the composition of business reports and letters. Recommended for students who wish to improve their reading and writing of Spanish and for those concentrating in Latin American studies.

390 Introduction to Hispanic Literary Analysis (3:3:0). Prerequisite: SPAN 300 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.

420 Studies in Spanish Linguistics (3:3:0). Prerequisite: SPAN 451, 452, or permission of instructor. Studies in Spanish phonetics, phonology, morphology, syntax, semantics, dialectology, or linguistic history. Topic for a given semester may be obtained from the department in advance. May be repeated for credit with permission of department.

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). Prerequisite: SPAN 300, 301, 351, and 352 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: SPAN 300, 301, and 352 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 pre-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 Hispanic Literature (3-3:0), (3-3:0). Prerequisites: SPAN 311 and 452 or permission of instructor. Study of a selected theme, topic, period, or genre. May be repeated for credit with permission of department.

483, 484 The Literature of Spain I, II (3:3:0). Prerequisite: SPAN 311 and 452 or permission of instructor. SPAN 483 examines the main periods, trends, genres, and most representative works of Spanish literature from its beginnings to the end of the Golden Age. SPAN 484 studies Spanish literature from 1700 to the present.

485, 486 The Literature of Spanish America I, II (3:3:0). Prerequisite: SPAN 311 and 452 or permission of instructor. Two-semester survey of the literature of Spanish America. SPAN 485 studies the texts that are representative of the colonial, romantic, and modernist periods in Spanish American literature. SPAN 486 studies the postmodernist period and contemporary writers.

497, 498 Senior Honors Tutorial (3:0:0), (3:0:0). Prerequisites: Spanish major with 90 credits, a cumulative GPA of 3.000, and of 3.000 in the major field. Students meeting these requirements are admitted to candidacy upon 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 precis 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. Research and reading 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 upon completion of the thesis. Students who do not take SPAN 798 receive six credits for SPAN 799 upon completion of the thesis.

800 Studies for the Doctor of Philosophy in Education (variable credit). Prerequisite: Admission to the Ph.D. in Education program and 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 See EDUC 500.

517 Computer Applications for Special Populations (4:3:1). Prerequisite: Graduate standing or permission of instructor. Presents a lecture/laboratory course for teachers of special populations (e.g., children with disabilities, bilingual) in applications of computer technology for instructional programs and computer skills. Students learn to use computer technology designed specifically for special populations.

544 Career, Transition, and Vocational Planning (3:3:0). Gives 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, curriculum content, scheduling, and personal relationships.

551 Classroom Management: Theory and Practice (3:3:0). Focuses on identifying, recording, evaluating, and changing social and academic behaviors of diverse student populations. Theories of classroom management are explored and various approaches to instructional, behavioral, and environmental management are presented. Development of individual education programs and their impact on management issues are addressed. Field experience in public schools is required.


554 Adaptive Methods in Education (3:3:0). Prerequisite: EDUC 523. Adapts social studies and science texts, materials, and instructional approaches to address the specific learning needs of students with emotional disturbances and/or learning disabilities. Emphasis is placed on developing lesson plans that include manipulative devices and experiential learning.

557 See EDUC 597.

560 See EDUC 600.

615 Early Intervention for Infants and Toddlers with Disabilities (3:3:0). Explores current public policy initiatives for coordinating services for infants and toddlers. Models of services delivery and approaches to family-centered service are discussed.

620 Advanced Applied Behavioral Analysis and Social Learning Theory (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. Emphasis is on single subject research designs.

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.

643 Characteristics of Students with Emotional Disturbances and Learning Disabilities (3:3:0). Presents theories of deviance and specific conditions in emotional disturbances and learning disabilities. The impact of the manifestations of these learning and behavioral differences on academic and social/emotional performances is studied. Diversity within student populations is addressed throughout the course. Field experience is required.

647 Medical and Health Aspects of Handicapping Conditions (3:3:0). Prerequisite: EDUC 523 or permission of advisor. Focuses on understanding the impact of physical and/or special health conditions. Examines screening and evaluation techniques, treatment goals, and intervention procedures. Field experience is required.

648 Introduction to Psychoeducational Assessment (3:3:0). 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. Field experience is required.

649 Clinical Psychoeducational Assessment in Special Education (3:3:0). Practices administering, scoring, and interpreting education evaluation instruments with emphasis on the generated educational plan and written report. Supervised experiences are required in the Educational Study Center on selected Saturdays.

655 Curriculum and Methods and Emotional Disturbances/Learning Disabilities (3:3:0). Applies research on teaching effectiveness, teacher accountability, and instructional approaches with specific attention to language arts instruction. Cooperative learning models are investigated.

658 Cognitive Instruction and Learning Strategies (3:3:0). Prerequisite: EDSE 644 or permission of instructor. Focuses developing metacognitive and self-regulated learning techniques in students with limited academic motivation and/or achievement. Integrated strategies instruction through individual learning styles are emphasized for content across the curriculum.

