Equal Opportunity/Affirmative Action

George Mason University is an Equal Opportunity/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, sex, age, or handicaps (except where sex or age is a bona fide occupational qualification).

Students, employees, or applicants for admission or employment who believe that they have not been dealt with by this university in accordance with the principles and requirements stated above may address the Office of Affirmative Action, George Mason University, stating the facts that occasioned the complaint, presenting any relevant documents or correspondence, and requesting assistance in resolving the matter. Disabled students or applicants may also contact the adviser to disabled students.

The Catalog

This catalog describes the programs and degrees offered by the Graduate School. All information, including statements of tuition and fees and admission and graduation requirements, is subject to change without notice.

For more information about any of the programs listed or for application forms, please write or call the Office of Admissions, 117 Finley Building, George Mason University, Fairfax, VA 22030-4444, (703) 323-2100.
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Academic Calendar
Academic Calendar 1989-90

Fall Semester 1989

March 1
Last day for filing D.N.Sc. admissions applications for fall 1989.

April 1
Last day for filing Ph.D. Economics, Ph.D. Biology, and D.P.A. admissions applications for fall 1989.

May 1
Last day to file applications for fall 1989 admission to doctoral programs in conflict analysis and resolution and information technology.

May 1
Last day for master's students to file applications for Graduate School fellowships.

July 1
Last day to file applications for fall 1989 admission to doctoral program in community college education.

July 4
Independence Day observed; university closed.

July 15
Master's theses and doctoral dissertations due in Office of the Graduate Dean for August graduation.

July 17
Start counseling and registration for fall extended studies enrollees. Call for appointment on or after July 5.

July 26-August 24
Registration and adjustment. (No schedule adjustment on August 21, 22, and 25.) For times and priorities see Schedule of Classes.

August 2
Tuition and fees due for early registered students (payment with late fee will be accepted until August 11).

August 14
Fall registrations canceled for early registered students who have not made arrangements for payment with cashier (canceled students who do not reregister for fall are assessed a $20 administrative fee).

August 28
First day of classes.

September 4
Labor Day; university closed.

September 5
Last day for a full tuition refund (less $20 fee).

September 8-28
Pick up applications for winter master's and doctoral degrees and certificate programs at the Office of the Registrar. (Application must be completed and returned with fee no later than September 28).

September 12
Last day for schedule adjustment for fall classes.

October 1
Last day for filing applications for spring 1990 admission to doctoral program in economics.

October 8-10
Recess (Note: Monday classes and laboratories meet on Wednesday this week only).
### Spring Semester 1990

#### October 23
Spring Semester Schedule of Classes (registration calendar) published.

#### November 1
Last day for filing applications for spring 1990 admission to master's and doctoral programs in biology, community college education, education, information technology, and public administration.

#### November 13
Start counseling for spring extended studies enrollees. Call for appointment on or after November 1.

#### November 15
Master's theses and doctoral dissertations due in Office of the Graduate Dean for January graduation.

#### November 23-26
Thanksgiving recess; university closed.

#### December 9
Last day of classes.

#### December 18
Tuition and fees due for early registered students. Payment with late fee will be accepted by mail if received by January 4 (but university offices will be closed December 23 - January 2).

#### December 11-18
Examinations (for times, see Schedule of Classes).

#### February 1
Last day for filing applications for fall 1990 admission to doctoral program in education.

#### February 8-28
Pick up applications for spring master's and doctoral degrees and certificate programs at Office of the Registrar. (Applications must be completed and returned with fee no later than February 28.)

#### February 15
Last day for filing applications for fall 1990 admission to doctoral program in psychology.

#### March 1
Last day for filing applications for summer session admission to master's programs and fall 1990 admission to doctoral program in nursing science.

#### March 8-April 28
Pick up summer master's and doctoral degree applications at the Office of the Registrar. (Applications must be completed and returned with fee no later than April 28.)

#### March 11-18
Midsemester recess.

#### March 19
Summer session registration begins.

#### March 31
Spring master's theses and doctoral dissertations due in Office of the Graduate Dean for May graduation.

#### April 1
Last day for filing applications for fall 1990 admission to doctoral programs in public administration, biology, and economics.

#### April 1
Last day for doctoral students to file Graduate School fellowship applications.

#### May 1
Last day for filing applications for fall 1990 admission to master's and doctoral programs in conflict analysis and resolution and information technology.
May 1
Last day for master's students to file Graduate School fellowship applications.

May 5
Last day of classes.

May 7-14
Examinations (for times, see Schedule of Classes).

May 19
Spring commencement.

May 28
Memorial Day observed; university closed.

May 29
Summer session begins.

Summer Session
Summer session consists of four terms of five or eight weeks from May 29 through August 2. Most graduate courses are scheduled in late afternoon and evening. For details, consult the summer session catalog, which is available in early March.
Profile of George Mason University
Profile of George Mason University

George Mason University is a dynamic, forward-looking institution that provides a diverse and interactive curriculum to educate students for life in a rapidly changing, highly technical world. George Mason, a medium-sized state university, is in Northern Virginia, convenient to all the resources of the nation's capital and the greater Washington, D.C., metropolitan area.

Both George Mason and surrounding Fairfax County have experienced phenomenal development over the past several years. From its origins in 1957 as a two-year branch of the University of Virginia, George Mason has grown into a comprehensive institution offering degrees through the doctoral level. From a rural suburb of Washington, D.C., Fairfax County has developed into a center of high technology enterprise, promising to rival the West Coast's Silicon Valley and the Boston area's Route 128 corridor.

The university's leadership has carefully planned curricular emphases to make the best use of the area's resources in high technology, the arts and humanities, and public affairs. George Mason's programs are an integral part of its Northern Virginia locale, giving to and receiving from the community in both service and intellectual interchange. The university also participates fully in the national and international exchange of ideas and knowledge.

The university's growing stature and reputation are exemplified by the presence of Virginia's first Nobel laureate, economist James Buchanan. The George Mason professor won the 1986 Nobel Prize in economics for his public choice theory of political decision making. Buchanan is executive director of the university's Center for Study of Public Choice, which applies scientific economic methods to the "public choice behavior" of voters, party leaders and other politicians, lobbyists, and bureaucrats. This center and 50 other GMU centers and institutes enhance university scholarship and contribute, both directly and indirectly, to the intellectual growth of the George Mason student.

Location
Situated on 583 wooded acres near the city of Fairfax, the university's Main Campus combines the quiet of a suburban setting with accessibility to Washington's libraries, galleries, and museums; Virginia's historic sites; and Fairfax County's high technology firms. Metrorail, the Washington area's subway system, enables GMU riders to reach the U.S. Capitol in 35 minutes. It also provides a quick ride to GMU's 5.5-acre Arlington Campus in Arlington, Virginia, which houses the law school and a professional and conference center.

Programs
The university's main academic divisions are the College of Arts and Sciences, College of Education and Human Services, School of Business Administration, School of Information Technology and Engineering, School of Nursing, Graduate School, School of Law, and School of Continuing and Alternative Learning. GMU offers a total of 98 degree programs, including 55 undergraduate, 33 master's, 9 doctoral, and a juris doctor degree.

Academic departments provide innovative and distinctive programs. For example, the university's Plan for Alternative General Education (PAGE), an integrated interdisciplinary program, received the 1986 G. Theodore Mitau Award for Innovation and Change in Higher Education from the American Association of State Colleges and Universities. The English Department, with several noted writers on its faculty, is establishing a national reputation. Its seminars and workshops attract many internationally known authors as workshop leaders and seminar speakers.

Students
The majority of the university's approximately 19,000 students are from Virginia, with the other 49 states and 81 foreign 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 un-
The volleyballs and doors, including a sports and entertainment events, as a situation Complex features and and batting cage; a weight room; saunas; and golf ceremonies. Such as the annual commencement oth other playing fields.

A new Science and Technology Building recently opened on the Main Campus, and the first phase will be completed in 1989. A 2,000-seat concert hall planned for the Arts Center will augment the existing Harris Theatre, expanding the range of performing arts presentations on campus.

The Patriot Center, a 10,000-seat sports and entertainment arena, provides a spacious home for George Mason's major campus and varsity athletic activities, and benefits the larger Northern Virginia community. The center is designed for basketball, indoor soccer, concerts, and other sports and entertainment events, as well as large convocations such as the annual commencement ceremonies.

The university's multipurpose Sports and Recreation Complex features 64,000 square feet of space indoors, including a 200-meter track; multiple basketball, tennis, handball/racquetball, and volleyball courts; a baseball and softball diamond and batting cage; a weight room; saunas; and golf and archery nets. Outdoor features include a 400-meter track, a baseball diamond, and soccer and other playing fields.

Approximately 2,500 students live in the university's on-campus housing. A variety of dining facilities, meeting rooms, a bank, the campus bookstore, and other student services are available in George Mason's two student unions.

Computing Services
The university has several mainframe computers, including Digital VAX 8800 and 8530 systems, that provide large-scale, contemporary software environments. Several hundred microcomputers (primarily IBM PC and AT compatibles) and terminals are available for student use in general purpose computer laboratories in the library, in dormitories, and in other key locations. Additional computing facilities, used for special applications such as artificial intelligence, computer graphics, elementary and secondary teacher education, library searching, and English composition, are also available. Access to computing throughout the campus is available through MASONet, a broadband and ethernet local area communications network. All academic buildings are linked to the central Computer Center through MASONet and students with the at-home computer capability can dial-in to the network.

Libraries and Special Collections
The George Mason University libraries are Fenwick Library on the Fairfax Campus, and the Law Library at the Arlington Campus. Fenwick Library contains the central collection, approximately 500,000 volumes, 500,000 microforms, and 4,000 serials; an additional 20,000 volumes are added annually. The Law Library holds more than 230,000 volumes and subscribes to more than 700 legal and law-related journals. Fenwick Library is open approximately 100 hours per week during the fall and spring semesters. The Law Library is open approximately 85 hours per week during the regular academic year.

Graduate students at George Mason University have access to library facilities on both campuses. Library borrowing privileges are extended to those holding a valid GMU library borrower's card. Graduate students are eligible to borrow materials directly from member institutions of the Consortium of Universities of the Washington Metropolitan Area. They may also use interlibrary loan services to obtain library resources.

Fenwick Library is a leader in the field of applying computerized automation to library functions and services. At the center of this effort is an automated library information system that provides computerized circulation, public catalog, and in-house processing services. In addition, the library provides microcomputer-based access to more than 300 data bases of interest to researchers in all fields. A complement to this service is the library's active role in helping students and faculty.
access this information—both through training and by providing a laboratory of microcomputer workstations.

Fenwick Library has been a selective depository for U.S. government documents since 1969. Additional government publications and other specialized collections are available in the microforms collection of the library (for example, ERIC, Human Relations Area File, Library of English Literature, Library of American Civilization). Items not available at the university may be borrowed through the library's computerized interlibrary loan service. Special services for the handicapped include a TTY for hearing-impaired persons and a Kurzweil Reading Machine for the visually impaired.

Fenwick Library offers students a wide range of audiovisual services, including small-group viewing facilities for video cassettes, laser discs, 16mm films, slides, and filmstrips, and listening facilities for audiotapes and records. The audiovisual resource center has a growing collection of media in most formats and is staffed during all regular library hours. Audiovisual equipment may be borrowed for use on campus from distribution sites in both Robinson and Thompson Halls.

The Washington metropolitan area offers some of the best library and information resources in the nation, including the Library of Congress, the National Archives, the Smithsonian Institution, the Folger Shakespeare Library, the National Library of Medicine, the National Agricultural Library, World Bank, and numerous university libraries and special collections. Fenwick Library also participates in a database sharing program with the Fairfax County Public Library System and the MITRE Corporation.

The university library houses special collections and archives containing primary resource materials for use by scholars in their research. More than 50 collections include these source materials for research:

**The Federal Theatre Project Collection.** Placed on permanent loan from the Library of Congress, this contains the major playscripts, radioscritps, sets, costume designs, and other creative materials produced by the Federal Theatre Project of the 1930s.

**Northern Virginiana.** This includes the papers of Congressman William Scott; historical collections from C. Harrison Mann, including rare historical maps, atlases, geographies, and law books relating to Virginia; and other papers of public officials.

**Performing Arts Archives.** Papers from the American Symphony Orchestra League and the Wolf Trap Foundation for the Performing Arts.

**Photographic Collections.** Prints and negatives, including those of Ollie Atkins, correspondent and photographer for the Saturday Evening Post and official White House photographer from 1965 to 1974.

**Rare Books.** Includes first editions and rare historical materials.

For further information about Fenwick Library, call 323-2616 or the main reference desk at 323-2392.

### Arlington Campus Professional Center and Conference Center

The Arlington Campus Professional Center and Conference Center are located on the third floor of the Arlington Campus building, 3401 North Fairfax Drive, near the Virginia Square-GMU Metro Station (Orange Line).

Graduate courses for five master's degree programs are regularly scheduled in the Professional Center: accounting, business administration, public policy track in economics, human resources program, and public administration. A master's degree in the public policy track in economics may be completed entirely at the Arlington Campus. Several liberal arts undergraduate courses are also offered at the Professional Center. Most courses are taught in convenient weekly sessions beginning at 4:30 p.m., 6:00 p.m., and 7:20 p.m. Courses are also offered on Saturdays from 9:00 a.m. to noon. More than 7,000 credit and non-credit students are served by the Professional Center.

The 200-seat Conference Center and Metro Gallery serve an additional 17,000 persons annually, who participate in university and community programs and business and professional conferences. The Metro Gallery hosts 12 professional art shows annually and is the site of many community cultural events.

The GMU Information Center on the Kirkwood Drive side of the building provides university publications and information on programs and activities at the Arlington Campus and the Fairfax Campus. Catalogs and applications are available. The Information Center telephone number is (703) 841-2604. Hours are 9 a.m. to 9 p.m. weekdays.

### Professional Programs and Activities

**School of Law**

The School of Law is at the Arlington Campus, 15 minutes from downtown Washington via Metrorail's orange line. The school offers programs leading to the first professional degree in
law, the juris doctor. Full-time faculty members teach most courses in both the day and evening divisions. The school is fully accredited by the American Bar Association.

The curriculum provides the basic knowledge and skills necessary for practice in any state. Many courses are problem oriented or involve extensive writing. The faculty includes perhaps the largest concentration of law and economics scholars in the United States.

The School of Law offers an innovative series of specialty tracks, allowing students to supplement their general legal education with in-depth study of a specialized area of practice. The patent law track began in fall 1988, and track programs in corporate and securities law and in banking and financial services begin this fall. Two additional tracks, real estate finance and international trade law, are being developed.

For more information, see the School of Law catalog or write or call George Mason University School of Law, Admissions Office, 3401 N. Fairfax Drive, Arlington, VA 22201-4498; (703) 841-2640.

George Mason University Press
Under the guidance and administration of the Graduate School, the George Mason University Press was established in April 1983. The press provides a scholarly publishing dimension to the university's overall mission of creating and disseminating knowledge through teaching, research, and publication. The GMU Press publishes monographs, books, research reports, conference proceedings, symposia, and reference works developed by local faculty and by authors throughout the world of scholarly endeavor. Among its publications, the press issues an annual series of lectures, The Legacy of George Mason. GMU Press books are advertised, exhibited, promoted, and sold worldwide by the exclusive agent of the press, University Publishing Associates.

Visiting the Campuses
Visitors are always welcome at the university, and prospective students are especially encouraged to visit, preferably while the university is in session. Administrative offices are open Monday through Friday, but because hours vary, appointments are suggested. A tour of the Main Campus is conducted each day beginning at the information desk in the lobby of the Finley Building. Call (703) 323-2100 for information.

Permits or decals are required for parking on campus Monday through Friday from 7 a.m. to 7:30 p.m. Decals are not required on weekends. Special parking places are provided for disabled per-
The Graduate School
The Graduate School

Graduate Study

Graduate study was initiated at George Mason in 1970 with the goal of providing opportunities for students to participate in intensive and individualized programs of study under the direction of a strong faculty. To promote this goal, the Graduate School encourages research, inquiry, and scholarship at the highest levels from both students and faculty.

The Graduate School offers 33 master's programs, 9 doctoral programs, and 8 certificate programs. Nearly all graduate courses are offered in the late afternoon and early evening. In fall 1988 more than 4,300 admitted graduate students were enrolled at George Mason, and more than 1,450 postbaccalaureate students were taking courses through extended studies enrollment.

Organization

The Graduate Faculty is the governing body for all academic policies and procedures of the Graduate School. The Graduate Faculty approves all new graduate programs; authorizes all graduate course work, policies, and degrees conferred by the university; and sets standards for admission to and graduation from the graduate programs.

The Graduate Council is the executive and policymaking body of the Graduate Faculty. The Graduate Council has three standing committees: the Academic Policies and Procedures Committee, the Curriculum Committee, and the Graduate Student Affairs Committee.

Administration

James W. Fonseca, Acting Dean

Purpose of Graduate Study

Graduate education is not simply an extension of undergraduate education. Graduate education means advanced, intensive, and purposeful study. Accordingly, the graduate experience requires rigorous inquiry and complete involvement in scholarly activities.

Graduate course work directly reflects and builds on the knowledge and intellectual maturity a student acquires during the undergraduate years. The graduate experience should be of such duration that there is time for reflection, absorption, and the emergence of intellectual independence and scholarly self-confidence.

George Mason's teaching resources and educational environments promote advanced learning, meet graduate-level educational objectives, and allow students to cultivate close, working relationships with experienced scholar-teachers. Regular evaluation of student performance ensures both students and their graduate teachers of the worth of their intellectual accomplishments.

Graduate study at the university involves a commitment to understanding and activity unlike that ordinarily called for in undergraduate degree programs. Accordingly, both full- and part-time graduate students are expected to meet requirements and standards of study that exceed those expected in undergraduate courses. Graduate students are asked to join faculty members in seeking excellence in advanced study.

Graduate Programs

Graduate School requirements applicable to all degrees are given in the first sections of the catalog. Specific graduate degree programs and their requirements are discussed in detail in the Areas of Study section, where they are listed in alphabetical order.

A number of departments without graduate degree programs offer graduate-level courses for elective credit and for personal or professional enrichment.
Graduate and Professional Degrees, and Department or School Offering Degree

Accounting M.S. (Accounting and Business Legal Studies)
Applied and Engineering Physics M.S. (Physics)
Biology M.S. (Biology)
Business Administration M.B.A. (School of Business Administration)
Chemistry M.S. (Chemistry)
Community College Education D.A. (Center for Community College Education)
Computer and Electronics Engineering M.S. (Electrical and Computer Engineering)
Computer Science M.S. (Computer Science)
Conflict Analysis and Resolution Ph.D. (Center for Conflict Analysis and Resolution)
Conflict Management M.S. (Center for Conflict Analysis and Resolution)
Counseling and Development M.Ed. (Educational Leadership and Human Development)
Creative Writing M.F.A. (English)
Curriculum and Instruction M.Ed. (Curriculum and Instruction)
Economics M.A., Ph.D. (Economics)
Education D.A.Ed. (College of Education and Human Services)
Education Administration and Supervision M.Ed. (Educational Leadership and Human Development)
Elementary Education M.Ed. (Curriculum and Instruction)
English M.A. (English)
Environmental Biology and Public Policy Ph.D. (Biology)
Foreign Languages M.A. (Foreign Languages and Literatures)
Geographic and Cartographic Sciences M.S. (Public Affairs)
Health Education M.Ed. (Health, Education, and Leisure Studies)
History M.A. (History)
Information Systems M.S. (Information Systems and Systems Engineering)
Information Technology Ph.D. (School of Information Technology and Engineering)
Interdisciplinary Studies M.A.I.S. (Individualized Study Degree Programs)
Law J.D. (School of Law)
Mathematics M.S. (Mathematical Sciences)
Music M.A. (Music)
Nursing M.S.N., D.N.Sc. (School of Nursing)
Physical Education M.S. (Health, Sport, and Leisure Studies)
Psychology M.A., Psy.D. (Psychology)
Public Administration M.P.A., D.P.A. (Public Affairs)
Reading M.Ed. (Curriculum and Instruction)
Secondary Education M.Ed. (Curriculum and Instruction)
Sociology M.A. (Sociology and Anthropology)
Software Systems Engineering M.S. (Information Systems and Systems Engineering)
Special Education M.Ed. (Curriculum and Instruction)
Statistical Sciences M.S. (Department of Operations Research and Applied Statistics)
Systems Engineering M.S. (Information Systems and Systems Engineering)
Telecommunications M.A. (Director of Telecommunications)

Certificate Programs

Community College Education
Gerontology
International Nursing
Nursing Administration
Nursing Education
Software Systems Engineering
Teaching of English as a Second Language
Translation

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: semester credit hours
   - Second number: hours of lecture/seminar per week
   - Third number: hours of laboratory/studio per week

2. For independent study, reading, topics, or similar courses, individual instructors set hours.

Graduate

1. Courses numbered 500 and above are graduate courses.

2. Courses are occasionally renumbered by departments. Additional credit is not permitted for a course under a different number if all requirements have been completed and a satisfactory letter grade has been earned in the course under its original number. For one year after the change the new number is accompanied by the old number in parentheses. Thus, 791 (591) means that the old course number was 591, and the new course number is 791. Students also may check with the department offering the course work to be certain that they are not repeating a graduate course for which they already have credit.
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 Graduate School, they may take these courses for reserve graduate credit.
- **600-699**: Open only to graduate students (admitted to master's or doctoral programs) and to other bachelor's degree holders.
- **700-799**: Master's level graduate courses open only to graduate students (admitted to master's or doctoral programs).
- **800-899**: Doctoral level graduate courses open only to graduate students admitted to study in doctoral programs.

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 Arts in Education program.
- **998**: Doctoral project research.
- **999**: Doctoral dissertation research.
- **790, 890**: Supervised practicum.
- **794, 894**: Internship.
- **796, 896**: Directed reading and research courses for master's and doctoral level students.

**Glossary of Course Symbols**

Abbreviations of graduate courses offered by the university:

- Accounting: ACCT
- American Studies: AMST
- Art History: ARTH
- Art Studio: ARTS
- Astronomy: ASTR
- Biology: BIOL
- Business Legal Studies: BULE
- Chemistry: CHEM
- Communication: COMM
- Community College Education: EDCC
- Computer Science: CS
- Conflict Management: CONF
- Dance: DANC
- Decision Sciences: DESC
- Economics: ECON
- Education: EDUC
- Education: Administration/Supervision: EDAS
- Education: Elementary/Secondary: EDCI
- Education: Guidance/Counseling: EDGC
- Education: Human Resource Development: EDRD
- Education: Reading: EDRD
- Education: Research: EDRS
- Education: School Psychology: EDSP
- Education: Special Education: EDS
- Electrical and Computer Engineering: ECE
- English: ENGL
- Finance: FAN
- Foreign Language: FRAN
- French: FREN
- Geographic and Cartographic Sciences: GECA
- Geology: GEOL
- German: GERM
- Government and Politics: GOVT
- Health Education: HEAL
- History: HIST
- Information Resource Management: IRM
- Information Systems: INF
- Interdisciplinary Studies: MAIS
- Management: MGMT
- Marketing: MKTG
- Mathematics: MATH
- Music: MUSI
- Nursing: NURS
- Operations Research: OR
- Philosophy and Religious Studies: PHIL
- Physical Education: PHED
- Physics: PHYS
- Psychology: PSYC
- Public Administration: PUAD
- Public Affairs: PUAF
- Sociology: SOCI
- Spanish: SPAN
- Statistics: STAT
- Software Systems Engineering: SWSE
- Systems Engineering: SYST
- University: UNIV

**Educational Centers**

**American Society of Cybernetics/ The Cybernetics Center**

ASC members include social scientists, cyberneticians, mathematicians, computer systems specialists, and others professionally involved in cybernetics, which is the analysis of the flow of information in electronic, mechanical, and biological systems. Located in the Decision Sciences Department, the Cybernetics Center is committed to providing educational and research opportunities in this interdisciplinary field.
to applying cybernetics to practical problems of business, system design, and public policy. The center also publishes the journal Cybernetics.

Center for Applied Research and Development in Education (CARD)
Founded in 1987, the center is supported by the College of Education and Human Services and school divisions in Northern Virginia. The center is establishing networks among teachers, principals, and administrators, and is developing forums based on research and development topics. The goal is to develop collaborative projects and activities in schools across Northern Virginia from a range of funding sources. The center plans to work with other George Mason centers contributing to the improvement of schooling.

Center for Artificial Intelligence
The center conducts basic and experimental research on fundamental problems of artificial intelligence and cognitive science, and applies the developed methods to a variety of real-world problems. Major research topics include machine learning and inference, cognitive models of human plausible reasoning, computer vision, second generation expert systems, and intelligent autonomous robots. The center has extensive state-of-the-art research facilities.

Center for Basic and Applied Science
Affiliated with the Geology Department, the center applies natural science to solving environmentally related problems. The center has sponsored two conferences on indoor radon, is conducting a regional survey of radon in homes, performs geochemical rock analyses for the Virginia Division of Mineral Resources, and is investigating the liquefaction of Virginia coal. The center is developing videotaped instructional material for libraries, television broadcast, and corporations.

Center for Behavioral and Cognitive Studies
Housed in the Psychology Department, the center carries out research, teaching, and service activities in areas related to developing human resources and enhancing human performance. Basic and applied research concentrates on selecting and training personnel in organizations, measuring performance in complex systems, improving human-computer interaction, determining factors in effective leadership and management, improving human reliability in complex systems, information processing and decision making, and developing and evaluating health-related motivational and educational programs. The center sponsors conferences focusing on the applications of behavioral sciences to national and social issues.

Center for Bilingual/Multicultural Teacher Preparation
The center trains bilingual and ESL teachers for service in linguistically and culturally diverse classroom settings to work with students of limited English proficiency. The center participates in 11 degree programs, from undergraduate to doctoral, and nondegree graduate teacher certification. Housed in the Department of Curriculum and Instruction, the center works with the Department of English and the Department of Foreign Languages and Literatures.

Center for Community College Education
The center brings the intellectual resources of the university to serve the needs of community colleges. The activities of the center focus on three areas: teaching, research, and professional development. The center offers a doctor of arts degree and a graduate certificate in community college education.

Center for Computational Statistics and Probability
The center is an interdisciplinary research center focusing on the relationship between statistical science and computing science. Research projects include computer-based graphical display methods for depicting large, multivariate statistical data sets; stochastic methods for tasking multiprocessors in parallel computers; signal processing; and methods for treating imprecision and uncertainty in expert systems.

Center for Conflict Analysis and Resolution
Affiliated with the Sociology and Anthropology Department, the center has three objectives: to continue to offer a master of science degree program in conflict management that trains professional conflict intervenors to mediate disputes at all levels of society, interpersonal to international; to demonstrate the potential of conflict management by developing community, state, national, and international programs; and to establish a resource base of knowledge, research, institutions, and individuals adept at specific problem solving. The center offers a Ph.D. in conflict analysis and resolution.
Center for Economic and Social Education
One of five centers affiliated with the Virginia Council on Economic Education, the center dispenses information about economics and other social studies to elementary and secondary school teachers and administrators. The center maintains a lending library and provides educators with consultations, research reports, and inservice courses and programs.

Center for Government, Society, and the Arts
Encouraging research and academic programs that explore the reciprocal relations, past and present, between government, society, and the arts, the center acts as a clearinghouse for information on current programs and studies, and fosters scholarly, artistic, and educational projects. A primary resource is the Institute on the Federal Theatre Project (FTP) and New Deal Culture (see listing).

Center for Health Promotion
Working with area citizens, businesses, health professionals, and health-related organizations, the center offers technical assistance on health issues and disease prevention in Northern Virginia. It also sponsors health and fitness programs for community residents of all ages, in addition to consultations, classes, and workshops on AIDS, substance abuse, nutrition, and stress management. The center is affiliated with the Health, Sport, and Leisure Studies Department.

Center for Human Disabilities
The center helps disabled individuals improve their skills and productivity through training opportunities. Center activities primarily include technical assistance, technology improvement, and positive training approaches. Other activities include research, policy analysis, and the development of model programs such as the Community Supported Employment Project.

Center for Interactive Educational Technology
Established by the College of Education and Human Services, the center promotes research and development in the use of advanced technology in education and training. The center oversees two microcomputer labs that support undergraduate and graduate educational technology programs, and supports a number of technology initiatives, including a computer-based training laboratory now being developed. The center is also the university's representative in the Research Consortium of the Smithsonian Institution's National Demonstration Laboratory for Interactive Technologies.

Center for Interactive Management
The center stresses the application of technology to organizational management, with an emphasis on the solution of complex management problems. The top priority is to provide a management service that assists clients in resolving problems that resist conventional solutions. In addition, the center conducts research aimed at new and advanced forms of computer-assisted participative management, and integrates field experience into classes, seminars, and training courses.

Center for Middle East Studies
Through its 42-hour undergraduate degree program in Middle East Studies, the center promotes a comprehensive examination of the art, culture, history, religions, and politics of this region. The program prepares students as Middle East specialists for careers in teaching, foreign service, and international charitable and educational institutions. Throughout the year, the center generates research on the Middle East and sponsors conferences and lectures featuring authorities in the field. It is affiliated with the Public Affairs Department.

Center for Outdoor Education
Affiliated with the Department of Health, Sport, and Leisure Studies, the center provides nature/cooperative education programs and environmental and recreational studies. Located on 420 acres in Hemlock Overlook Regional Park in Fairfax County, the center serves as a conference-retreat site and offers a summer camp for youngsters. Facilities include five dormitories with 100 beds, a dining hall/lodge seating 150, four conference rooms, and a team development course.

Center for Parallel Computation
The center provides a dedicated environment for developing, understanding, and using multiprocessor systems. Specific objectives of the center are to serve as a knowledge base in the area of parallel computing, to develop and test special purpose applications of parallel computing, and to perform fundamental research on algorithms, languages, and architectures for parallel computing.
Center for Productive Use of Technology
The center promotes a more effective use of information resources by conducting research and providing consultative support in such areas as technology transfer, technical information networking, and knowledge diffusion and use. It is located at the Arlington Campus.

Center for Real Estate and Land Use Analysis
Affiliated with the School of Business Administration, the center supports the SBA’s real estate and urban development program. Self-supporting, it promotes faculty research, sponsors seminars, and funds student research and class projects.

Center for Recreation Resources Policy
Established by faculty members of the Department of Health, Sport, and Leisure Studies, the center sponsors research, service, and training for natural resource agencies such as the Fairfax County and Northern Virginia Regional park authorities, the Virginia Commission of Game and Inland Fisheries, and the National Park Service. The center conducts policy-related research and is a clearinghouse for information on recreational policy and law. It conducts an annual training symposium called the MEGA Institute and hosts the Federal Recreation Roundtable.

Center for Robotics and Control
Located in the School of Information Technology and Engineering, the center promotes and conducts research and trains graduate students. Research projects are adaptive control via expert systems, failure detection in complex systems, applications of knowledge-based systems in computer-aided control design, use of Kalman filtering in tracking multiple aircraft, adaptive control of lightweight robots with unknown payload weight, evidential reasoning for robot perception and motion planning, intelligent control of dexterous multifingered hands, and sensor fusion for C3 systems.

Center for Study of Public Choice
Based on the “public choice” economic theory developed by executive director James Buchanan and former economics professor Gordon Tullock, the center applies scientific economic methods to the “public choice behavior” of voters, party leaders, lobbyists, politicians, and bureaucrats. It also encourages education and research programs in public choice theory, publishes research results, and, where relevant, formulates proposals for basic institutional-constitutional reforms based on such research. The center is affiliated with the Economics Department.

Center for the Study of Constitutional Rights
This center examines the formation of the Bill of Rights and how George Mason of Gunston Hall influenced its formation. Established in 1981 as the Project for the Study of Human Rights, the center coordinates an annual lecture series, “The Legacy of George Mason,” and publishes these lectures through the George Mason University Press. Past lectures have focused on the histories of states and countries that have established bills of rights, the effects of the First Amendment, and natural law and natural rights. The center is sponsored by Gunston Hall, the Fairfax Bar Association, the George Mason School of Law, the School of Continuing and Alternative Education, the Virginia Foundation for the Humanities and Public Policy, the Alexandria Bicentennial Center, the Northern Virginia Association of Historians, and the departments of History, Public Affairs, American Studies, and Philosophy and Religious Studies.

Center for the Study of Market Processes
Market process economists strongly emphasize “spontaneous order,” the unplanned social order created through voluntary exchange. Based on the theories of the Austrian School of economic thought, the center trains students for careers in academia, government, policy institutions, and business and industry. In addition to publishing a scholarly newsletter, Market Processes, the center’s members conduct research on such topics as free banking, antitrust laws, socialist economic policies, and the economics of law. The center is affiliated with George Mason’s Economics Department.

Center for the Study of Race and Ethnic Relations
Affiliated with the College of Education and Human Services, the center consists of faculty members from all relevant disciplines and a nationwide advisory council. The center has seven basic functions and objectives: initiate a study and inventory of extant knowledge and needed research; continue extant study and research projects; schedule colloquia on relevant problems and their resolutions; formulate interdisciplinary
curricula for the elementary, high school, and college levels; organize local, national, and international conferences; publish scholarly research papers and conference proceedings; and establish a George Mason Award for the Most Scholarly Contribution to Race and Ethnic Relations.

Citizens Applied Research Institute
To stimulate regional interest in research, the institute works with Northern Virginia government, industry, and civic organizations on projects of mutual interest to or at the request of those organizations. The institute is affiliated with the Department of Public Affairs.

The Conflict Clinic, Inc.
An independent nonprofit corporation, the clinic seeks to improve the practice and understanding of cooperative methods of resolving public disputes. The clinic identifies important conflicts, assesses their potential for resolution, and, where appropriate, provides mediation, conciliation, and other services to the disputants, either directly or by arranging for assistance from third parties. Clinic activity, through its affiliation with the Center for Conflict Analysis and Resolution, connects the problems of resolving real life disputes with scholars doing research, testing, and publication of new theories, and with students preparing for careers in conflict resolution.

Educational Study Center
A community outreach program, the center offers psychoeducational evaluations, tutoring, and career counseling to children and young adults in Northern Virginia, while training graduate students enrolled in the Department of Educational Leadership and Human Development’s reading, special education, and counseling and development programs.