659 Curriculum and Methods and Early Childhood Special Education (3:3:0). Prerequisite: Permission of advisor. Emphasizes planning, organizing, implementing, and evaluating programs for young children with special needs.

661 Curriculum and Methods and Severe Disabilities (3:3:0). Prerequisite: Permission of advisor. Presents formulation, implementation, and evaluation of individualized education programs for individuals with severe disabilities.

662 Educational Consultation (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 communication 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. Population characteristics, current best practices for programming, evaluation, and planning are studied. Students participate in research, development of presentations, writing, and discussion of selected topics. May be repeated for credit.

665 Family Intervention Programs for Children with Disabilities (3:3:0). Focuses on strategies for developing family-professional partnerships to benefit children with special needs. Theories and research that support a family-centered approach are explored. Cultural sensitivity and procedural safeguards are emphasized.

669 Transdisciplinary Approach for Students with Physical Disabilities (3:3:0). Prerequisites: Graduate standing and permission of advisor. Introduces neurodevelopmental and sensory integrative treatment approaches for students with physical disabilities. Emphasis is on positioning and handling techniques. Applies transdisciplinary model in educational and therapeutic settings.

671 Special Topics in the Education of Exceptional Children (1:1:0). Offers a variable topics course. No more than three credits may be applied to the M.Ed. degree.


782 Comprehensive Topics in Special Education: Trends and Issues (3:3:0). Prerequisites: Approval of advisor and permission of Special Education Committee. Synthesizes course work, theory, and practical application. Focus is on current trends and issues, foundations, and preparation for traditional area specialization comprehensives, which can be taken in the same or in a separate semester. If
Statistics (STAT)

Applied and Engineering Statistics

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. fall

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. fall

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. fall

362 Introduction to Computer Statistical Packages (3:3:0). Prerequisite: 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. fall

455 Experimental Design (3:3:0). Prerequisite: STAT 350, 354, or DESC 353. 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. fall

457 Applied Nonparametric Statistics (3:3:0). Prerequisites: STAT 350, STAT 354, DESC 353, 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 250 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. spring

474 Introduction to Survey Sampling (3:3:0). Prerequisite: STAT 300. Level course in probability or statistics. 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. fall

498 Independent Study in Statistics (1-3:0). Prerequisite: 60 undergraduate credits; must be arranged with instructor and approved by the department chair before registering. Direct self-study of special topics of current interest in statistics. May be repeated for a maximum of six credits if topics are substantially different. spring

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. spring

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. fall

512 The Use of Computer Statistical Packages (3:3:0). Prerequisites: CS 103 or equivalent and a course in statistics, or permission of instructor. Credits are not applicable toward the credit requirements for the M.S. in Mathematics, Computer Science, and Operations Research and Management Science, or Statistical Science, but may be applicable toward a degree in some other fields. Introduction to use of computer packages in the statistical analysis of data. Techniques common to use of all statistical packages, including data checking, cleaning, manipulation, and transformation, are emphasized. Both simple and complex statistical analyses
are covered. Techniques are illustrated by concentrating on one of the major statistical packages such as SAS or SPSS. Other packages are discussed and compared. Students are expected to perform computer statistical analyses of data relevant to their respective fields of study.

530 Mathematical Methods for Statistics and Engineering (3:3:0). Prerequisite: MATH 108 or 113. Calculus, linear algebra, and probability results required for the pursuit of an advanced degree in statistics or a related field.

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.

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.

574 Survey Sampling I (3:3:0). Prerequisite: STAT 354 or 554. 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 may be required.

634 Case Studies in Data Analysis (3:3:0). Prerequisite: STAT 554 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.

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.

655 Analysis of Variance (3:3:0). Prerequisite: STAT 554 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.

656 Regression Analysis (3:3:0). Prerequisites: STAT 554 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.

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. 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, multiattribute utility theory, influence diagrams and Bayesian networks, measuring utilities, and probability distributions.

665 Categorical Data Analysis (3:3:0). Prerequisite: STAT 554 or equivalent. 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 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.

679 Topics in Survey Design and Analysis (3:3:0). Prerequisite: STAT 674 or permission of instructor. Seminar format in which topics are presented according to the interests of students and instructors. Topics may include use of administrative records in analysis of survey data, adaptive sampling, capture-recapture sampling to estimate population size, telephone survey methods, establishment surveys, survey errors and costs, imputation methods for imputing nonresponse, small area estimation, technique of interpenetrating samples, variance estimation, model versus design-based inference, randomized response for sensitive questions, multivariate analysis of survey data, and spatial sampling.

682/OR 682/MATH 685/CSI 700 Computational Methods in Engineering and Statistics (3:3:0). Prerequisites: MATH 203 and MATH 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 science. 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 (3:0:0). 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 computational-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.

774 Statistical Inference for Survey Sampling (3:3:0). Prerequisite: STAT 674. Variance estimation using resampling methods such as balanced half-samples, jackknife and bootstrap methods, inference for percentiles, model-based inference under superpopulations, and Bayesian methods.

781/SYST 781/INFS 781 Data Mining and Knowledge Discovery (3:3:0). Prerequisite: STAT 663/CSI 773 or STAT 534 or CS 580 or STAT664/SYST 664 or CS 650 or INFS 614 or INFS 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)

201 News Media in the Americas (3:3:0). Prerequisite: 30 credits. Examination of the operation and impact of news media in the Americas. Topics include the institutions of news production and distribution, the generation and formation of news, the ideological nature and impact of news, and the relationships between the news media and the economic, political, and cultural structures and practices of the various regions of the Americas.

202 Popular Culture in the Americas (3:3:0). Prerequisite: 30 credits. Examination of the popular cultures of the Americas. Topics include the institutions for the production and distribution of popular culture, the generation and formation of popular culture forms, the ideological nature and impact of popular culture forms, and the relationships between the institutions and practices of popular culture and the economic, political, and broader cultural structures and practices of the various regions of the Americas.

303, 304 Introduction to the Study of the Americas I, II (3:3:0). Prerequisite: 30 credits. Study of the diverse yet related regions, societies, cultures, and peoples of the Americas. STAM 303 focuses on selected topics up to 1800; STAM 304 introduces selected topics since 1800. The courses introduce students to the various methodologies involved in the study of the histories and cultures of the Americas. Students majoring in the study of the Americas should take this two-course sequence in order, and before all other courses in the major. Preference in enrollment is given to majors in the study of the Americas. Enrollment is limited to 30.

310 Places and the Study of the Americas (3:3:0). Prerequisite: 45 credits. Examination of the relationship between natural and social space and the various societies and cultures of the Americas in the overall historical context of their economic, political, and ideological structures and practices. Particular subtitles often drawn from the fields of geography and literature are announced. May be repeated when the subtitle and content of the course are different.

320 Peoples and the Study of the Americas (3:3:0). Prerequisite: 45 credits. Examination of the relationships between the various peoples of the Americas in the overall historical context of their economic, political, and ideological structures and practices. Particular subtitles often drawn from the fields of anthropology, art history, history, and sociology are announced. May be repeated when the subtitle and content of the course are different.

330 Eras and the Study of the Americas (3:3:0). Prerequisite: 45 credits. Examination of the relationship between specific historic eras and the various societies and cultures of the Americas in the overall historical context of their economic, political, and ideological structures and practices. Particular subtitles often drawn from the fields of art history and history are announced. May be repeated when the subtitle and content of the course are different.

340 Institutions and the Study of the Americas (3:3:0). Prerequisite: 45 credits. Examination of the relationship between specific institutions and the various societies and cultures of the Americas in the overall historical context of their economic, political, and ideological structures and practices. Particular subtitles often drawn from the fields of anthropology, communication, public affairs, and sociology are announced. May be repeated when the subtitle and content of the course are different.

401 Thematic Approaches to the Study of the Americas (3:3:0). Prerequisite: 60 credits. Intensive study of a significant theme, problem, question, conflict, or possibility that furthers our understanding of the societies and cultures of the Americas. Particular subtitles are announced. May be repeated when the subtitle and content of the course are different. Preference in enrollment is given to majors in the study of the Americas.

410 Senior Seminar in the Study of the Americas (3:3:0). Prerequisite: Majors in the study of the Americas with 90 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). Prerequisites: 60 credits and 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.

502 Problems in the Study of the Americas (1-6:3:0). Prerequisite: Majors in the study of the Americas with at least 15 credits of STAM courses above 300; or senior standing and permission of the instructor; or possession of the baccalaureate degree. Examination of a particular aspect or problem or question in the study of the Americas. Particular subtitles are announced. May be repeated when the subtitle and content of the course are different.

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 upon availability of positions.
Systems Engineering (SYST)

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). Corequisite: SYST 417 or OR 441, 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. 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 resources.

422 Data Communication and Networks (3:3:0). Prerequisites: SYST 202 and SYST 203. 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). Prerequisites: CS 211 and 60 credits. 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.

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, inferencing, 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, PSYC 100. 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.
471 Systems Engineering Management (3:3:0). Prerequisite: 75 credits. 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.

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. The instructor and guest lecturers will present material that is not part of the required course load to expand the horizons of the students. Each student will write a short paper on each of these presentations. Examples of such "hot" topics are "knowledge-based" design, enterprise-wide reengineering, electronic commerce, and optimization by "natural analogy" (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). Corequisites: SYST 301 and 471. 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 advisor 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 (1-3:0:0). Prerequisites: 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 systems engineering. May be repeated for a maximum of six credits if the topics are substantially different.

499 Special Topics in Systems Engineering (3:3:0). Prerequisites: 60 credits; 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 Quantitative Foundations for Systems Engineering (3:3:0). Prerequisites: MATH 213 and 214. Provides the quantitative foundations necessary for core courses in the systems engineering master's program and the certificate program in CII. Topics include vectors and matrices; differential and difference equations; linear systems; Fourier, Laplace and Z-transforms and probability theory. Engineering applications of the topics are emphasized. Students receive graduate credit for this course that, when used on a plan of study, extends the minimum credit 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 requirements definition, including functional problem analysis. Examination of the systems engineering definition phase including requirements, problem analysis, definition, and functional economics. Specification of functional and nonfunctional 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. Life cycle of systems is addressed; generation and analysis of life cycle requirements; development 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. Software tools are introduced and used for portions of the systems engineering cycle.