English Language Institute
Unique in Northern Virginia, the institute aids foreign-born members of the community by providing intensive noncredit instruction in grammar, reading, culture, history, composition, and communication. Students can also choose elective courses such as word processing, public speaking, and TOEFL preparation.

Entrepreneurship Center
The center promotes the success of small and emerging companies based in Virginia or doing substantial business in the state. The center has both domestic and export programs organized into three areas: (1) incubator programs providing direct company startup assistance through moderately priced office space, partially subsidized professional services, and access to university resources; (2) the Small Business Development Center, housed in the incubator facility, providing individual counseling, training seminars, and information for the small business entrepreneur; and (3) the Entrepreneurship Development program, assisting business growth through increased access to financing and other strategic contacts including the Technology Information Service.

Expert System Research Center
The center promotes research useful to the business communities in Northern Virginia and the Washington, D.C., metropolitan area. Research topics include information requirements analysis and the design, development, implementation, and maintenance of expert systems. Participating in the center are area businesses, government, and nonprofit organizations.

George Mason Institute of Science and Technology
Directed by 45 board members representing the university and Northern Virginia high-tech industry, the institute (GMI) supports student internships, the executive/faculty exchange program, and endowed professorships and research fellowships in engineering and information technology. With donations of more than $1 million in funds and equipment, GMI has helped produce a statewide faculty resource data bank and helped develop high-technology curricula and research projects at George Mason.

History Research Center
The History Research Center is a consolidation of several established projects supporting the historical interests of the university and Northern Virginia. These projects include directing the Northern Virginia Association of Historians (NVAH)—a regional agency with approximately 400 members and 40 organizational affiliations—and producing its monthly newsletter, The Courier of Historical Events. Affiliated with George Mason’s History Department, the center also produces a journal of local history, Northern Virginia Heritage, which has more than 1,000 subscribers, and has helped to establish the George Mason Project for the Study of Human Rights. In recent years, the center has broadened the scope of its project on local oral history and expanded its col-
lection of books and manuscripts on Northern Virginia history and culture.

Indochina Institute
Established as an outreach program to the Indochinese community of the metropolitan area, the Indochina Institute encourages research on Indochina and its refugees; serves as a clearinghouse for information and research; organizes and sponsors conferences, lectures, and workshops; and sponsors the publication of research papers. It is affiliated with the Public Affairs Department.

Institute for Humane Studies
Located at Tallwood House at the northeast corner of campus, the institute is a 25-year-old independent, nonprofit organization dedicated to advancing interdisciplinary scholarship in the humane sciences: ethics; history; economics; psychology; sociology; and moral, legal, and political philosophy. The institute’s goal is to discover, develop, and support scholars and intellectuals who appreciate individual liberty and the classical liberal tradition of natural rights, private property, and free exchange. It accomplishes this goal through a program of seminars and fellowships for undergraduates, graduate students, and faculty members. It is also a clearinghouse of information for its worldwide network of distinguished scholars.

Institute for Resources, History, and Policy
One of two research groups in the center for Government, Society, and the Arts, this institute develops programs and activities in cultural and natural resource policy studies. Growing out of the need to broaden the research possibilities and university support of study on the politics and culture of the 1930s, the institute cooperates with Oregon State University in publishing The Environmental Review.

Institute on the Federal Theatre Project and New Deal Culture
A clearinghouse for information on 1930s culture and politics, the institute coordinates exhibits and discussions of the Depression-era Federal Theatre Project, including programs co-presented with the Smithsonian’s Air and Space Museum and National Museum of American History. The mainstay of the institute is the FTP archival collection, on permanent loan from the Library of Congress, which contains more than 7,000 original stage production scripts, 2,500 radio scripts, 500 posters, hundreds of original stage and costume designs, and photographs of FTP-sponsored, Depression-era theatre productions. In addition, the institute has gathered and organized existing audio tapes on all Works Progress Administration (WPA) arts projects. The institute publishes a newsletter, Federal One, which is mailed to more than 1,000 subscribers.

Law and Economics Center
With the goal of furthering the development of law and economics as intellectually related disciplines, the center seeks to demonstrate the applicability of economics scholarship to legal policy and to relate economics to the substance and procedures of law. Located at the George Mason University School of Law in Arlington, the center offers residential programs that introduce federal judges and law professors to economics. Comparable programs introducing academic economists to law are also offered. In addition, the center publishes Lexicon, a quarterly newsletter listing working papers, lecture series, conferences, and other programs. It sponsors a series of interdisciplinary symposia that explore current topics in law and economics.

Northern BTAP Regional Center
This center is located in the Department of Curriculum and Instruction at George Mason University. Funded by the State of Virginia, the role of BTAP (Beginning Teacher Assistance Program) is twofold: (1) to assess beginning teachers in the classrooms to ensure that they possess certain minimum competencies; and (2) to assist beginning teachers in meeting these competencies. Successful completion of BTAP is required for a teacher to receive a five-year renewable Collegiate Professional Certificate.

Northern Virginia Regional Assessment Center
Supported by grants from the Virginia Department of Education, the center assesses the administrative skills of prospective school principals. Part of a nationwide program developed by the National Association of Secondary School Principals, the center annually trains 24 individuals to assess the skills of 72 candidates for positions in the Arlington, Alexandria, Falls Church, Fairfax, Prince William, Stafford, and District of Columbia school systems.

http://catalog.gmu.edu
Northern Virginia Survey Research Lab
Affiliated with the Sociology and Anthropology Department, the lab examines issues important to Northern Virginians and conducts surveys in regard to regional growth and change. National surveys will also be conducted with focus on the environment, science and technology, and the arts. The lab also serves as a source of expertise in research methodology for faculty and staff.

Northern Virginia Writing Project
A statewide effort to improve the writing skills of Virginia students, kindergarten through university, the Virginia Writing Project has branches at public universities throughout the commonwealth. During the summer, teachers selected from each writing project area attend an intensive five-week program examining problems in teaching good writing skills. Participants demonstrate successful teaching techniques, study research on writing, and write papers. After the summer institutes, the teachers return to their schools and lead seminars for other teachers in their districts.

Project for the Study of Young Children
Through the College of Education and Human Services, the project offers a cognitive-develop­mental program for preschool children and their families. George Mason students and faculty members, Fairfax County public school teachers, and the parents of children enrolled in the program study the children’s educational development. The project promotes collaborative, multidisciplinary research among students and faculty members; provides a program that encourages children’s involvement with their environment by focusing on problem solving, discovery-learning, and cognitive skill development; and provides research and development services. The project is located at Fairfax High School.

Psychology Clinic
Operated by the clinical faculty of the Psychology Department, the clinic offers psychological assessment and psychotherapy services to members of the campus and Northern Virginia communities. Services are provided by faculty and by clinical and school psychology graduate students under professional supervision. The clinic also serves as a site for faculty research.

Self-Care Institute
Affiliated with George Mason’s School of Nursing, the institute brings together professionals from health research, education, and practice to support the advancement of self-care and the understanding of health and illness from the consumer’s point of view.

Small Business Development Center
The center works in cooperation with both public and private sectors to improve the status of private enterprise in Northern Virginia. Funded by the university and the federal Small Business Administration, the center supports the local business community by providing counseling and training to persons starting their own businesses.

Technical Assistance Center #3
A community outreach program, the center serves teachers and other professionals in 10 Northern Virginia school districts who work with handicapped preschool children. TAC #3 offers expertise, materials, and resources, including consultations, workshops, assessment tools, an agency network, parent participation projects, audiovisual materials on handicapping conditions, and programs for motor, physical, language, and self-help skills development. It is sponsored by the College of Education and Human Services.

Technical Assistance Center: Severely-Profoundly Handicapped/Deaf-Blind
Affiliated with the College of Education and Human Services, this center is also a community outreach program but one that aids professionals working with children and adolescents to age 21 who are severely mentally and/or physically disabled, deaf and/or blind. The SPH/DB center offers workshops, assessment tools, parent participation projects, audiovisual materials, and programs for skills development, including vocational and leisure skills. The center also serves teachers of deaf and blind children in the western half of the state, and teachers of severely mentally and physically disabled children in 25 counties.

Writing Center
The center assists students, faculty and staff members, and alumni with writing projects and assignments. Support is provided on a one-to-one or small workshop basis. In addition, ongoing support groups meet twice weekly throughout each semester. The staff is trained in the teaching of writing as a process and guides clients through projects from inception to final draft. All services are free.
Graduate Policies and Procedures
Admission Policies

Admission to the university and acceptance into a particular degree program are competitive. Admission space is determined largely by the availability of resources. Demand for resources is balanced to meet the university's many educational responsibilities. The university, therefore, qualitatively evaluates students and makes selections based on performance and evidence of potential for success.

For an applicant who wishes to obtain a graduate degree, the general university admission requirements are:

1. A baccalaureate degree or equivalent from an accredited institution of higher education.
2. A 3.0 GPA (on a 4.00 scale) or better in the last 60 hours 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.
4. Test scores and letters of recommendation as required by each program.

Departmental admission requirements for a degree student are listed in the catalog under the relevant discipline.

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.

An applicant who is not interested in pursuing a graduate degree program but who wishes to take one or more graduate courses should request nondegree status in the Graduate School. Although the primary mission of the Graduate School is to conduct programs of instruction leading to graduate degrees, a qualified student who has no immediate degree objectives is welcome to the extent that available university and Graduate School resources allow. An applicant requesting nondegree status must submit a transcript showing that a baccalaureate degree has been earned at an accredited college or university.

Submission of Application

Requests for information about graduate admission, the application for admission, and related forms should be addressed to the Office of Admissions, Graduate Study, 117 Finley Building, George Mason University, Fairfax, VA 22030-4444; (703) 323-2100. An applicant seeking admission to the Graduate School must submit the following:

1. An application form.
2. Two official copies of transcripts from each institution attended, including George Mason University (undergraduate or extended studies enrollment), which must be received directly from the institution by the deadline date.
3. A $20 application fee (nonrefundable).
4. A Virginia Domicile Classification form.
5. Examinations scores (GRE, GMAT, etc.) mailed directly from ETS as required by certain departments (see admission requirements of appropriate program).
6. Letters of recommendation as required by departments (see admission requirements of appropriate program).
7. A notarized Affidavit of Financial Support Form for Foreign Students (J-1 and F-I visas).
8. A student from a non-English-speaking country must complete the Test of English as a Foreign Language (TOEFL) and attain a score of 575 or higher. A TOEFL score of at least 600 is required of teaching and research assistants.

Application Deadlines

Master's Programs:

Fall semester . . . . . . . May 1
Spring semester . . . November 1
Summer session . . . . . . March 1
Graduate Admission Examinations (GRE and GMAT)

Although a number of graduate programs do not require the Graduate Record Examination (GRE), almost all will use such test scores as an additional measurement of an applicant's qualifications. The GRE may be taken in either or both of two forms: (1) the General Test, and (2) the Subject Tests. Some departments require official scores for both the General and the Subject Test. During 1989-90, the GRE will be administered locally and nationally on the following dates:

- October 14, 1989
- December 9, 1989
- February 3, 1990
- April 21, 1990
- June 9, 1990 (General only)

The Graduate Management Admission Test (GMAT) is required of all applicants seeking an M.B.A., M.S. in Accounting, or M.S. in Information Systems. During 1989-90, the GMAT will be administered locally and nationally on the following dates:

- October 21, 1989
- January 27, 1990
- March 17, 1990
- June 16, 1990

Academic Testing in the Office of Admissions administers all academic examinations for the university, including the GRE and the GMAT. Information concerning examinations, test applications, and dates may be obtained from Academic Testing, Room 117 Finley, (703) 323-2525. Applicants also may write directly to GRE, Box 955, or GMAT, Box 966, Princeton, NJ 08540. A telephone number in the Washington, D.C., area for the Educational Testing Service is (202) 659-0616.

Graduate School Foreign Language Tests

Certain graduate programs require students who have not already completed 12 hours of undergraduate credit 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. Information concerning the Graduate School Foreign Language Tests (GSFLT) may be obtained from Academic Testing.

Admission of International Students

International students should apply directly to the Office of Admissions, 117 Finley. They must meet each of the following conditions:

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 documents certifying their previous educational training and attainments. Graduate student applicants' documents should show the award of either a bachelor's degree or equivalent, or a graduate degree. Personal student papers, photostats, or attested copies are not accepted for evaluation. International students may be assessed a fee for the evaluation of foreign transcripts.
3. Students must have completed the Test of English as a Foreign Language (TOEFL) and have attained a score of 575 or higher. A TOEFL score of at least 600 is required of teaching and research assistants. Foreign student applicants with undergraduate degrees from accredited universities in which the language of instruction for the program was English are exempted from this requirement. Information concerning the time and place of the TOEFL can be obtained from Academic

4. After applicants receive a written offer of acceptance, the 1-20 will be provided, upon request, to those requiring an F-1 student visa. International students must enter the United States on a valid student or other visa. Visitor or transit visas are not valid for enrollment at the university. Students sponsored by the U.S. government or their home government are required to enter the U.S. on an Exchange Visitor’s visa (J-1).

5. The U.S. Department of Justice, Immigration and Naturalization Service regulations governing nonimmigrant F-1 students require that international students in this category pursue a full course of study (nine credits for graduate students) while maintaining nonimmigrant student status. Students on J-1 or F-1 visas are required to secure an affidavit of support proving that they have a sufficient amount of money to support themselves for the duration of their study. All students holding a J-1 visa or an F-1 visa are required to carry medical insurance either on their own or through the Office of International Student Services insurance program. International students must meet and conform to all current regulations of the U.S. Immigration and Naturalization Service.

Admission Procedures

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 to the Graduate School

A written offer of admission is made by the Dean of the Graduate School to an applicant who has been accepted. The offer specifies the effective date of admission, the category of admission offered, and the name of the faculty adviser assigned to the applicant. This offer of admission is good for two semesters (one semester for programs in the School of Business Administration), provided the applicant does not take course work elsewhere without prior written permission of the Graduate School. The offer of admission must be accepted by returning an enrollment confirmation card and by enrolling within two semesters. An individual whose offer of admission has lapsed must submit a new application and fee to be reconsidered for admission at a later date.

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. Such an applicant is encouraged to notify the Admissions Office 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 even if they were completed at the university. No admission decision can be made until these grades are received.

Records Maintenance and Disposal

All graduate 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 requirements.

Admission credentials are retained for 24 months only and 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 with respect to the receipt of all official transcripts and test results.

Readmission to the Graduate School

A graduate student whose study at the university is interrupted for any reason for a period of two semesters or more (exclusive of summer sessions) must apply for readmission. Readmission forms are available through the Office of Admissions, 117 Finley. The student is responsible for requesting that the Registrar’s office forward to the Admissions office a recent transcript of all work completed at George Mason University. Since the department chair and the dean of the Graduate School must approve all readmissions, students are encouraged to complete the forms and return
them to the Admissions office no later than one month prior to the anticipated date of registration. A $20 nonrefundable fee must accompany the readmission form. If such readmission is approved, the student is subject to the academic regulations and requirements in effect at the time of registration after readmission. A student who is readmitted may not count the six-year time limit as beginning on the date of readmission. All degree requirements must be completed within six years from the date of initial registration as an admitted (degree or provisional) graduate student.

Extended studies enrollees who wish to apply for graduate admission to the university may do so at any time by following the regular graduate admission procedures.

If a student applies for admission to the Graduate School and is accepted into a degree program, a maximum of 12 hours of graduate credit earned through extended studies enrollment may be applied toward a master's degree program with approval of the graduate dean. The student is responsible for having transcripts of credits earned through extended studies enrollment sent to the Graduate School. After admission to the Graduate School and during initial registration as a degree student, the student is responsible for initiating such a request on a Transfer of Credit Form. If the student also has transferable credit from another institution, the amount of applicable credit earned through extended studies enrollment is reduced accordingly.

Change in Field of Graduate Study

Admission to graduate study is contingent on a recommendation by the department in which the student proposes to concentrate. 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.

Termination of Admission to Graduate Study

A student may submit an application to more than one graduate program, but may be admitted to only one graduate program at one time. Accepting an offer of admission to a second graduate program automatically terminates admission to the first program. Admission also terminates when time limits have been exceeded or when other conditions for the continuation of admission have not been met.

Extended Studies Enrollment

Administered by the School of Continuing and Alternative Learning, the extended studies enrollment procedure allows persons who may need to satisfy prerequisites for graduate admission, or who have no immediate degree objectives, to request enrollment in courses for which they are qualified without seeking admission to the university. Extended studies enrollees are restricted to undergraduate and 500- and 600-level graduate courses. Prospective enrollees are required to supply unofficial evidence of their academic background along with the enrollment request packet to the Extended Studies Enrollment office. Transcripts or grade reports of previous college course work are required prior to enrollment. Credits earned by students as extended studies enrollees are recorded on regular university transcripts.

Guest Matriculant

A graduate student admitted to another graduate school may be given permission to register on a temporary basis as a guest matriculant. This admission as a visiting student is for one semester. A guest matriculant must have been officially admitted as a graduate student at another recognized university and certified by his or her dean as being in good standing. An application form for requesting guest matriculant status may be obtained from the Office of Extended Studies.