521/OR543 Network Analysis (3:3:0). Prerequisites: MATH 213 or equivalent; OR 441 or 441/341. Network nomenclature. Elementary graph theory. Linear and nonlinear network models: multimmodity 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 out 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 graduate standing. 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 subsymbolic reasoning, imprecise and approximate reasoning (e.g., fuzzy logic), and neural networks, and emphasizes engineering analysis and systems 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. Study of the basics of systems engineering management. This includes 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.

572 Introduction to Systems Integration Engineering (3:3:0). Prerequisite: SYST 301 or SYST 510 or SYST 520. 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 collaborations.

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. Provides a broad, yet rigorous introduction to methodologies for systems engineering. Includes the introduction to the tools of systems analysis: economic analysis techniques, optimization, statistical analysis, simulation, control concepts and project management. It also provides tools for system design, feasibility testing. Other topics include design for reliability, maintainability and managing the system. Case studies are presented.

621 Systems Architecture for Large-Scale Systems (3:3:0). Prerequisite: SYST 310 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 Analysis (3:3:0). Prerequisite: STAT 544 or STAT 554 or equivalent. Fundamentals of Bayesian decision theory, and its application in statistical inference and decision analysis. Random variables, Prior distributions and Bayes theorem, Proper scoring rules, Precise measurement, Conjugate priors, Approximate posterior distributions, Multivariate utility theory, Influence diagrams and Bayesian networks, Measuring utilities and probability distributions.

671/671 Judgment and Choice Processing and Decision Making (3:3:0). Prerequisite: STAT 610. 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 535. 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). Prerequisites: STAT 554, STAT 610, 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 systems 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 670/683 Principles of Command, Control, Communications, and Intelligence (C'1) Part I (3:3:0). Prerequisite: ECE 528 or OR 542 or equivalent. Fundamentals of C'1 are developed from a descriptive, theoretical, and quantitative perspective. Topics include C'1 process, quantitative models for combat, sensing, data fusion, individual and team decision making, organizational theory, tools for modeling C'2 systems, and evaluation of C'3 systems.

681/ECE 671/684 Principles of Command, Control, Communications, and Intelligence (C'1) Part II (3:3:0). Prerequisite: SYST 680/ECE 670/684. Technology required for C'3 systems is developed. Technology areas include sensors, communications, and computer-based systems. The C'1 required for mission areas such as strategic, theater, and tactical are developed and analyzed. Electronic warfare and counter-C'1 is discussed.

683 Modeling, Simulation, and Gaming (3:3:0). Prerequisite: MATH 213 and graduate standing. Develops methods for designing combat models and games. Existing combat models are critical to the C'1 process. Exercises and games are used to demonstrate the value of properly developed C'1 modules in a combat simulation.


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 C'1 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 C'1 area, with different content in different terms. Representative areas include quantitative evaluation of C' systems, applications of artificial intelligence in C' systems, and military communications systems.
394 Systems Engineering (SYST) • Telecommunications (TELE)

781/INF S 781/STAT 781: Data Mining and Knowledge Discovery (3:3:0). Prerequisites: SYST/STAT 644 or CS 650 or INF S 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 coers 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: 9 graduate credits. Research project chosen and completed under the guidance of a graduate faculty member, resulting in an acceptable technical report. f, s, sum

799 Master's Thesis (1-6:0:0). Prerequisites: 9 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-faculty-member committee, and an oral defense. f, s, sum

Technology (TECH)

School of Information Technology and Engineering

All TECH courses are available to GMU/CLC students only.

503 Computer Networks Laboratory I (1:3:3). Corequisite: TECH 523. Introductory intensive hands-on experience laboratory supporting coursework covered by TECH 523 and preparing students for the four course sequence in Systems Engineering of Network Based Systems. Basic exercises form the area of network design and engineering, network administration, network testing, and troubleshooting. LAN, client server, Internet, and Intranet networking.

504 Computer Networks Laboratory II (1:3:3). Corequisite: TECH 524. Intensive introductory hands-on experience laboratory supporting coursework covered by TECH 524 and preparing students for the four course sequence in Systems Engineering of Network Based Systems. Basic exercises form the area of network design and engineering, network administration, network testing, and troubleshooting. LAN, client server, Internet, and Intranet networking.


526 Advanced Computer Networks Laboratory (1:3:3). Prerequisite: TECH 525. Intensive hands-on experience laboratory supporting coursework covered by the sequence of TECH 523, 524, and 525 courses. Basic and advanced exercises from the area of network design and engineering, network administration, network testing, and troubleshooting. LAN, client-server, Internet, and Intranet networking. Network implementation and installation with state-of-art networking software.

Telecommunications (TELE)

Telecommunications

350 Telecommunications Systems (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, circuit twisted pair telephony, broad band 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. Services as the capstone seminar in the Telecommunications minor.

750 Coordinating Seminar (3:3:0). Prerequisite: Acceptance in the M.A. in Telecommunications program with at least 18 credits completed. 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.

799 Individualized Studies Thesis (1-6:0:0). Prerequisite: Degree candidacy in the M.A. in Telecommunications, completion of 24 credits of graduate course work, approval of a thesis proposal by the faculty advisor and telecommunication director. Taught on an independent study basis. Individualized section form required. Original research endeavor related to the student’s concentration in telecommunications. Academic research involves posing a question or hypothesis and using appropriate methodology to prove or disprove the proposed hypothesis. Research must result in a document meeting university standards.
Theater (THR)
Institute of the 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.

200 Play Production Practicum (1-2:0:0). Academic credit is awarded to Theater Division B.A. candidates for satisfactory participation in major departmental or Theater of the First Amendment productions. One to two credits are awarded for each production assignment up to a total of four credits, which fulfills the departmental major requirement. See departmental listing for more information.

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.

204 Visual Thinking (3:3:0). Also ARIN 204, ARTS 204, and DANC 204. Not open to students who have had ARTS 102. 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 Impulses (3:3:0). Also ARIN 205, ARTS 205, and DANC 205. 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.

210 Acting I (3:3:0). Basic training in acting, emphasizing theater games, improvisations, and nonscripted situations and scenes.

230 Introduction to Technical Theater I (3:3:0). Review of basic theater organization and technology with emphasis on lighting and scenery. 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.

307 Aesthetic Awareness (3:3:0). Also ARIN 307, ARTS 307, and DANC 307. Presentation of the historical, philosophical, and aesthetic traditions of the arts with opportunities for each student to confront their own sense of beauty.

308 Cross-Cultural Arts Appreciation (3:3:0). Also ARIN 308, ARTS 308, and DANC 308. Attempts to give 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 each semester.

310 Acting II (3:3:0). Prerequisite: THR 210 or permission of instructor. Extends the principles begun in THR 210 through scene study, audition technique, and work in analysis, characterization, and relationships.

320, 321 Acting Ensemble I, II (3:3:0), (3:3:0). Prerequisite: Audition. Concentrated course of study in the varied skills associated with the versatile actor and company player with individualized attention to students' needs.

322 Alexander Technique/Stage Combat (3:3:0). Offered during the Acting Ensemble 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.

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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.

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, 421 Acting Ensemble III, IV (3:3:0), (3:3:0). Prerequisite: Audition. Second year in the sequence of a concentrated course of study in the varied skills associated with the versatile actor and company player, with individualized attention to students' needs.

422 Stage Make-up/Styles (3:3:0). Prerequisite: THR 210, junior standing, or permission of instructor. Introduces the actor to the challenges of working with make-up and costume as a stylistic enhancement of the performance task. Questions of period style and behavior are also considered.

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.

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/dramaturg 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 puppetry, dramatic writing for 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.

497 Independent Study (1-6:0:0). Prerequisite: Open only to theater majors with 90 credits and by special permission of the division director. 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.

499 Independent Study (1-6:1-6:0). Prerequisite: Undergraduate degree or equivalent, or permission of instructor. Independent study. May be repeated for a total of six credits.
University/Interdisciplinary Studies (UNIV) 

New Century College

100 University 100 (1:1:0). A one-credit course offered during the fall semester to assist freshmen with their transition to college life. This success-oriented course helps students adjust academically, develop decision-making skills, and learn about the services and opportunities for involvement at George Mason. Although all the classes have a core body of knowledge, each class specializes in a particular aspect of college life. The team development courses at Hemlock Overlook are a component of every section. Approximately 20 students are in each class.

190 Freshman Seminar (3:3:0). Prerequisite: Freshman standing, minimum 3.300 cumulative GPA or permission of instructor. Broad interdisciplinary subjects taught by Robinson Professors. Topics vary. Enrollment is by invitation only. Courses may be repeated for up to 12 credit hours.

200 University (2:2:0). A select topics course focusing on the transition issues for students at second semester freshman standing or higher. Section topics each semester may include Careers/Major Decisions, Relationships, Involvement: Focus and Development, Conflict Management.

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, biological, and technological sciences. The course is intended for non-science majors and uses little mathematics.

390 University Seminar (3:3:0). Prerequisite: 3.300 cumulative GPA and 45 earned hours or permission of instructor. Broad interdisciplinary subjects taught by distinguished faculty professors, including the Robinson Professors. Topics vary. Enrollment is by invitation only. Courses may be repeated for up to 12 credit hours.

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 world of work, development of field of study expertise, resume/portfolio development, professional ethics, money management, career/ alumni support networks, and final year motivation.