Graduate Study During Summer Session

Applicants wishing to begin graduate work in summer must complete a Graduate School application for admission before submitting a summer session enrollment request form. A $20 nonrefundable fee is required with the application for admission. Qualified students may also take graduate summer courses through summer session offerings. Students who wish to complete graduation requirements during summer session enrollment should understand that the university does not necessarily offer all required courses in summer session.

Senior Citizens Enrollment

The School of Continuing and Alternative Learning 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 over 60 years of age with a taxable income of less than
$7,500 are entitled to enroll in courses offered for academic credit on a space-available basis without payment of tuition and fees.

In addition, the act provides for audit of course(s) offered for academic credit and also for enrollment in noncredit course(s) on a space-available basis without payment of tuition and fees, regardless of the taxable income level. Tuition may be charged, however, for courses designed exclusively for senior citizen groups. No senior citizen may change registration status in any given semester once he or she has registered for classes.

**Registration**

**Permission to Register as a Graduate Student**

Registration in the Graduate School is permitted only after the student has been notified of admission by the dean of the Graduate School. During course registration, admitted students are given preference over nonadmitted students if the number of applicants exceeds the enrollment limits. 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, Graduate School, or departmental regulations.

**Academic Advising for Graduate Students**

At the time of admission to graduate study, the student is assigned a faculty adviser by the department 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 adviser. 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 adviser. The graduate student is responsible for compliance with the rules and procedures of the Graduate School and all applicable departmental requirements which govern the individual program of study. Students should consult with their advisers before registration each semester.

**Schedule of Classes and Course Approval Form**

In developing a program of study with the adviser, the graduate student needs to consult the Schedule of Classes, distributed before each registration period by the Office of the Registrar. It provides information about the times and locations of classes, the names of course instructors, the final examination schedule, and procedures for paying tuition and fees. Dropping or adding a course and procedures for making other changes in registration are also outlined in the schedule.

The Schedule of Classes is mailed by the Graduate School to admitted graduate students. A newly admitted student who does not receive the Schedule of Classes in the mail can find one at numerous locations on campus. Continuing students can find schedules in their departments, at the information desk in the Student Union, at the information desk in Finley Building, and at the Office of the Registrar. Courses listed in the Schedule of Classes are withdrawn when enrollment is insufficient. The university reserves the right to change the class schedule and to adjust individual section enrollments as necessary.

The Schedule of Classes also contains the Course Approval Form to be used at the time of registration. For each registration, the student, consulting with the adviser, prepares a schedule of courses appropriate to satisfying degree requirements and individual needs. This schedule is then entered on the Course Approval Form. For newly admitted graduate students, the schedule of courses must be approved by the faculty adviser prior to registration.

**Registration Procedures and Information**

The Schedule of Classes contains instructions for registering. Any graduate student who fails to appear for registration within the specified period will not be permitted to register unless the delay can be explained to the satisfaction of the department chair.

After registering, each student is issued a university photo identification card. It must be presented to obtain a library card, 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 mailed. Questions may be directed to the Photo ID office, 323-6372.

Each student is required to notify the Office of the Registrar and the Graduate School of any
change of home address, telephone number, or legal name.

**Student Information**

Before or during each registration period, all students are asked to provide directory and other types of information used in preparing a student's education record and numerous statistical reports. Such information is collected and disseminated in compliance with the Family Educational Rights and Privacy Act of 1974, as amended, which provides that the university maintain the confidentiality of student education records and establish the right of students to inspect and challenge the data maintained in those records. Personally identifiable data from a student's education record may be released only to persons described in the Act, including "school officials with a legitimate educational interest."

The university may release directory information to any outside party at its discretion except when a student requests in writing that some or all directory information be withheld.

Category I of directory information includes student's dates of attendance, major(s), full- or part-time status, and awards received.

Category II of directory information includes student's address, telephone number(s), date and place of birth, participation in recognized activities and sports, weight and height (normally given only for athletics), most recent previous institution attended, and other similar information.

Students desiring to withhold directory information from the public should request such withholding in writing from the Registrar's office at the time of registration for a semester or summer session. Since such withholding may prohibit the Registrar's office from providing confirmation of enrollment to prospective employers or even residence address to the student's family, students who are considering such a request should consult the registrar.

Students may inspect their education records and obtain more information about the Privacy Act at the Office of the Registrar. They also may obtain copies of most parts of their records for a nominal fee. Those so desiring should schedule an appointment with the registrar.

**Academic Load**

Graduate students are urged to register each semester for only the number of hours they can successfully complete. A normal full-time academic load is 12 semester hours. The minimum full-time academic load is nine hours per semester during the regular academic year. During the summer, a normal full-time academic load is nine semester hours for the entire session. Permission of the department chair is required to exceed the normal load.

Graduate students are expected to attend all class periods of courses for which they are registered and to meet all course requirements set by graduate faculty.

**Graduate Course Enrollment by Undergraduates**

A student may seek to take a 500-level graduate course either for reserve graduate credit or for undergraduate credit. A maximum of six hours may be earned for reserve graduate credit. Courses numbered 600 and above are closed to undergraduates.

Approval to register for reserve graduate credit (earned credit held in reserve to apply later toward a graduate degree) is normally given only to George Mason seniors within 15 hours of completion of undergraduate study. In addition, this privilege is normally extended only to seniors who have completed a minimum of 12 semester hours at the university, have a cumulative grade point average of 3.00 or better, have successfully completed all prerequisite courses and have a major in the department offering the courses. Permission must be obtained in writing prior to registration. Forms are available in the Graduate School Admissions office. Students are responsible for obtaining all signatures required and for submitting a current transcript with the request.

Approval for reserve graduate credit 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.

Graduate School policy permits undergraduates to enroll in graduate courses numbered 500 to 599 and apply the credit earned toward an undergraduate degree. For details of requirements and procedures see *Graduate Course Enrollment by Undergraduates* in the *Admission* section of the undergraduate catalog.

**Adding and Dropping Courses**

To add or drop a course during the schedule adjustment period, a graduate student must complete a Schedule Change Request Form and submit it at the registration site. Forms may be obtained from the appropriate department, at the Office of the Registrar, or at the registration site.
The last day for adding or dropping a course is two calendar weeks after and including the first day of classes.

Withdrawal from All Classes
Graduate students who are enrolled in one or more courses are considered in attendance until they formally withdraw by submitting an official withdrawal form. Graduate students who drop all courses in any semester must submit an official withdrawal form.

Upon approval by the dean of the Graduate School, graduate students may withdraw from all classes after the drop period without academic penalty, but only for nonacademic reasons that prevent completion of the courses. Graduate students who stop attending all classes after the drop period without the dean’s approval receive F’s in all courses.

Upon withdrawal, the following notation is made on the student’s permanent record: “Withdrawn voluntarily for nonacademic reasons on (date) in the (number) week of a (number) week semester.” A list of the student’s courses follows, together with W grades.

Graduate students withdrawing before the final examinations in any semester or summer session forfeit credit for work done in that term.

The Graduate School may impose enforced withdrawal as a penalty for any fault that prevents the graduate student from fulfilling the purposes of enrollment.

Repeating a Course
A graduate student who has passed a course with a grade of B or better is not permitted to repeat the course. A graduate student may repeat a course in which a grade of C or below has been earned. Permission for repeating the course must be obtained from the department offering the course. Each department establishes procedures for granting permission for repeating a course.

When a course is repeated, all hours attempted are used in GPA calculation toward probation or dismissal, the transcript shows both the original and repeat grades, and only one grade per course may be presented on the degree application.

Auditing a Course
Auditing a course requires the permission of the department chair in which the course is offered. A previously audited course may be taken for credit at a later date. A graduate student may also audit a course previously taken and passed. A graduate student may not change from credit to audit status after the schedule adjustment period. The usual tuition and fees apply to audit status.

Final Examinations Policy for Graduate Courses
Written examinations are held at the end of each semester. No changes may be made in the announced examination schedule unless approved in writing by the chair of the department offering the course.

After consulting the department chair, the individual faculty member may exercise judgment regarding the use of a formal examination at the end of the course.

Absence from examination is not excused except for sickness on the day of the examination, or for other cause approved by the graduate dean. If an absence is unexcused, the grade on the course is entered as F. A student whose absence from an examination is excused may take a special examination within a 10-day period on a date to be arranged between the student and the instructor in charge of the examination. If the examination is not taken within 10 days, the grade on the course is entered as F. A request to take an examination late should be made on a Student Request Form and submitted by the graduate professor to the department.

Grading System
The grading system for graduate credit is A, B (satisfactory), C, F (unsatisfactory). Theses and dissertations may be assigned a letter grade or S (satisfactory), NC (no credit), or IP (in progress). The mark of IN (incomplete) may be given when all course requirements have been completed except for assigned papers or reports which the student has been compelled to postpone for reasons beyond the student’s control. Regulations concerning incomplete marks may be found under the section Change of Grade.

Grade points for each semester hour are assigned on a scale of 4 for A, 3 for B, 2 for C, and 0 for F. A grade point score is computed by multiplying the value of the letter grade by the number of credits for the course. As an example, a student receiving an A in a three-semester-hour course earns 12 grade points. Dividing the number of grade points earned by the number of semester hours attempted gives the GPA. (Note: The marks of S, NC, and IP have no grade points associated with them and hours with such marks are not included in GPA computations. NC and IP have no negative impact on a student’s record.)
A grade point average does not appear on the transcripts of graduate students.

Each faculty member is responsible for preparing course examinations and determining grades.

Policies concerning the weight given to examinations in computing final grades and the kinds of examinations used may differ according to the preferences of individual instructors.

Grade reports are sent to the student and to the adviser each semester in which the student is registered, including those in which the student withdraws. The report includes all courses for that semester and the grades received, the cumulative hours of satisfactory grades, and the cumulative hours of unsatisfactory grades.

**Change of Grade**

Final grades in courses for graduate credit may be changed only on the basis of the following two circumstances and procedures.

Change from Incomplete and In Progress to Letter Grade. For cause beyond reasonable control, a student may be unable to complete a course on schedule. In such cases, the instructor may assign a temporary grade of Incomplete (IN). If the student fails to complete all requirements in time for the instructor to assign a regular grade by the last day of classes of the next semester (excluding summer session), the mark of IN is changed by the registrar to F. The student is responsible for submitting work to the instructor with sufficient time for its evaluation.

While the mark of IN remains on the transcript, it is treated as an unsatisfactory grade and may contribute to dismissal. A mark of In Progress (IP) is used for courses numbered 999, 998, 799, 798, internship courses, and some other courses until such time as all course work is completed. IP is not treated as an unsatisfactory grade, nor is it subject to the time limit prescribed for IN. Note that IP can be changed to any regular grade, with one exception: when comprehensive seminars or other such registrations are repeated through successive registrations, then only the final registration receives a grade. The previous IPs remain unchanged in such cases.

Change of Final Grade. Once a final grade in a course has been recorded by the registrar, it can be changed only in cases of computational error or other justifiable cause approved by the graduate dean. (Refer to Challenge of Grade.) All changes of final grades must be initiated, approved, and recorded prior to the last day of classes of the next regular semester (excluding summer session).

**Challenge of Grade**

Although generally the individual faculty member must be the best judge of student performance, there may be instances in which a graduate student believes a grade has been assigned unfairly. In such cases the student should ask the professor to reconsider the grade. If the student is not satisfied, an appeal may be made to the department chair, who initiates procedures established by the department. No challenge of a grade is considered after the end of the drop period of the next regular session (excluding summer session).

**Academic Dismissal**

A graduate student performs satisfactorily during any academic period (semester or summer session) in which the student receives a grade point average of 3.0 or higher. A graduate student is dismissed upon accumulating 12 hours of unsatisfactory grades in graduate-level courses. These are minimum standards of academic performance; some programs have higher standards. See the program requirements section. 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.

**Academic Termination**

A provisional graduate student who fails to achieve at least a 3.00 GPA after completing 12 hours of course work 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 hours of unsatisfactory undergraduate course work grades. Graduate and undergraduate grades are not combined in the calculation of hours toward termination or dismissal. However, nondegree students are terminated after the accumulation of 12 hours of unsatisfactory grades in graduate or undergraduate courses combined.

**Change from Provisional to Degree Status**

For a change from provisional status to be considered, a graduate student must have completed 12 semester hours of graduate course work 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. Appropriate admission credentials, such as
transcripts, letters of recommendation, or test scores needed for consideration for a change of status must be submitted to the Graduate School office. Written confirmation from the Graduate School dean 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 master's 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 to the Graduate School in nondegree status may request a change to degree-seeking status within the same program. To do so, the student must secure departmental and Graduate School approval on the Graduate School'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 Graduate School's Transfer of Credit form.

Transfer of Credit for Work Taken Prior to Admission

With the recommendation of the appropriate program faculty and approval of the graduate dean, a graduate student may transfer up to six semester hours of graduate credit earned at other accredited institutions before the student enrolled in the George Mason Graduate School; these credits may be applied toward the requirements for a master's degree. Up to 12 hours of credit may be transferred within the Cooperative Graduate Engineering program and the Master of Arts in Interdisciplinary Studies program. Up to 12 semester hours may be applied toward a doctoral degree. In addition, if a student has earned a master's degree prior to admission to a doctoral program, the number of hours required for the doctoral degree may be reduced. 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 the 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 graduate dean sends students written confirmation of all credits approved for transfer.

Criteria for Transferable Credit

To be accepted for transfer, previous credits must have been earned within six years prior to admission.

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 comparable degree at the institution offering the course. Courses taken within the Consortium for Continuing Higher Education in Northern Virginia and Continuing Education at George Mason must also meet these requirements. Extension and inservice 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 evidence that any courses presented for transfer of credit are applicable to a comparable degree at the institution where the credits were earned. If this information is not on the official transcript, it must be obtained in writing from the appropriate dean at that institution. The graduate dean decides whether work taken elsewhere and presented for transfer credit to a graduate program at the university is acceptable.

Courses at Other Institutions

If a need exists, 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 chair, students may earn up to 6 hours of such transfer credit toward a master's degree or 12 hours toward a doctoral degree. Up to 12 hours of credit may be transferred within the Cooperative Graduate Engineering program. Permission to take a course elsewhere must be secured in writing from the graduate dean prior to registering at the other institution. Forms are available in the Graduate School office. The student is responsible for requesting transfer credit for such courses after their completion and for having an official transcript submitted to the Graduate School office for evaluation of possible transfer of credit.

Permission is not ordinarily given for a student to take courses elsewhere for transfer credit during the semester in which the student is advanced to
Degree Requirements

Requirements Applicable to All Master’s Degrees

Candidates must satisfy all Graduate School degree requirements and all requirements set 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 semester hours of graduate credit.
2. Only graduate-level courses may apply toward the degree.
3. A graduate student may apply up to six hours of C grades in graduate-level courses and must have a grade point average of at least 3.0 on the degree application.
4. A candidate must have completed at least 18 semester hours of graduate-level work at the university after having been admitted to degree status.
5. A candidate must have completed at least 24 semester hours at the university of which:
   a. A maximum of 6 semester hours may be in master’s thesis research (799) or in master’s project research (798);
   b. No more than 12 semester hours may have been earned through enrollment in nondegree status or through extended studies enrollment prior to acceptance in a degree program;
   c. No more than 6 semester hours may be transfer credit for course work taken prior to admission, with credit earned in nondegree status or through extended studies enrollment reduced accordingly (exceptions are noted under individual degree programs);
   d. A maximum of 6 semester hours may be transfer credit taken after admission to the Graduate School;

Applicable Catalog

Master’s degree candidates are subject to the degree requirements in force at the time of their initial registration in degree or provisional status following admission. Degree candidates who have been readmitted following voluntary withdrawal for more than one semester are subject to the degree requirements in force at the time of their initial registration following readmission. All degree candidates have the option of graduating under the degree requirements in force at the time the degree is to be awarded.

Time Limit

A student must complete all requirements for the desired master’s degree 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 readmitted to the Graduate School in the same master’s program may not count the six-year time limit as beginning on the date of readmission.

Foreign Language Requirement

Several master’s degree programs require that a master’s student demonstrate a proficiency in one or more foreign languages as part of the degree re-
quirements established by the program faculty. Such a requirement is listed under the degree requirements for a specific master's degree in the academic program section of this catalog. Certification of the successful completion of the foreign language requirement should be sent by the academic adviser to the Graduate School office.

**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 graduate dean a copy of the thesis proposal, including the names of the master's thesis committee members. The student may enroll in the thesis research course (799) at the beginning of the next semester.

The master's thesis committee is named by the candidate's department chair, who also designates a professor from that department as the thesis committee chair. The committee is appointed after consultation with the candidate and the adviser, and consists of at least three persons, one of whom may be from outside the department.

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

Students selecting the thesis option should obtain from the Graduate School office a copy of the *Guide for Preparing Graduate Theses, Dissertations, and Projects*. 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 hour per semester.

**Thesis Submission**

The original and one copy of the thesis with signed cover sheet must be deposited with the graduate dean on or before the date specified in the Academic Calendar.

**Degree Application**

Master's students who expect to complete all degree requirements in a given semester must secure a degree application from the Office of the Registrar and return it with departmental signatures to the Graduate School office by the date designated in the Academic Calendar. A $15 graduation fee is due when the degree application is submitted. Students who fail to complete degree requirements in the semester for which the degree application was filed must submit a new degree application and another $15 graduation fee by the next appropriate deadline.