441 AIDS: Its Impact in Our Society (3:3:0). Designed to give students an in-depth understanding of the medical and social matters surrounding HIV disease. Topics include progression of the disease, epidemiology, global AIDS, economic/financial consequences, and end-of-life issues. Students are provided with current information and presentations from university faculty and community experts working in HIV services.

498 Directed Readings in Interdisciplinary Studies (3:0:0). Prerequisite: Open only to degree students in the Bachelor of Arts in Interdisciplinary Studies program. Individualized sections by arrangement. A grade of C or better is required.

499 Senior Thesis in Interdisciplinary Studies (3:0:0). Prerequisite: UNIV 498. Open only to degree students in the Bachelor of Arts in Interdisciplinary Studies program. Individualized sections by arrangement. A grade of C or better is required.

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 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.

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 students qualifications and the availability of positions. Students work with an on-site supervisor and the coordinator of Urban and Suburban Studies.

Urban Systems Engineering (USE)

Civil, Environmental, and Infrastructure Engineering

197, 297, 397 Industrial Internship I-A, II-A, III-A (0:0:0). Prerequisite: USE majors only. Preparation for summer work experience in urban systems 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). Prerequisite: USE 197, 297, 397. USE majors only. Supervised 10-week summer work experience in urban systems engineering positions with land development, architecture/engineering, and construction firms or government.

199, 299, 399 Industrial Internship I-C, II-C, III-C (1:1:0). Prerequisite: USE 198, 298, 398. Evaluation of summer work experience in urban systems engineering positions with land development, architecture/engineering, and construction firms or government. Written report and presentation is required.

230 Hydraulics (3:3:0). Formerly USE 310. Prerequisites: ENGR 210 and MATH 213. 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 II (4:2:6).
Prerequisite: ENGR 183. Introduction to the urban systems 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 computation are also covered. Design projects are included. s

300 Urban Systems Planning and Management I (3:3:0).
Prerequisite: USE 290 or permission of instructor. Introduction to the complex relationships of overlapping urban systems such as land, transportation, energy, water, and communications. Topics include the history of engineering, land, and infrastructure; the social, economic, environmental, and political aspects of urban policy and decision making. Current issues in the urban environment are examined. Contemporary urban systems engineering design problems are discussed. s

301 Engineering and Economic Models in Urban Systems Engineering (3:3:0). Prerequisite: USE 300 or permission of instructor. Study of planning, analysis, control, and engineering economic models applicable to the life cycle of physical urban infrastructure. The infrastructure design process and the application of quantitative models are introduced. Applications of model building for engineering economics, decision making, forecasting, resource scheduling and allocation, estimating, work measurement and materials, quality and process control in water, transportation, energy, telecommunications infrastructure systems, and the built environment are presented. f

305 Soil Mechanics (3:3:0). Formerly USE 405. 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. s


340 Water Resource Engineering (3:2:3). Prerequisite: USE 230 or 310. Analytic methods and computer models for the design and evaluation of water resource projects such as flood control and river basin development. Topics include governing principles, common models, and typical applications for water resource systems; principles of design for stormwater management systems; and environmental impact assessments. Laboratory and field work are required on selected topics. s

365 Transportation Systems (5:4:3). Corequisite: USE 301. Introduction to urban 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, capacity calculations of uninterrupted and interrupted highway sections; introduction to traffic control; traffic signs and markings; traffic signals; traffic signal control systems; intersection design; intersection control; pedestrian control; speed zoning and control; principles of public transportation planning and operations; and an introduction to Intelligent Transportation Systems and traffic demand management. Laboratory and field work are required on selected topics. f

367 Behavior of Concrete and Steel Structures (3:3:0). Formerly 467. Prerequisite: ENGR 210, 310, and USE311. 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. f

400 Urban Systems Planning and Management II (3:3:0). Prerequisites: ENGL 302, USE 301 and 365; corequisites: USE 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- and 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 processes 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. f

410 Geographical Information Systems in Engineering (3:2:3). Credit is not given for both USE 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. f

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: USE 455. Credit is not given for both USE 450 and 350. 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.

451 Wastewater Management I (3:3:0). Prerequisites: USE 230 or 310 and 340. Introduction to the planning and design considerations in wastewater collection and disposal systems. Topics covered include wastewater flow rates, regulatory requirements, small on-site disposal systems, sewer collection systems, pump stations, wastewater treatment, effluent disposal, environmental considerations, financing, and management. Tangible and intangible consequences of environmental policies; environmental impact assessments; federal, state, and local government laws and regulations related to wastewater collection, treatment, and disposal are also covered.

452 Wastewater Management II (3:3:0). Prerequisite: USE 451 or 455. Credit is not given for both USE 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; 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 USE 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 USE 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: USE 365 or 465. Credit is not given for both USE 460 and 560. Study of the history of public transportation in the United States and its relationship with land use and the structure of cities; quantitative performance attributes of different modes including vehicle operational characteristics, geometric elements, capacity and costs; techniques for the planning and operation of public transportation systems including modal split, elasticity, systems planning, route planning, and scheduling; management and administrative concepts; and survey techniques and performance measures.