**Commencement**

Commencement exercises provide an opportunity for master's candidates and their families to share in the conferral of academic degrees. Degree candidates who do not wish to participate in the formal graduation ceremonies should notify the Office of the Registrar at least six weeks prior to the date of the ceremony.

**Requirements Applicable to All Doctoral Degrees**

Candidates must satisfy all Graduate School 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 requirements that follow apply to all doctoral degrees. A doctoral candidate must:

1. Acquire a minimum of 72 semester hours of graduate credit beyond the baccalaureate degree, with the following limitations:
   (a) No more than 24 semester hours in doctoral dissertation research (999) or doctoral project research (998) combined;
   (b) No more than 12 semester hours of graduate credit earned through enrollment in nondegree status or through extended studies enrollment prior to admission to doctoral degree status;
   (c) No more than 12 semester hours of transfer credit taken after admission to doctoral degree status.
2. Pass a written doctoral candidacy examination as certified by the department.
3. Pass a final oral examination as certified by the department.
4. Submit to the Graduate School office and defend at the time of the final doctoral examination a doctoral dissertation or doctoral project that has been approved by the doctoral supervisory committee, the Graduate School representative, and the graduate dean.

The number of hours required by a doctoral degree program may be reduced if a master's degree has been earned prior to admission.

Applicable Catalog

Doctoral students are subject to the degree requirements in force at the time of their initial registration in doctoral degree status following admission to the Graduate School. Doctoral students who have been readmitted following voluntary withdrawal for more than one semester are subject to the degree requirements in force at the time of their initial registration following readmission. All doctoral candidates have the option of graduating under the degree requirements in force at the time the doctoral degree is to be awarded.

Residence

All doctoral students are required to spend a minimum of two consecutive semesters, not including the summer session, in continuous registration. The doctoral program of study must include a minimum of 36 semester hours of graduate work taken at George Mason University after admission to degree-seeking status.

Time Limit

Doctoral students must complete all degree requirements within five years following the semester of advancement to candidacy. The date of advancement does not change if a student terminates enrollment and later is readmitted to the same doctoral program.

Doctoral Supervisory Committee

At the time that a doctoral student is to be considered for advancement to candidacy (normally by the end of the second year of full-time graduate study), the dean of the Graduate School appoints a doctoral supervisory committee upon recommendation by the department chair. The committee consists of a professor from the department of the student's major and at least two other members of the graduate 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. The professor from the student's major department chairs the committee. The doctoral supervisory committee is responsible for approving the doctoral dissertation and certifying successful completion of the final doctoral examination (which may include a written part in addition to the oral part). In addition, the graduate dean may appoint to the doctoral supervisory committee a member of the graduate faculty, who attends the final doctoral examination.

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 of the Graduate School. 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 for the Doctoral Degree forms are available from each program's doctoral coordinator.

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. A doctoral student should normally be considered for advancement to candidacy by the end of the second year of full-time graduate study.

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 sepa-
rationally 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 dean of the Graduate School, they should have completed all doctoral program examinations required by the program faculty, have been certified in all doctoral research skills required, passed the candidacy examination, and be recommended by the doctoral supervisory committee. Report on Candidacy Examination and Recommendation for Advancement to Candidacy forms are available in the Graduate School office.

Dissertation and Non-Dissertation Options

A dissertation is required for the doctor of philosophy degree and some of the 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 achieved generally through consideration of a problem on the boundaries of knowledge in the discipline.

While no less demanding, some of the professional doctoral degree programs do not require the preparation of a dissertation. These professional doctorates provide candidates with other means of demonstrating their intellectual competencies and personal abilities.

Doctoral Dissertation

The chair of the doctoral supervisory committee is primarily responsible for directing the doctoral candidate's research and guiding the preparation of the written dissertation. After the doctoral supervisory 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 doctoral supervisory committee and sent to the dean of the Graduate School for approval.

The content and format of the doctoral dissertation proposal may be found in the Guide for Preparing Graduate Theses, Dissertations, and Projects, which is available in the Graduate School office. The guide also includes information on the number of copies required, binding, and submission of the dissertation for approval by the doctoral supervisory committee and the graduate dean.

Dissertation Submission and Fee

The original and one copy of the dissertation must be deposited with the graduate dean on or before the date specified in the Academic Calendar. Submission of the dissertation to University Microfilming, Inc. (UMI), is required; a fee of approximately $50 is charged to the student for this process. All copies of the dissertation must be submitted and fees paid before the doctoral degree is awarded.

Any student not in attendance at the university who is preparing a dissertation 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 hour per semester.

Final Doctoral Examination

As soon as all degree requirements have been satisfied, including the completion of the doctoral dissertation (where required), the doctoral candidate may arrange with the doctoral supervisory committee to schedule the final doctoral examination.

The final doctoral examination includes an oral defense of the dissertation when a dissertation is required by the doctoral program. It should also demonstrate the candidate's maturity of judgment and intellectual command of the chosen branches of the candidate's field of study. Some doctoral programs may require, in addition to the oral portion of the examination, a written part as listed under the degree requirements for each doctoral program. Depending on the particular program, a passing or failing mark may be assigned to the oral and written portions independently or to the two together as a single examination.

At the close of the final doctoral examination, the doctoral supervisory committee makes final judgments for approving the doctoral dissertation, which may require some minor changes resulting from the oral defense. The doctoral candidate is responsible for making all required changes promptly, securing the signatures of the director and other members of the supervisory committee, and submitting the original and one copy to the Graduate School office for the graduate dean's approval.

Doctoral Degree Application

At the beginning of the semester in which a doctoral candidate expects to finish all degree requirements, including the final doctoral examination, the candidate should submit to the Graduate School office a doctoral degree application with departmental signatures and pay the $15 gradua-
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, 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:
A. Cheating and attempted cheating,
B. Plagiarism,
C. Lying, and
D. 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 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:
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
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.

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 Procedures 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, within five Honor Committee working days, mails a letter of accusation to the suspected party. This letter is addressed to the accused student's current mailing address listed with the Office of the Registrar.

The Honor Committee retains a copy of the accusation letter, which 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 to be advised 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 which may be given are:

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. Non-academic 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: “Non-academic suspension from (date) to (date).” The recommendation is made to the Associate Provost and Dean for Undergraduate Studies or the Dean of the Graduate School.

G. Recommendation of expulsion from the university: A student’s scholastic record would read: “Non-academic expulsion as of (date).” This penalty is recommended to the Associate Provost and Dean for Undergraduate Studies or the Dean of the Graduate School 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 hearings 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 adviser(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 and vice chair of the committee are elected by majority vote of the committee members. For each hearing, five members of the Honor Committee are designated as voting members.

The faculty hearing adviser, acting as a nonvoting member of the committee, sits with and advises the committee at all hearings. The faculty adviser and faculty hearing adviser 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.
Tuition, Expenses, and Financial Aid
Tuition, Expenses, and Financial Aid

Tuition and Fees

By registering, students accept responsibility for the charges of the entire semester. The basic premises are:

1. Registration is not allowed if a student has outstanding financial obligations to the university.
2. Payments are due at the Cashier's Office on or before due dates (regardless of postmark).
3. Failure to receive a bill does not waive the requirement for payment when due.
4. The Office of the Registrar must receive written notice of withdrawal from students who find they cannot attend classes during the semester for which they are registered.
5. Determination of domicile requires completion of the Virginia Domicile Classification Form available in the Office of Admissions.
6. The entire student registration is cancelled if payment or payment arrangements are not made in full.

Payment and Cancellation Schedule

Pre-registered Students

<table>
<thead>
<tr>
<th>Fall 1989</th>
<th>Spring 1990</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reminder bill mailed</td>
<td>July 12</td>
</tr>
<tr>
<td>Due date</td>
<td>August 2</td>
</tr>
<tr>
<td>Payment accepted with $25 late fee</td>
<td>December 18</td>
</tr>
<tr>
<td>Nonpayment cancellation</td>
<td>January 4</td>
</tr>
<tr>
<td>Close of business</td>
<td>Close of business</td>
</tr>
</tbody>
</table>

Continuing/Late Registration

Students registering on July 10 (November 20) or after will receive a class confirmation schedule showing tuition due at time of registration. The full amount shown must be paid directly to the Cashier's Office on the day of registration. The entire registration will be canceled if payment or payment arrangements are not made for the full amount.

Tuition and Related Fees

<table>
<thead>
<tr>
<th>Tuition Charges Per Semester</th>
<th>In-State</th>
<th>Out-of-State</th>
</tr>
</thead>
<tbody>
<tr>
<td>Full-time (12-17 credit hours) per semester</td>
<td>$1,146.00</td>
<td>$2,538.00</td>
</tr>
<tr>
<td>Per-credit-hour (less than 12 or more than 17)</td>
<td>95.50</td>
<td>211.50</td>
</tr>
</tbody>
</table>

Related Fees

| Application fee | $20.00 | $20.00 |
| Graduation fee | 15.00 | 15.00 |
| Late fee | 25.00 | 25.00 |
| Return check charge | 15.00 | 15.00 |
| Reinstatement fee | 25.00 | 25.00 |
| Withdrawal fee | 20.00 | 20.00 |
| Nonpayment cancellation fee | 20.00 | 20.00 |

On-Campus Housing Costs 1989-90

Room Rental Charges Per Semester

| Apartments | 2-person | $1,750.00 |
| 4-person | 1,550.00 |
| 6-person | 1,375.00 |

| Commonwealth and Dominion University Commons | Single rooms | 1,550.00 |
| Double rooms | 1,375.00 |

| University Park | Townhouses | 1,750.00 |
| Patrick's Village | Single rooms | 1,550.00 |
| Double rooms | 1,375.00 |

| Residence III | Single rooms | 1,550.00 |
| Double rooms | 1,375.00 |

All rates are per person. Four persons are assigned to a two-bedroom townhouse.

Meal Plan Charges Per Semester

| Meals per week | $825.00 |
| 15 meals per week | 750.00 |
| 10 meals per week | 650.00 |

All residents, with the exception of those residing in the townhouses and apartments, are required to have a meal plan.
Payment Methods
WHERE:
Window, Cashier’s Office, 106 Krug Hall, 9:00 a.m. to 4:30 p.m.
Drop Box outside Cashier’s Office, 107 Krug Hall
U.S. Mail, George Mason University, Cashier’s Office, Fairfax, VA 22030-4444

HOW:
Cash: At window only
Check: Payable to GMU, student ID# written on front. Third-party checks not accepted.
Credit card (subject to credit approval): MasterCard or Visa. Daytime phone number must be provided.

For payment information or information on payment plan options, please call the Bursar’s Office at 323-2370.

Payment Plan Options
Installment Payments
Academic Management Services provides installment service or a deferred payment service for GMU students. Students may budget all or part of the annual tuition, room, and board in 10 equal monthly installments. The annual cost is $45 including a Life Benefit Insurance plan. For information, call 800-556-6684 toll free.

Deferred Payments
A deferred contract must be completed at the Bursar’s Office and be submitted to the Cashier’s Office with a down payment (1/2 of contract amount plus fee). The contract fee is $25; minimum contract amount is the cost of 6 credit hours.

Second and third deferred payments are sent directly to Academic Management Services (AMS) and must be received on or before the due date:

<table>
<thead>
<tr>
<th>Fall 1989</th>
<th>Spring 1990</th>
</tr>
</thead>
<tbody>
<tr>
<td>2nd payment</td>
<td>September 13</td>
</tr>
<tr>
<td>3rd payment</td>
<td>October 13</td>
</tr>
</tbody>
</table>

A $25 late fee is assessed by GMU on all payments received late by AMS.

Financial Penalties
Late Fee
Failure to make any payment on or before the due date results in a late charge of $25.

Returned Check Charge
Any check returned to the university by a bank results in a $15 penalty fee for the payer. Students who fail to clear their accounts within five calendar days following notification by the Cashier’s Office are placed on financial suspension without further notice.

Financial Suspension
All academic service is withheld for students who are not in good financial standing with the university. This means that no transcripts of record are issued, no diplomas are released, and no registrations are permitted until outstanding obligations, including the reinstatement fee, have been paid in full.

Reinstatement Fee
Students placed on financial suspension because of outstanding obligations in excess of $50 are assessed a $25 reinstatement fee.

Collection of Accounts
Failure to meet financial obligations to the university may result in the delinquent account being placed with a collection agency, withholding of money from tax returns, and other collection procedures. Students are responsible for any additional costs incurred in collecting delinquent accounts. Fines owed for traffic and parking violations and to libraries of institutions and participating public libraries of the Consortium for Continuing Higher Education in Northern Virginia similarly affect students’ status.

Refunds
Students withdrawing from the university before the beginning of the semester or during the first week of classes may have their tuition refunded, less an administrative charge of $20. Assessed penalties are nonrefundable.

Tuition is refunded on a graduated scale for voluntary drops and withdrawals during the second and third weeks of classes. The calculation of the amount of refund is based on the date of the drop or withdrawal as certified by the Registrar’s Office. Hours dropped after the third week of classes must be paid for in full. To initiate the refund process, the student submits a request to the Bursar’s Office.

Refund Scale:

<table>
<thead>
<tr>
<th>Refund Scale</th>
<th>Tuition</th>
<th>Room</th>
<th>Meal Plan</th>
</tr>
</thead>
<tbody>
<tr>
<td>Week 1</td>
<td>100% less $20</td>
<td>100% less $100</td>
<td>100% less $50</td>
</tr>
<tr>
<td>Week 2</td>
<td>66.7% of total</td>
<td>66.7% of total</td>
<td>66.7% of total</td>
</tr>
<tr>
<td>Week 3</td>
<td>33.3% of total</td>
<td>33.3% of total</td>
<td>33.3% of total</td>
</tr>
</tbody>
</table>

Off-Campus Courses
Students enrolling in off-campus courses are assessed tuition and fees at the same rates as those for on-campus courses.

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Credits Earned Elsewhere
A few George Mason University degree programs include academic credits that students must earn at other institutions. Students enrolling for academic credits at other institutions assume all financial responsibility for these arrangements.

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 prior to the semester for which in-state tuition is sought. A person becomes domiciled in Virginia when legally capable of establishing a domicile and when present in Virginia with the intention of remaining in the state permanently.

Domicile, however, is primarily a question of intent and the burden of proof of domicile is upon the student seeking the benefit of in-state tuition. See the receptionist in Finley Building for a copy of the complete domicile legislation.

Change of Domicile Classification
Students requesting a change of classification from out-of-state to in-state must file the required form before the first day of the semester for which in-state status is sought. Forms are available in the Finley Building reception area.

Penalties
A student who provides false information or refuses or conceals information for the purpose of achieving in-state status, or who fails to notify the university of a change of facts which might affect reclassification from in-state to out-of-state status, shall be required to pay retroactively any tuition and fees that would normally have been charged and shall be subject to appropriate disciplinary action.

Other Expenses
International Student Health Insurance
Health insurance is required for all F-1 and J-1 Visa holders. Health insurance fees are deducted from all payments received by the university before funds are applied to tuition or other charges, which could result in cancellation of classes for nonpayment of tuition.

Lab Cards
Breakage cards are available at the Cashier's Office for $5. Lab cards are required by the end of the second week of class by students enrolled in chemistry laboratory courses. Cost of items lost or damaged are recorded on the card. Unused portions of the card which have been validated by the Chemistry Department may be redeemed at the Cashier's Office no later than May 31, 1990.

Transcript Fee
A $2 fee is charged for the first copy of each transcript of record requested by students, and $1 for each additional copy ordered at the same time. Payment must accompany the request.

Graduation Fee
The university requires a $15 graduation fee. See Application for Degree for more information.

Motor Vehicle Registration Fees
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. Parking Services is in South Chesapeake Module, directly behind Fenwick Library.

Financial Aid
Office of Student Financial Planning and Resources
The Office of Student Financial Planning and Resources provides a variety of services to help students finance their education. These services include financial counseling, referral and information resources, and financial assistance. Student financial assistance consists of grants, loans, and employment. Awards are based on financial need. Located in Student Union Building I, Room 354, the office is open Monday through Friday from 9:00 a.m. until 4:30 p.m., and Tuesday until 8:00 p.m.

To apply for financial aid, each year new and currently enrolled students must complete a Financial Aid Form and forward it to the College Scholarship Service in Princeton, New Jersey, four weeks prior to the application deadline. The application deadlines for consideration of federal and most of the state funds are as follows:

1990-91 Academic Year
First Year Graduate Students March 1, 1990
Returning Students May 1, 1990
Summer 1990 April 1, 1990

Applications received after the deadline are evaluated according to the availability of funds.

The university administers federal, state, and other aid programs as outlined below.
Federal Programs

The Perkins Loan
Long-term, 5 percent interest loans from the federally sponsored Perkins Loan Program are available to qualified students. Repayment begins six months after graduation and may be deferred for students entering graduate school, the Peace Corps, VISTA, or military service. Repayment may be deferred three years for those temporarily disabled. Students must be enrolled at least halftime to qualify. Half-time is defined as 6 credit hours for both undergraduate and graduate students.

Stafford Student Loan Program (SSL)
Students must demonstrate need through the Financial Aid Form and be enrolled in a degree program at least 6 hours to qualify. Eligible students may borrow up to $7,500 per graduate grade level up to a total of $54,750 (including $17,250 of undergraduate SSLs). The government pays the 8 percent interest until the repayment period begins six months after the student leaves school. Interest remains at 8 percent through the fourth year of repayment and increases to 10 percent beginning the fifth year of repayment.

Supplemental Loan Program (SLS)
SLS is an additional form of financial aid to be used in conjunction with or in lieu of the Stafford Student Loan (GSL) program. SLS loans are available to students who are ineligible for the GSL program or need funding above the GSL amounts. This program can aid middle-income families and others who are not able to meet the cost of education through grants, scholarships, GSLs, and other financial aid programs. This is a non-need program, so anyone may participate. For specific information, contact the Office of Student Financial Planning and Resources.

Graduate Assistance

Graduate School Fellowships
George Mason University annually awards a limited number of University Fellowships. They are funded by the Commonwealth of Virginia and can be awarded in any department. The awards, based on merit, are intended to encourage and assist superior students in completing graduate studies in the shortest time possible. All recipients must enroll in full-time study. Applications must be submitted to the Graduate School for review by the department of the student's major. Prospective graduate students must also have filed an application for admission to the Graduate School. For further information and an application, contact the Graduate School office at (703) 323-2124.

Outside Scholarships and Fellowships

Woodrow Wilson Foundation
The Woodrow Wilson Foundation provides funds for graduate fellowships to students planning college teaching careers in a liberal arts field. Seniors interested in applying for such grants as they become available must be nominated by one of their professors in October. Consult the departmental adviser or the Woodrow Wilson campus representative for further information.

Zonta Scholarship
The Zonta Club of Fairfax offers a scholarship to a woman admitted to the Graduate School for study leading to a profession. The field of study and the amount of the award varies. Consult the Graduate School office for information and an application.

Other Fellowships and Grants
The American Association of University Women, the National Research Council, and other organizations administer graduate fellowships and grants. Contact the Office of Student Financial Planning and Resources.

State Nursing Scholarships
The Bureau of Public Health Nursing provides limited scholarships to Virginia residents. These scholarships are based on need and are available to graduates and undergraduates. Applications are made directly to the Bureau of Public Health Nursing. The application deadline for students previously enrolled in a nursing program is March 1. The deadline for new students entering a nursing program is June 1. Applications are available in the Office of Student Financial Planning and Resources.

Virginia Programs for State Residents

Graduate Assistantships
The Graduate School offers a number of graduate teaching and research assistantships in departments with graduate programs. Assistantships are awarded on a non-need basis. A student holding an assistantship must be in degree status and must take at least six semester hours of graduate credit each semester. Stipends ranged from $5,300 to $10,000 for the 1988-89 academic year. Application for a graduate assistantship should be made to the chair of the department involved. For further information and an application contact the Graduate School office at (703) 323-2124.

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Inservice Training Program for Teachers
Candidates for graduate degrees may establish eligibility to receive state funds for graduate study closely related to their field of work through one of the state's division superintendents of schools. Candidates may use the funds to enroll at the university in previously approved courses.

Emergency Loan Program
Mary E. Ferguson Emergency Loan Program
Currently enrolled students may borrow funds for legitimate emergencies. Tuition and fees, books, and supplies are not considered emergencies. Emergency loans must be repaid within 30 days; overdue payment results in a late charge of $5. Failure to repay the loan within 30 days, without requesting an extension for a reasonable excuse, will result in financial suspension. Students financially suspended for nonpayment of an emergency loan are ineligible for any future emergency loans.

Veterans Services
Veterans Educational Benefits
Students eligible for Veterans Educational Benefits while attending the university must contact the Office of Veterans Services. The following actions are required:

1. Veterans, active duty, and reserve personnel who have never received benefits must apply on Form 22-1990. The application should be turned in to the Veterans Services office on campus with a certified copy of the student's DD-214 (where applicable).
2. Students who have received benefits from another school or who are changing either their type of program or course objectives must fill out form 22-1995 — Request for Change of Program or Place of Training.
3. Veterans' dependents who receive educational benefits under Chapter 35 of Title 38 USC must establish eligibility with the Veterans Services office. They should fill out form S490 or S495. The office then sends the paperwork to the Veterans Administration with the school certification.
4. Students must request the veterans' counselor to send an enrollment certificate to the Veterans Administration Regional Office each school year (each semester if the students are under half-time, on active duty, or in continuing education). Students must apply separately for a summer session. Students in continuing education will be certified for no more than two semesters while the GMU application is pending.
5. Students are responsible for notifying the Veterans Services office on campus of any change in status. Such changes include:
   a. adding or dropping courses
   b. change in marital status
   c. addition of a dependent
   d. change of address (notify VARO immediately)
   e. withdrawal from school (notify immediately)
Forms for making these changes are available at the Office of Veterans Services in Room 355 of Student Union I.
6. VA benefits are paid on the following basis:

<table>
<thead>
<tr>
<th></th>
<th>Undergraduate</th>
<th>Graduate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Full time</td>
<td>12 hours</td>
<td>9 or more hours</td>
</tr>
<tr>
<td>3/4 time</td>
<td>9-11 hours</td>
<td>6, 7, 8 hours</td>
</tr>
<tr>
<td>1/2 time</td>
<td>6-8 hours</td>
<td>4, 5 hours</td>
</tr>
<tr>
<td>less than 1/2 time</td>
<td>less than 4 hours</td>
<td>less than 3 hours</td>
</tr>
<tr>
<td>more than 1/4 time</td>
<td>less than 4 hours</td>
<td>less than 3 hours</td>
</tr>
</tbody>
</table>

Students on active duty and those taking fewer than six undergraduate hours are paid either tuition and fees or the rate set for the training time, whichever is less. Books and supplies are not included. Benefits are not payable for ENGL 101 or 102 when a no-credit grade is received. The Veterans Administration does not pay for audit courses.

Public Law 98-525 established a new GI Bill (Chapter 30) and also a new educational assistance program for members of the Selected Reserve (Chapter 106). Details may be obtained from the Veterans Services Office on campus.

Tutorial Service for Veterans
The VA will pay $84 per month, not to exceed $1,008 per year, for needed tutorial services. For further information, see the Veterans Office on campus.

Virginia War Orphans Education Program
The Virginia War Orphans Program provides educational assistance to children of qualified veterans. To be eligible an applicant must meet the following requirements:

1. The applicant must be between the ages of 16 and 25.
2. The applicant's parent must have served in the armed forces of the United States and must (a) be totally disabled due to an injury or disease incurred in a time of armed conflict; or (b) have died as a result of injury or disease incurred in a time of armed conflict; or (c) be listed as a prisoner of war or missing in action.
3. The applicant's parent must have been a resident of the Commonwealth of Virginia at the time of entry into active military duty, or must have been a resident of the state for at least 10 consecutive years immediately prior to the date of application.

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4. The applicant must provide written verification of acceptance as a student in a state-supported post-secondary school.

Eligible individuals are entitled to a maximum of 48 months of tuition-free education at a state-supported educational institution. For more information, contact the Office of Veterans Services.
Student Life
Student Life

Student Support Services
George Mason University provides many support services designed to enhance the college experience and enable students to take full advantage of the university's educational and personal enrichment opportunities.

Student Unions
The two student unions are the center for most nonacademic activities. Student Union I houses offices of student service coordinators and student organization offices, as well as a large lounge area, a mini-mall, a game room, a bank, a rathskeller, and food services. In Student Union II are a bookstore, cash and contract cafeterias, and meeting rooms.

Other Recreational Facilities
The Patriot Center, a 10,000-seat arena completed in 1985, is home to the university's varsity sports, as well as a center of activity for Northern Virginia. Large gatherings such as commencement are held there, as are community activities and recreational events. Among 1988's Patriot Center events were the McDonald's American Cup Gymnastics, the Moscow Circus, and the Chicago rock concert.

The Harris Theatre produces smaller-scale events and performing arts activities. In addition to concerts and plays staged by the university companies, an International Arts Festival featuring professional performers is held in the theatre each year.

Facilities of the Sports and Recreation Complex are available at no charge to university students. These include indoor and outdoor tracks and playing fields, a weight room and sauna, and other sports facilities.

Student Health Center
Personnel in the Student Health Center treat minor illnesses, administer first aid, and dispense nonprescription medications. They also provide referral services to outside health resources, offer information and counseling on matters of hygiene, and assist in the administration of a program of health and accident insurance and a student dental plan. Pregnancy tests, throat cultures, and mononucleosis spot tests are performed for a minimal fee. Abortion counseling and referrals are also offered. During the academic year, the health center emphasizes preventive health care and health education.

The staff includes a director, one full-time nurse, a part-time nurse, a health educator, and a consulting physician. The Student Health Center is on the Fairfax Campus in Student Union I, Room 232 (323-2584).

Health Insurance and Dental Plan
All students of George Mason University are eligible, on a voluntary basis, to enroll in the university-endorsed Accident and Sickness Health Insurance Plan and the university-sponsored dental plan made available through DENTICARE of Virginia.

The health insurance policy includes provisions for major medical coverage, outpatient laboratory fees and x-ray coverage, as well as the usual provisions for hospital room and board and surgical expenses. At minimal cost, this policy covers the insured student 12 months per year, 24 hours per day, worldwide, at the university or elsewhere. For a minimal fee per year, the dental plan provides x-rays, teeth cleaning, and office visits at no charge and various dental procedures such as fillings, crown and bridgework, and root canal therapy at reduced costs.

Health insurance brochures, enrollment applications, and claim forms, as well as dental plan information, may be obtained at the Student Health Center, Student Union I, Room 232, (703) 323-2584.

Services to Disabled Persons
Students with disabilities, including learning disabilities, have access to a wide range of services and assistance. Students who require special con-

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sideration in curriculum, assignments, or testing must provide documentation of the disability. Therefore, students are advised to obtain existing documentation and forward it to Disabled Student Services. Please contact the Adviser to Disabled Students at (703) 323-2523 (Voice/TDD) for more information.

Housing

The university has on-campus housing for 2,500 students. Several types of housing are available including residence halls, apartments, and townhouses. Commonwealth and Dominion halls each house 250 residents in double occupancy rooms. The student apartments complex consists of nine three-story buildings that contain 121 apartments and house 500 residents. The Patriot Village complex consists of 29 buildings that house 390 residents. University Commons is an eight-building complex accommodating 500 students. University Park Townhouses is a 36-unit complex located a quarter mile from the Fairfax Campus. A new complex opening in fall 1989 will house 500 students.

See Housing Costs under the Tuition, Expenses, and Financial Aid section of the catalog. For complete information about the university's on-campus housing, write or call the director of Housing and Residential Life, (703) 323-2354. The Office of Housing and Residential Life will also supply information about off-campus housing.

Counseling Center Services

The Counseling Center is staffed by professional counselors who help students reach their academic, social, and personal goals. Counselors assist students in making appropriate choices concerning education and work, developing effective study skills, and learning to manage personal problems that interfere with learning.

Services are available at no charge to all university students. The main office is in Room 364, Student Union I, and is open Monday through Friday from 8:30 a.m. to 5 p.m., and Tuesday and Wednesday evenings. For information about the following Counseling Center services, or for assistance, call 323-2165: mental health services; learning services; self-assessment; black peer program; re-entry program; consultation; training and supervision; and referral to other mental health practitioners.

The university Counseling Center is accredited by the International Association of Counseling Services. All services to students are confidential and no information is released without the student's written consent.

Career Development Center

The Career Development Center provides career counseling, career information, cooperative education, part-time and full-time job listings, and job hunting assistance to students and alumni. The office, located in Room 348 in Student Union I, is open Monday through Friday from 8:30 a.m. until 5 p.m. and on Tuesday and Wednesday evenings during the fall and spring semesters. For information call 323-2476. The following major program areas are offered:

Career Counseling. In individual counseling sessions and workshops, students learn a career-planning, decision-making process that can be used throughout their lives. Thorough self-assessment of personal interests, skills, values, and motivations is emphasized prior to researching appropriate majors and relevant career opportunities. Counselors are also available to assist students with various aspects of their job search.

Career Workshops. Workshops are offered on the following topics: Career Identification, Exploring Majors and Careers, Adult Career Planning, Applying to Graduate/Professional School, Job Hunting Strategies, Resume Writing, and Interviewing Skills. Check the Career Development Center brochure for a workshop schedule and program descriptions. Evening programs are available.

Career Resource Library. This specialized library contains information on career fields, graduate and professional schools, government employment, researching employers, and job hunting. SIGI Plus, a computerized career guidance system is available to assist in career exploration. Videotapes and handouts on career planning and job hunting topics are also available in the Career Resource Library.

Cooperative Education. Cooperative education is a program that provides qualified students with professional-level, progressively responsible, paid work experience in positions related to their majors. Two calendar plans are available: the preferred traditional plan, in which students alternate periods of full-time work with periods of full-time study, and the parallel plan in which students attend school full time and work part time. Positions are open to both undergraduate and graduate students in all disciplines. Participation is recognized by the university through notation of the work assignments on academic transcripts. Orientation sessions are scheduled weekly to provide more complete information.

Internships. Internships can provide students with project-oriented experiences relating to their academic and career interests. Student employ-
ment assistants with the Employment Referral Service (ERS) provide a referral service to students interested in paid internships. Both paid and non-paid internship information is available in the Career Resource Library and is posted on the job board. Internship opportunities are also forwarded to the appropriate academic departments.

**Job Center.** Students registered with the center receive job referrals on part-time professional jobs, internships, summer jobs, and other part-time jobs for a three-month renewable period. Job listings are posted on the bulletin board directly outside the Career Center.

**On-Campus Interviews.** During the fall and spring semesters, employers conduct interviews on campus for full-time career positions. Graduating students and alumni can participate by first attending an orientation session, completing a registration form, and submitting it with a copy of their resume. A schedule of employers is available at the beginning of each semester.

**Job Leads.** Graduating students and alumni can register to receive weekly bulletins of full-time job vacancies. Job notices are also filed in the Career Resource Library and posted on a job bulletin board outside the office.

**Credentia l File.** Graduating students and alumni may establish credential files containing references, resumes, and course listings to support application for employment or graduate school.

**Veterans Services**

The Veterans Coordinator in the university’s Office of Veterans Services assists veterans, service personnel, dependents, and survivors in obtaining authorized educational benefits. The office helps veterans adjust to university life. Located in Student Union I, the office is open Monday through Friday from 8:30 a.m. to 5 p.m., and two days a week until 7 p.m. during regular semesters. (Late days vary. Check with the office at 323-2381.)

**Minority Student Services**

Minority Student Services is an administrative office that coordinates the university’s planning and programming for ethnic minority students. The office staff works with minority students to help them understand their academic needs and then find appropriate ways to meet those needs. The office also participates in an ongoing evaluation and assessment of the impact of university policies and procedures on minority students. Minority program initiatives are designed to stimulate multi-cultural understanding and create an educational atmosphere in which minority students will be successful. Minority Student Services is in Student Union I, Room 352, (703) 323-2383.

**Campus Ministry**

The Campus Ministry is an ecumenical group available on campus to assist students, faculty, and staff. The ministry includes religious counseling, Bible study, worship services, social-action opportunities, education programs, social activities, seminars, retreat weekends, and fellowship gatherings.

The Campus Ministry offices are in Student Union I, Rooms 207 and 229, and are open daily for discussion and assistance of any kind. For more information, call 323-2160 or contact the individual ministries: Assemblies of God (323-2160); Baptist (323-3848); Episcopal (323-4217); Greek Orthodox (671-1515); International Students (830-3483); Jewish (323-3848 or 301-468-3422); Mormon (323-2160); Navigators (323-2160); People of the World (323-2160); Roman Catholic (323-4218 or 425-0022); United College Ministries (820-2144); Muslim (476-0519 or 471-1133).

**International Student Services**

The Office of International Student Services is responsible for all matters pertaining to U.S. immigration law concerning the university, for example, admitting international students, helping students maintain their immigration status, and hiring international personnel. ISS seeks to foster the intellectual, cultural and personal development of international students and scholars during their time at GMU and in the United States.

Services consist of the following:

1. Reviewing and verifying documents relative to admission and financial support for issuance of certificate of eligibility (Form I-20 and Form IAP-66) to international students.
2. Advising international students, scholars, and staff on immigration and visa requirements.
3. Advising international students and faculty concerning cross-cultural understanding, and academic, housing, and personal problems.
4. Advising the university on immigration matters and serving as liaison between the university and the Immigration and Naturalization Service.
5. Organizing activities for international students and scholars to integrate them into the academic process, the campus student population, and the surrounding community.

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6. Conducting intercultural events on campus, such as International Week, United Nations Day, Ethnic Days, International Coffee Hour, films, and lectures.

7. Representing the interests of international students at GMU before the U.S. Immigration and Naturalization Service, the State Department, government agencies in international education, and foreign embassies.

8. Establishing links between international students and the local community through program activities and holiday hosting.

9. Disseminating information via newsletters and other publications of importance to international students and their American counterparts.

Student Life Programs

Student participation helps shape the character and quality of the students and the university. Thus, George Mason encourages people to express their talents and interests through participation in student government, student publications, and through membership in academic, Greek, international, special interest, law, cultural, religious, and athletic organizations.

While involvement in such activities is a desirable adjunct to classroom learning, participation must be complemented by academic progress. For this reason, 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, 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. It is the individual student's responsibility to notify an organization when becoming ineligible.

Performing Arts Activities

George Mason offers students the opportunity to participate in many arts events throughout the school year. The George Mason University Dance Company presents two annual concerts and all students are encouraged to audition.