463 Construction Systems (3:3:0). Prerequisite: USE 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.

465 Transportation Systems I (3:3:0). Corequisite: USE 301. Introduction to urban transportation systems and the factors that influence their planning, design, and operation. Topics include fundamentals of travel demand forecasting, supply modeling, demand management, systems design, and equilibrium analysis. Mass transit, automated guideway transit, and pedestrian and cycling facilities in context with automotive transport are also covered. Project evaluation, benefit cost analysis, and time staging methods for transportation systems are introduced.

466 Transportation Systems II (3:3:0). Prerequisite: USE 465 or equivalent. Introduction to the analysis of transportation systems for passengers and freight. Deterministic and stochastic models for transportation systems are discussed. Theory and techniques for state-of-the-art transportation planning and design decision support systems are studied in detail. Discrete and continuous network design models; interface of transportation planning and design software with geographical information systems; and suburban mobility are also included.

490, 495 Senior Design Project I, II (3:3:0), (3:3:0). Prerequisite: USE 400. Capstone design experience. Integrates all design fundamentals employed by a typical urban systems 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 verbal 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 urban systems project.

498 Independent Study in Urban Systems Engineering (1-3:0:0). 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 USE. May be repeated for a maximum of six credits if the topics are substantially different.
499 Special Topics in Urban Systems 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.

510 Geographical Information Systems in Engineering (3:2:3). Credit is not given for both USE 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: USE 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: OR 541 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 hydro-system operations, water quality management, capacity expansion, urban drainage network design, and sanitary sewer design are used to illustrate the applications of systems analysis. Tools include linear and dynamic programming and knowledge-based systems.

550 Environmental Engineering Systems (3:3:0). Prerequisite: USE 453. Credit is not given for both USE 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. Reviews experimental design approaches for the characterization of environmental sites.

552 Wastewater Engineering (3:3:0). Prerequisite: USE 455 or 555. Credit is not given for both USE 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.

555 Introduction to Environmental Engineering (3:3:0). Credit is not given for both USE 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.

556 Environmental Law (3:3:0). Formerly USE 650. Credit is not given for both USE 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 data bases.

560 Public Transportation Systems (3:3:0). Prerequisite: USE 460 or equivalent. Credit is not given for both USE 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.

585 Automated Support Tools for Urban Systems Engineers (3:3:0). Prerequisite: ENGR 555 or equivalent. Study of information technology support functions such as computer-aided design, geographic information systems, computer-aided engineering, computer-aided cost engineering, computer-aided facilities management, and their application in engineering practice. Strategies and techniques for automating the engineering operation are studied, including software and hardware requirements determination, specifications, selection and purchasing; principles and strategies for computer networks; training; and productivity assessment. Explores unique automated support opportunities such as scanning, automated raster to vector conversion, file format conversion, file compression, computer-aided presentation and projection, telecommuting, and teleconferencing.

600 Urban Systems Engineering In Infrastructure Planning and Management (3:3:0). Corequisite: SYST 530. 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.

601 CEIE Modeling and Problem Solving (3:3:0). Prerequisites: MATH 213 and CS 112, or USE 300, or equivalent. Concepts of modeling, systems analysis and engineering for problem solving in the urban environment. Covers modeling, simulation, optimization, and limitations of modeling approaches. Also included are decision support tools; multiple objective, multiple decision maker problems in the public and private sectors; and multiple case studies in urban systems engineering design, planning, and management in areas such as transportation, water resources, the environment, solid, liquid, and gaseous waste, energy, telecommunications, and construction.
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 the constructed system. 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:** USE 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:** USE 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 on-site vehicle and pedestrian circulation, transportation interface, environmental planning, and planning administration. S, even years

670 Urban Systems Decision Methods and Tools (3:3:0). **Prerequisite:** STAT 644 or equivalent. Principles of decision making and of knowledge acquisition in the context of building knowledge-based decision support tools for urban systems 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. F, even years

680 Spatial Decision Support Systems (3:3:0). **Prerequisite:** SYST 642 or equivalent. Fundamentals of traditional decision support systems and their application to spatially or geometrically related decision environments. Surveys decision analysis models; explores spatial database methodologies; reviews engineering models including computer aided design, geographic information systems, computer aided engineering, AM/FM, expert systems, etc.; and surveys of man-machine interface techniques. Study of the application of decision support systems in construction, engineering design, facilities management, transportation, public service, etc. is also included. F, odd years

685 Urban Systems Engineering Information Management (3:3:0). **Prerequisite:** USE 601 or permission of instructor. Advanced course in information resources management as applied to urban 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 urban systems 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 urban systems engineering application. F, odd years

690 Topics in Urban Systems Engineering (3:3:0). **Prerequisite:** Determined by topic. Topics not covered in the regular urban systems engineering offerings. Course content may vary each semester. Course may be repeated with a change in topic.

798 Directed Readings in Urban Systems Engineering (3:3:0). **Prerequisite:** Permission of instructor. Analysis and investigation of a contemporary problem in urban systems engineering. Prior approval by a faculty member who supervises the student's work is required. Written report is also required.