Theatre events include four major productions, as well as several student-directed, one-act, and experimental plays. Auditions for theatre events are open to all George Mason students and are held each semester. Students interested in technical theatre can work in a variety of production crews, including light and sound, costumes, and publicity. Information concerning auditions, crew work, and performance dates may be obtained from the Department of Dance and Theatre (764-6500).

Students interested in music may audition to perform in the following: University Chorale, Symphonic Chorus, Symphony Orchestra, Symphonic Band, Jazz Ensemble, Pep Band, and various chamber ensembles. All members of the university community are invited to attend concerts and recitals given by the Department of Music (764-6200).

Student Organizations

Approximately 180 on-campus student organizations complement the university's curricular programs and provide opportunities for students to exercise and develop their talents. The organizations span a wide range of interests, including politics, forensics, drama, music, journalism, academic, service, recreation, business, social life, religion, and fellowship. Membership in student organizations is open to any registered George Mason University student and can open vistas to new friendships, informal contact with faculty and staff, learning opportunities, and leadership experience.

Recognized student organizations are also members of larger umbrella organizations. These clusters of organizations facilitate coordinated development of campus activities, interaction with other student organizations, and fee funding for student organizations. They also provide a university mailing address, access to file and storage space, duplicating services, and a channel of communication with the university administration regarding support services for student organizations.

The Student Organization Development Center maintains updated information on names and phone numbers of contact persons in each organization. The Student Organization Manual, a "how-to" resource handbook for student leaders, can be obtained there. The office staff also consults with students or student organizations that are planning programs for students; assists new clubs in attracting members and receiving recognition; and offers leadership training through workshops, retreats, and credit course formats to organization members and to students not affiliated with a club.

Broadside is the university's student-run newspaper. The paper provides opportunities in news writing, sports reporting, feature writing, editing, layout, advertising, public relations, and many other areas. Contact the Broadside staff in Student Union I for more information.
**Student Alumni Association**

An active Student Alumni Association assists the GMU Alumni Association and the Office of Alumni Relations with activities such as homecoming, reunion, the annual phonathon, and other events. Alumni enjoy meeting students and students benefit from meeting alumni in their academic fields.

Students interested in joining the Student Alumni Association should ask an instructor or adviser to nominate them. For more information about alumni activities and the Student Alumni Association, contact the Office of Alumni Relations, 10720 Kelley Drive, 323-2136. The office is open Monday through Friday from 8:30 a.m. until 5 p.m.
Areas of Study
Areas of Study

Accounting

Faculty
Bradwick, Faye L., L.L.M., Georgetown University Law Center, 1988; J.D., Syracuse University, 1984; CPA, Assistant Professor
Buchanan, Phillip G., Ph.D., Temple University, 1982; CPA, Associate Professor
Cao, Le T., D.B.A., University of Southern California, 1975; Associate Professor
Coffinberger, Richard L., J.D., Wake Forest University, 1974; Associate Professor
Godfrey, James T., Ph.D., University of Michigan, 1967; George Mason University Foundation Professor
Gopalakrishnan, V., Ph.D., University of North Texas, 1986; ACA, Assistant Professor
Harr, David J., Ph.D., University of Wisconsin, 1978; CPA, Assistant Professor
Heller, Kenneth H., Ph.D., University of Texas, Austin, 1977; CPA, Professor, Department Chair
Joseph, Terry R., M.B.A., George Mason University, 1987; CPA, Instructor
Mariano, Frank A., M.B.A., Pennsylvania State University, 1981; CPA, Instructor
Millsapahaugh, Peter, J.D., American University, 1968; Associate Professor
Quarles, N. Ross, Ph.D., University of North Texas, 1988; CPA, Assistant Professor
Samuels, Linda B., J.D., University of Virginia, 1975; Associate Professor
Trussel, John M., M.A. George Washington University, 1987; CPA, Instructor
Tucker, Michael J., Ph.D., University of Houston, 1980; J.D., New York University, 1974; CPA, Associate Professor
Wardlow, Penelope J., Ph.D., University of Georgia, 1985; Assistant Professor

Accounting, M.S.

The Master of Science in Accounting degree is administered by the Department of Accounting and Business Legal Studies. Course work leading to this degree offers the student either (1) an additional university-level accounting program (in the general accounting track or the taxation track), which combines with an undergraduate accounting degree to meet the five-year, 150-hour program supported by the accounting profession; or (2) a taxation specialization option with 24 hours of tax courses and 6 hours of elective graduate courses.

Admission Requirements

In general, a degree applicant should have the following minimum admission requirements:

1. Bachelor's degree from an accredited institution (no application is processed until official transcripts are received from all colleges and universities attended).
2. Grade point average of 2.75 on a 4.00 scale for the last 60 semester hours of upper-level course work leading to an undergraduate degree. A student may be admitted to the program while completing the required undergraduate course work.
3. Three letters of recommendation from professors or other persons with direct knowledge of the applicant's professional and academic competence and potential as a graduate student.
4. Satisfactory score on the Graduate Management Admission Test (GMAT), taken within seven years of applying for admission.

Admission to the M.S. degree program is competitive. The admissions decision is based principally on grades in undergraduate academic course work and performance on the GMAT. These criteria are applied flexibly to ensure that individuals with unusual academic qualifications are not denied admission.
Degree Requirements

The M.S. program requires a minimum of 30 semester hours of graduate course work. However, students who have not earned an undergraduate degree in business administration with a major in accounting may be required to take up to 48 hours of additional undergraduate credit. The exact number of credit hours for an individual is based on an evaluation by the department faculty at the time of admission.

Contact the associate dean for academic affairs for information about accounting courses for students without an undergraduate accounting degree.

M.S. in Accounting Core—General Accounting Track/Taxation Track (15 hours)

Each candidate in the general accounting track or the taxation track must complete the following accounting core courses unless, in the opinion of the department faculty, the candidate has had previous comparable graduate-level course work that would justify substitution of other graduate accounting courses, or if the candidate’s degree objective is a taxation specialization (see below):

1. ACCT 712 Accounting Systems
2. ACCT 713 Managerial Accounting Theory
3. ACCT 732 Financial Accounting Theory
4. ACCT 762 Advanced Auditing Theory and Practice
5. A tax course from the 700-level graduate tax courses

Graduate Electives—General Accounting Track/Taxation Track (15 hours)

Candidates in the general accounting track or the taxation track must satisfactorily complete at least 15 hours of graduate course work which does not repeat previous academic work.

General Accounting Track. Twelve hours must be taken from the courses shown below and must include 3 hours in accounting, 3 hours in financial management, 3 hours in decision sciences, and 3 hours in information resource management. The remaining 3 hours must be from graduate courses at the 600-level or higher, which may include DESC 611 and/or MKTG 775.

Accounting:
ACCT 733 Corporate Financial Reporting
ACCT 772 Fund Accounting
ACCT 782 International Accounting
ACCT 792 Seminar in Accounting
ACCT 796 Independent Study and Directed Readings
Any 700-level graduate tax course

Financial Management:
FNAN 611 Cases in Financial Administration
FNAN 711 Long-term Financial Management
FNAN 721 Security Analysis
FNAN 722 Portfolio Analysis
FNAN 772 Managerial Economics

Decision Sciences:
DESC 611 Quantitative Analysis in Business and Operations Management
DESC 742 Management Science

Information Resource Management:
Information Resource Management courses at the 700-level.

Taxation Track. Twelve additional hours must be taken in taxation. ACCT 740 is required. The remaining 9 hours of taxation must be from any combination of 700-level graduate tax courses. The remaining 3 hours must be from 600-level or higher graduate courses, which may include DESC 611 and/or MKTG 775.

Taxation Specialization (30 hours)

Each candidate must complete 15 hours of tax core courses as follows:

Tax Core Courses:
ACCT 740 Tax Research
ACCT 741 Corporate Federal Income Taxation I
ACCT 742 Corporate Federal Income Taxation II
ACCT 743 Partnership Taxation
ACCT 744 Federal Estate and Gift Taxation

In addition, 9 hours of tax courses must be selected from the following:

ACCT 745 Tax Exempt Organizations
ACCT 746 International Taxation
ACCT 747 Advanced Tax Topics
ACCT 748 State and Local Taxation
ACCT 749 Pensions and Deferred Compensation

Each candidate must also complete 6 hours of elective courses from 600-level or higher graduate courses, which may include DESC 611 and/or MKTG 775.

Graduate Courses Required for Students Without Undergraduate Business Degrees (24 hours)

BULE 610 Law and the Business Environment
DESC 610 Statistical Foundation for Business Decision Making
FNAN 602 Managerial Economics
FNAN 610 Financial Management
IRM 610 Computer Systems for Management
MGMT 612 Organizational Behavior

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MGMT 797 Business Policy
MKTG 610 Marketing Concepts and Processes

Accounting Courses (ACCT)

General Prerequisites
1. Students who have not gained admitted status from the Graduate School may not register for graduate-level courses numbered 600 or higher offered by the School of Business Administration.
2. All students must satisfy ALL course prerequisites listed in the Schedule of Classes for courses offered by the School of Business Administration. Students who register for such courses without the prerequisites or without a written waiver from the associate dean of the School of Business Administration will be dropped from those courses.

610 Accounting and Reporting (3:3:0). Prerequisite: Graduate standing. All aspects of accounting from the basic concept of a transaction through financial statements and their interpretation.

611 Managerial Accounting (3:3:0). Prerequisite: Completion of all MBA foundation courses including ACCT 610 or equivalent, and graduate standing. Topics include profit planning, relevant costing, budgeting, measurement of performance, and product costing.

712 Accounting Systems (3:3:0). Prerequisite: ACCT 611. Accounting systems design and integration with other information systems.

713 Managerial Accounting Theory (3:3:0). Prerequisite: ACCT 611. Controllership function in public or private organizations, particularly in regard to development of policy and evaluation of performance.


740 Tax Research (3:3:0). Prerequisite: 24 credits of graduate and/or undergraduate accounting courses. Study of the process necessary to research a tax problem, to arrive at a defensible solution, and to communicate that solution. Emphasis is on the tools of tax research: Internal Revenue Code, Treasury Regulations, and administrative and judicial sources of tax law.

741 Corporate Federal Income Taxation I (3:3:0). Prerequisite: 24 credits of graduate and/or undergraduate accounting courses. Concepts and principles that relate to federal income taxation of corporations and their shareholders. Emphasis is on research of fact situations. Coverage includes corporate reorganizations, multiple corporations, and consolidated returns.

743 Partnership Taxation (3:3:0). Prerequisite: 24 credits of graduate and/or undergraduate accounting courses. Major aspects of taxation affecting partners and partnerships. Emphasis is on tax planning and detailed study of the Internal Revenue Code, Treasury Regulations, and case law governing these areas.

744 Federal Estate and Gift Taxation (3:3:0). Prerequisite: 24 credits of graduate and/or undergraduate accounting courses. Concepts and principles that relate to federal estate and gift taxation and the federal income taxation of estates, trusts, and beneficiaries. Emphasis is on estate tax planning and a detailed study of the Internal Revenue Code, Treasury Regulations, and case law governing these areas.

745 Tax Exempt Organizations (3:3:0). Prerequisite: ACCT 740 recommended. Tax issues dealing with tax-exempt organizations, including tax exempt status, qualifying as a charitable organization, non-charitable exempt organizations, and unrelated trade or business income.

746 International Taxation (3:3:0). Prerequisite: ACCT 740 recommended. Taxation of individuals and corporations with foreign source income and tax liability to the United States.

747 Advanced Tax Topics (3:3:0). Prerequisite: ACCT 740 recommended. Selective analysis of current tax topics addressing important issues in contemporary tax practice. Two or three major topics are usually discussed.

748 State and Location Taxation (3:3:0). Prerequisite: ACCT 740 recommended. Detailed analysis of the principal forms of state and local taxation.

749 Pensions and Deferred Compensation (3:3:0). Prerequisite: ACCT 740 recommended. Analysis of the structure, operation, and requirements for obtaining and maintaining IRS approval of tax qualified pensions, profit-sharing, and deferred compensation plans.

752 Federal Taxation and Business Planning (3:3:0). Prerequisite: ACCT 611. Topics include organizations, acquisitions, mergers, spinoffs, and other divestitures from the viewpoint of profit planning, cash flow, and tax deferment. Emphasis on tax problems of corporations. This course is not available to M.S. in accounting students.

762 Advanced Auditing Theory and Practice (3:3:0). Prerequisite: ACCT 611. Auditing standards and supporting theory. Application of techniques including statistical sampling. Legal liability of the auditor, role of the auditor in securities regulation, and auditing in a computerized environment.


782 International Accounting (3:3:0). Prerequisite: ACCT 611. Principles, practices, and techniques used by multinational enterprises in international trade and investment. Topics include financial and managerial accounting, auditing, foreign currency translations, and U.S. tax policy toward the multinational firm.
Biology

Faculty

Adamkiewicz, S. Laura, Ph.D., University of Virginia, 1968; Associate Professor
Andrykovitch, George E., Ph.D., University of Maryland, 1968; Associate Professor
Birchard, Geoffrey F., Ph.D., Dartmouth Medical School, 1985; Assistant Professor
Bradley, Ted R., Ph.D., University of North Carolina, 1968; Associate Professor
Brown, Luther, Ph.D., Ohio State University, 1978; Associate Professor
Emsley, Michael G., Ph.D., University of London, 1964; Professor
Ernst, Carl H., Ph.D., University of Kentucky, 1969; Professor
Greitz, Michael R., Ph.D., Arizona State University, 1981; Assistant Professor
Hart, Jayne T., Ph.D., University of Wisconsin, 1969; Professor
Heliotis, Francis D., Ph.D., University of Wisconsin, 1985; Assistant Professor
Jonas, Robert B., Ph.D., University of North Carolina, 1981; Assistant Professor
Jones, R. Christian, Ph.D., University of Wisconsin, 1980; Associate Professor
Kelso, Donald P., Ph.D., University of Hawaii, 1970; Associate Professor
Lawrey, James D., Ph.D., Ohio State University, 1977; Associate Professor
Morowitz, Harold J., Ph.D., Yale University, 1951; Robinson Professor of Biology and Natural Philosophy
Oates, Karen K., Ph.D., George Washington University, 1985; Assistant Professor
Rockwood, Larry L., Ph.D., University of Chicago, 1972; Associate Professor
Roit, Paulette A., Ph.D., University of Maryland, 1974; Associate Professor
Shaffer, Jay C., Ph.D., Cornell University, 1967; Professor
Sherald, Allen F., Ph.D., University of Virginia, 1973; Associate Professor
Skog, Judith E., Ph.D., Cornell University, 1972; Associate Professor
Stanley, Melissa S., Ph.D., University of Utah, 1965; Professor
Taub, Stephan R., Ph.D., Indiana University, 1960; Professor
Torzilli, Albert P., Ph.D., University of Georgia, 1976; Associate Professor
Wilson, John W., Ph.D., University of Chicago, 1972; Associate Professor

Biology, M.S.

The Master of Science program in Biology provides advanced training for recent college graduates, professionals in teaching, technical, and other biology-related fields, and research-oriented individuals.

Admission Requirements

An applicant for the M.S. program is expected to have a bachelor's degree in biology or its equivalent, with a grade point average of 3.00 or better in biology courses. The applicant must submit three letters of recommendation and scores on the Graduate Record General and Subject Biology Examinations. To be accepted as a degree student, an applicant's scores on the verbal and quantitative general test should total 1,100 or greater, and should be in the 50th percentile or better on the subject biology portion with no raw subscore less than 60 (40th percentile).

Degree Requirements

A student must complete at least 30 semester hours, including two hours of seminar, one of which must be BIOL 690 Introduction to Graduate Studies in Biology. The student is first assigned an academic adviser and then must form a three-member graduate committee within the first 15 hours of course work. At the conclusion of the program, the student must successfully complete an oral and written comprehensive examination or defend a thesis. A student who completes a thesis presents his or her research in a public seminar. The basic requirements for each specialization are detailed below.
1. Organismal Biology: An organized set of course work is developed after consultation with an academic adviser. Traditional programs of study such as botany, vertebrate zoology, developmental biology, animal behavior, genetics, or physiology may be included in this specialization.

2. Environmental Biology: A student electing this specialization must take Biology 640 and 641: Environmental Biology I and II, and must complete at least one semester of Biology 692: Seminar in Environmental Biology. The remaining hours are selected from a list of environmentally oriented courses in consultation with the academic adviser. The student is encouraged to take one or two courses outside of the department, subject to approval by the graduate committee.

3. Systematic, Evolutionary, and Population Biology: The student must complete a program of study selected from a list of courses emphasizing evolutionary and systematic biology. These courses must be approved by the academic adviser and must include one course from each of three areas: evolution, populations, and experimental biology.

4. Molecular, Microbial, and Cellular Biology: The student must complete three hours of seminar in addition to Biology 690. In consultation with the academic adviser, the student may enroll in Biology 691: Current Topics in Biology and/or Biology 695: Seminar in Molecular, Microbial, and Cellular Biology. All further course work is selected after consultation with the academic adviser.