799 Masters 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.

Visual Information Technologies (VIT) Institute of the Arts

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 report is required. May be repeated for credit.

600 VIT Research Methodologies (3:3:0). **Prerequisite:** Admission to the VIT program or permission of instructor. Explores methods of examining and interpreting works of art developed by art historians since the 19th century, as well as new ways of looking at art by using computer tools such as expert systems, computer analysis of pigments and other materials, and electronic search and retrieval of archived documents. Methods are examined through analytical and critical readings of texts and articles.

613 Graphic Design (3:0:6). **Prerequisite:** Admission to the VIT program or permission of instructor. Combined lecture and studio course covering concepts in graphic design, digital typography, and hypermedia. Course intended for students whose area of concentration is other than graphic design to increase the scope of their technical expertise while developing their studio work. Students design a digital typeface that is used in a self-promotional package consisting of both hard copy and hypertext.

614 Problems in Typography (5:2:6). **Prerequisite:** Admission to the VIT program or permission of instructor. Combined lecture and studio course in designing for electronic and print media. Contemporary typeface design for digital typesetting. Design of typefaces for use in on-screen presentations. Perceptual, visual, practical, and aesthetic issues in typography.
616 Hypertext and Hypermedia (5:2:6). Prerequisite: Admission to the VIT program or permission of instructor. Combined lecture and studio course in hypermedia and hypertext design. Solutions to perceptual problems in designing the presentation of visual and textual information for electronic display. Exploration of how design considerations are affected by changes in presentation media.

618 Problems in Graphic Design (5:2:6). Prerequisite: Admission to the VIT 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/PHIL 356 Philosophy, Theory, and Criticism (3:3:0). Prerequisite: Admission to the VIT 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 in the VIT program write a supplemental paper and design an individualized project.

670 Teaching Practicum (3:3:0 or 6:6:0). Prerequisite: Admission to the VIT program or permission of instructor. Supervised classroom teaching practicum in the undergraduate program at George Mason or in a community college program.

676 Sound and Music for Video and Animation (5:2:6). Prerequisite: Admission to the VIT 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 domain and processing, is 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 VIT 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 aural artistic 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 VIT 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 Computer Imaging (5:2:6). Prerequisite: Admission to the VIT program or permission of instructor. Overview of 2-D 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 Computer Imaging (5:2:6). Prerequisite: Admission to the VIT program or permission of instructor. Overview of 3-D computer imaging applications in the arts in fields including sculpture, mixed media, video, and animation. Lectures combine technical and aesthetic material, including three-dimensional design, modeling, and rendering. Emphasis on developing an advanced studio portfolio.

688 Computer Animation (5:2:6). Prerequisite: Admission to the VIT program or permission of instructor. Description, representation, creation, and movement of three-dimensional environments using computers, including video production for animators. Lectures integrate advanced technical aesthetic material. Emphasis on developing an advanced studio portfolio.

693 Apprenticeship (3:3:0 or 6:6:0). Prerequisite: Admission to the VIT program or permission of instructor. VIT students apprentice at a local business that conforms to their application interest in visual information technologies.

696 Special Topics in Visual Information Technologies (3:4:3-4:0). Prerequisite: Admission to the VIT program or permission of instructor. Rotating topics of special interest in the field.

796, 798, 799 Directed Project, Directed Reading, Thesis (9:0:0), (3:0:0), (3:0:0). Prerequisite: Admission to the VIT program or permission of instructor. Three courses comprising the M.F.A. comprehensive experience for VIT 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.

Women’s Studies (WMST)

Women’s Studies Program

200 Introduction to Women’s Studies (3:3:0). Prerequisite: 30 credits. Interdisciplinary introduction to the field of women studies, encompassing key concepts in the field, history of womens movements and womens 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 womens studies. Topics vary, but include subjects such as women and violence, women and international development, womens myth and ritual, the history and politics of sexuality, psychoanalysis, and religion.

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.

http://catalog.gmu.edu
400 Internship in Women's Studies (1-3:0:0). 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 (1-3:0:0). 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 may be applied toward the women's studies interdisciplinary minor.

490 Independent Study in Women's Studies (1-3:0:0). 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.
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Director, Student Media Learning Group: Michele Braithwaite, M.A.
Director, Student Organizations, Activities, and Programs: Mark Kidd, Ph.D.
Director, Women's Studies Research and Resource Center: Debra Bergoffen, Ph.D.

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Helen S. Garson, B.A., M.A., Ph.D., Professor Emerita of English
Martha M. Giles, B.M.Ed., M.M.Ed., D.M.Ed., Associate Professor Emerita of Music
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George W. Johnson, B.A., M.A., Ph.D., President Emeritus, Professor Emeritus of English
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Robert Charles Krug, B.S., M.S., Ph.D., Professor Emeritus of Chemistry
Thelma Z. Lavine, A.B., A.M., Ph.D., Professor Emerita of Philosophy and American Culture
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Instructional and Administrative Faculty 1998-99

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