5. Interpretive Biology: This specialization is for individuals currently or recently employed in interpreting biology to the public, including teachers, park naturalists, and science writers. Three to 9 hours are chosen from BIOL 504, 601, 602, 605, or approved graduate courses in other departments. The remaining 21 to 27 hours must be graduate-level biology courses and must include two hours of seminar. All courses must be approved by the student's graduate committee.

6. Bioinformatics: In addition to 21 hours of graduate biology courses including biochemistry, 9 hours of courses are taken in the information sciences. Students requiring more grounding in mathematics take INFT 500. Other courses are chosen from the core curriculum courses in information technology. Suggested courses are CS 580, CS 521, and INFS 714. Entering students are expected to be familiar with a programming language such as Pascal, C, or Fortran. Status of computer prerequisites and choice of courses in informational sciences are decided with the graduate coordinator in computer science.

Environmental Biology—Public Policy, Ph.D.

The Ph.D. program in environmental biology-public policy offers training in the traditional research-oriented disciplines of ecology and environmental biology, as well as in public affairs, business administration, and economics. Graduates develop research, technical, and administrative skills that enable them to deal effectively with pure and applied environmental research, policy issues, environmental legislation, and implementation of environmental law. Prospective students who are already employed as environmental biologists by government, industry, or consulting firms have the opportunity to upgrade and broaden their skills. Recent bachelor's or master's degree recipients gain practical experience and important contacts during the internship phase of their training.

Admission Requirements

An applicant should have a bachelor's degree in biology or the equivalent, with an overall grade point average of at least 2.75 (on a scale of 4.00) in the last 60 hours of undergraduate work and a 3.00 average in all biology courses. A student who applies for graduate work but who lacks a bachelor's or master's degree in biology must complete a program of undergraduate course work designated by the doctoral coordinator acting in consultation with the doctoral committee in the Department of Biology. The application deadline for admission in the fall semester is April 1 and for the spring semester, November 1.

All applicants for degree status must submit:

1. Scores on the Graduate Record Examination, including the Subject Test in Biology as stated above (this requirement may be waived if the applicant has earned a master's degree in a biological discipline);
2. Three letters of recommendation;
3. Official transcripts from each college or university attended;
4. A recent resume. An interview with the doctoral coordinator is encouraged.

Degree Requirements

Because most graduate courses in the Department of Biology are offered in the late afternoon or evening hours, course work for the Ph.D. may be completed on a part-time basis. The Ph.D. in
Environmental biology-public policy requires 78 semester hours of study beyond the bachelor’s degree, 30 of which may be from master’s-level work or its equivalent. At least 48 hours of work must be completed at George Mason University. The program of study is designed to further the career goals of the student in consultation with the major professor and supervisory committee. The following requirements must be satisfied:

1. A minimum of 22 hours of graduate course work must be completed in biology, computer science, and statistics; and a minimum of two semesters (four semester hours) in doctoral-level environmental biology seminars (BIOL 991).
2. A competency in public policy equivalent to 9 hours of course work in business administration, economics, or public affairs (determined in consultation with the major professor and supervisory committee) must be demonstrated at the time of the candidacy exam.
3. An internship must be completed. Up to 12 semester hours may be earned by fulfilling the internship requirement. The internship may be with an approved industry, government agency, consulting firm, or a professional scientific organization. Internships are negotiated or waived on a case-by-case basis by the Biology Department with the student. The student’s committee, after assessing the strengths and interests of the student and identifying available organizations or scientific mentors, determines the location, duration, and other terms of the internship.
4. A course in environmental law (BIOL 670) must be taken.
5. A Ph.D. dissertation (BIOL 999) — 12-24 semester hours — must be completed.

**Sequence of Study**

Upon admission to the program, a plan of course work is developed by the student and his or her committee. As soon as possible, the student should establish a supervisory committee, consisting of a major professor and at least two environmental biologists in the department. When course work has been completed, a second phase of the program — advancement to candidacy — is entered. The student is advanced to candidacy upon (1) enlarging the supervisory committee to include two other members, one of whom must be from one of the nonbiology departments participating in the doctoral program; (2) successfully completing a written and oral qualifying examination; and (3) submitting an acceptable dissertation proposal.

**Residency, Candidacy, and Other Requirements**

A student must advance to candidacy (complete the qualifying examination) within five years of initial registration. Once advanced to candidacy, a student is expected to be in continuous residence on a full-time basis. The minimum period of full-time residency is one year. The dissertation and final examination must be completed within six years after advancing to candidacy.

**Electron Microscopy Laboratory**

This facility provides high-resolution transmission and scanning electron microscopic facilities for the university community. The laboratory supports faculty research in such areas as investigations of fine structure of marine bacteria, algal polysaccharide immunocytochemistry, fern ultrastructure, and fine structure of epithelial and muscle cells in animals. It also serves several local agencies. An ultrastructure course offered each year provides graduate and undergraduate instruction for use of the facility.

**Biology Courses (BIOL)**

- **504 Virginia Natural History for Teachers (4:3:3).** Prerequisite: Permission of instructor. The interrelations of plants, wildlife, soil, and waters of local environments with emphasis on the teaching of their proper use and conservation. May be applied to the M.S. in biology in the interpretive track only and then within a six-hour maximum if combined with BIOL 605.
- **513 Food, Energy, and Insects (3:3:0).** Prerequisite: BIOL 332 and permission of instructor. History and future of man’s competition with insects in fields of agriculture and medicine.
- **514 Human Evolution and Ecology (3:3:0).** Materialistic study of the evolution of man and his prehistoric, historic, and contemporary relationship with natural environment.
- **520 Systematics in Complex Angiosperm Families (3:1:6).** Prerequisite: BIOL 344 or 534 or permission of instructor. Morphology and speciation of the more complex families such as Poaceae, Cyperaceae, and Asteraceae. Lab emphasizes identification of specimens and acquaintance with taxonomic literature.
- **523 Reproductive Strategies (3:3:0).** Prerequisite: Permission of instructor. Evolution of reproductive tactics, including sexual and asexual reproduction, sex ratios, parental investment, propagule sizes and numbers, mating systems and social structure. Animals and plants emphasized as appropriate.
- **526 Paleoecology (4:3:3).** Prerequisite: Permission of instructor. Study of origin and evolution of interrelationships between components of the earth’s major ecosystems.
527 Current Problems in Evolutionary Theory (3:3:0). Prerequisite: Course in evolution or permission of instructor. Course on contemporary evolutionary thought.

528 Selected Topics in Invertebrate Zoology (3:3:0) or (3:2:3). Prerequisite: Course in invertebrate zoology or permission of instructor. Different topics in different years. Possible topics include the biology of a specific group such as mollusks or crustaceans, or the comparison of one trait, such as larval survival, in diverse phyla.

529 Vertebrate Paleontology (4:2:6). Prerequisite: Course in vertebrate zoology or comparative anatomy or invertebrate paleontology, or permission of instructor. Study of evolutionary patterns of vertebrates. Emphasis on major adaptive radiations.

530 Animal Behavior (3:3:0). Prerequisite: BIOL 324 or permission of instructor. Study of the ecological aspects of animal behavior.

533 Selected Topics in Plant Biology (3:3:0) or (3:2:3). Prerequisite: 8 hours in 100-level BIOL, upper-division course in botany, and permission of instructor. Topic depends upon the specialty of the instructor. May be repeated only with permission of chair.

534 Speciation and Field Studies in Flowering Plants (3:1:8). Prerequisite: Course in plant taxonomy or permission of instructor. Modes of speciation in flowering plants. Lab emphasizes field trips, collection, preparation, and identification of plants.

535 Paleobotany (4:3:3). Prerequisite: Plant morphology or anatomy or vertebrate or invertebrate paleontology. Evolution of fossil plants, their origin, history, and extinction, including the various selective pressures responsible for these events. Lab presents techniques to elucidate fossil plant structure. Three Saturday field trips. Fall.

536 Ichthyology (4:3:3). Prerequisite: Course in ecology or permission of instructor. Study of the systems, 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. Spring of even-numbered years.

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. Fall of odd-numbered years.

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. Spring of odd-numbered years.

542 Ecology of Animal Communities (3:3:0) Prerequisite: Course in ecology or permission of instructor. In-depth study of animal communities emphasizing community structures and functions, changes in composition over time and space, stability and equilibrium properties, disturbances, and insularization effects.

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 and 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 and permission of instructor. Emphasizes marine biology of estuarine and coastal habitats of the Chesapeake Bay region and factors affecting distribution and abundance of organisms. Lab provides training in field measurement of physical and chemical parameters and collection and identification of local organisms. Extended field trips made to mid-Atlantic sites. Summer.

547 Terrestrial Plant Ecology (4:3:3). Prerequisite: Course in ecology. Consideration of community organization, development, productivity and mineral cycling, interactions between plants and competitors, herbivores and various environmental factors, especially light, water and soil. Field and lab emphasize data collection and statistical analysis.

550 Limnology (3:3:4) Prerequisite: General chemistry and a course in ecology. Study of the origin of freshwater ecosystems and the chemical, physical, and ecological processes occurring in them. The impact of human activities on freshwater ecosystems is also considered.

552 Chem 502 General Biochemistry (3:3:0). Prerequisite: CHEM 313-314 and BIOL 383 or permission of instructor. Survey course for graduate students in biology and chemistry that examines the chemical basis of biological systems emphasizing structure, function, and regulation of metabolic systems.

553 Advanced Topics in Immunology (3:3:0). Prerequisite: BIOL 452 or permission of instructor. Comprehensive study of immunologic mechanisms as they pertain to immunologic diseases and transplantation.

556 Microbial Physiology and Metabolism (3:3:0). Prerequisite: BIOL 383 or permission of instructor. Comprehensive study of microorganisms covering aspects of growth, nutrition, transport, autotrophic and heterotrophic metabolism, regulation, and differentiation.

557 Experiments in Microbiology (2:0:6). Prerequisite: BIOL 566 or permission of instructor. Students perform a select group of experiments that illustrate techniques used in the study of microbial taxonomy, genetics, physiology, and metabolism.

560 Biological Ultrastructure (4:2:6). Prerequisite: BIOL 301, CHEM 313-314, and permission of instructor. Introduction to techniques involved in electron microscopy and to the interpretation of electron micrographs of plants and animals.

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 383 and 311 or permission of instructor. Fundamental concepts of the nature of viruses, virus classification, cultivation and biochemistry. Bacteriophage and animal viruses emphasized. Fall.

564 Techniques in Virology (2:1:3). Co- or prerequisite: BIOL 563 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.

567 Molecular Genetics (3:3:0). Prerequisite: BIOL 311 or permission of instructor. Study of molecular struc-
nature of genetic material and control of gene expression in viruses, procaryotes, and eucaryotes.

572 Human Genetics (3:3:0). Prerequisite: General genetics or permission of instructor. Study of the inheritance of man, emphasizing current problems, including genetic control of metabolic diseases, effects of radiation and chemical agents in the environment, and directed genetic change. Fall, odd-numbered years.

573 Developmental Genetics (3:3:0). Prerequisite: General genetics or permission of instructor. Study of genetic approaches to the problem of eucaryotic development emphasizing current research on the regulation of gene enzyme systems. Fall, even-numbered years.

574 Population Genetics (4:3:3). Prerequisite: General genetics or permission of instructor. Study of the genetic structure of populations and the forces that affect that structure. Spring, even-numbered years.

575 Selected Topics in Genetics (3:3:0). Prerequisite: General genetics 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 chair. Spring, odd-numbered years.

601 Advanced General Biology: Classical Principles and Modern Views I (3:3:0). Prerequisite: 24 hours in life sciences or permission of instructor. Intensive review of the fundamental concepts relating to cellular biology and to the structure and function of plants and animals. Available for credit toward M.S. with specialization in interpretive biology only.

602 Advanced General Biology: Classical Principles and Modern Views II (3:3:0). Prerequisite: 24 hours in life sciences or permission of instructor. Intensive review of the fundamental concepts relating to genetics, development, evolution, behavior and ecology. Available for credit toward M.S. with specialization in interpretive biology only.

605 Special Skills in the Life Science (1-3:3:0). Prerequisite: Baccalaureate degree and 24 hours of biology or permission of instructor. Lectures, lecture-demonstrations, laboratory, workshop, or field experiences in specific methods or techniques. Content varies. May be repeated with permission of chair. A maximum of three courses and six hours may be applied to the M.S. in biology in the interpretive track only.

606 The Clinical Laboratory: An Introduction for Teachers (3:0:0). Prerequisite: Baccalaureate degree, 34 hours of biology, and permission of instructor. Workshop on clinical laboratory topics with emphasis on applications of biological concepts, counseling for allied health careers, and development of teaching materials for the public school. May be applied only to the M.S. in biology in the interpretive track and only within a six-hour limit if combined with BIOL 504, 601, 602, or 605.

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.

624 Coevolution of Plants and Animals (3:3:0). Prerequisite: Course in evolution. Topics include the mechanisms of evolution of plant and animal interactions, chemical communication, population dynamics, energetics of ecosystems, and development of the interactions over time.

630 Selected Topics in Vertebrate Zoology (3:3:0) or (3:2:3). Prerequisite: Courses in vertebrate zoology or comparative anatomy and ecology or permission of instructor. Topic depends on specialty of instructor. May be repeated once.

640 Environmental Biology I (3:3:0). Prerequisite: Course in ecology or permission of instructor. Patterns of climate and weather, tectons, soil formation, and surface and ground water movements. Fall.

641 Environmental Biology II (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. Spring.

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 those environments. Spring of odd-numbered years.

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. Fall.

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: Calculus, course in ecology, programming experience, 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.

665 Environmental Hazards to Human Health (3:3:0). Prerequisite: Course in animal physiology or permission of instructor. Health effects of chemical contaminants of air, water, and food resulting from industrialized society. Includes identifying, evaluating, and controlling hazards.

666 Advanced Techniques in Molecular Biology (4:2:6). Prerequisite: BIOL 383, 311; CHEM 313-314, 563-564; or permission of instructor. BIOL 361 is recommended. Experimental studies utilizing current methods for purification and characterization of biologically important compounds; designed to provide training for research in molecular biology.

669 Pathogenic Microbiology (3:3:0). Prerequisite: Courses in microbiology and in biochemistry. Molecular
mechanisms of exotoxins, endotoxins, and viral pathogenicity and the immune response in infectious diseases.

670 Environmental Law for Biologists (3:3:0). Prerequisite: Course in ecology or 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 bio-statistics 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. Spring.

690 Introduction to Graduate Studies in Biology (1:1:0). Required of all new M.S. students in Biology. Fall.

691 Current Topics in Biology (1:1:0). 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). Prerequisite: Permission of instructor, chair, and student's graduate committee. Topic study 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 prerequisite 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 (3:3:0) or (3:2:3). Prerequisite: 8 hours of ecology or permission of instructor. Topics vary. May be repeated only with permission of chair.

745 Environmental Toxicology (3:3:0). Prerequisite: 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). Prerequisite: 8 graduate hours 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 hours.

799 Thesis (3-6:0:0). Prerequisite: 8 hours of graduate credit in BIOL and permission of instructor and 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 BIOL 799.

800 Studies for the Doctor of Arts in Education (variable credit). Prerequisite: D.A.Ed. student admission to study in biology. Program of studies designed by the student's discipline director and approved by student's doctoral committee which brings the student to participate in research of discipline director and results in a paper reporting the original contributions of the student. The paper is presented in a subsequent D.A.Ed. summer seminar. Enrollment may be repeated.

894 Supervised Internship (3-12:0:0). Prerequisite: Permission of chair and of student's doctoral committee. Training in application of ecological skills to environmental management and policy under supervision of a qualified environmental scientist at a governmental agency, consulting firm, industry or other acceptable organization.

991 Advanced Seminar in Environmental Biology (2:2:0). Prerequisite: 8 hours of ecology or permission of instructor. Topics generally address the interface between environmental biology and public policy, but some address more basic environmental biology. May be repeated. Required of all Ph.D. students.

999 Doctoral Dissertation Research (1-12:3:0). Prerequisite: Approval of dissertation proposal. Research dealing with a basic or applied problem in environmental biology.

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Business Administration

Faculty

Anderson, Evan E., Ph.D., Cornell University, 1970; Professor, Decision Sciences

Bracker, Jeffrey S., Ph.D., Georgia State University, 1982; Associate Professor, Management

Bradwick, Faye L., L.L.M., Georgetown University Law Center, 1988; J.D., Syracuse University, 1984; CPA, Assistant Professor

Buchanan, Phillip G., Ph.D., Temple University, 1982; Assistant Professor, Accounting

Cao, Le Thi, D.B.A., University of Southern California, 1975; Associate Professor, Accounting

Carlson, Christopher, D.P.A., University of Southern California, 1985; Assistant Professor, Decision Sciences

Coffinberger, Richard L., J.D., Wake Forest University, 1974; Associate Professor, Business Legal Studies

Cohen, Debra J., Ph.D., Ohio State University, 1987; Assistant Professor, Management

Cordell, Victor V., Ph.D., University of Houston, 1988; Assistant Professor, Marketing

Crawford, Peggy J., Ph.D., Purdue University, 1979; Assistant Professor, Finance

Crockett, John H., Ph.D., University of North Carolina, Chapel Hill, 1975; Associate Professor, Finance

Das, Sidhartha R., Ph.D., University of Houston, 1985; Assistant Professor, Decision Sciences

DeBoer, Lloyd M., Ph.D., University of Illinois, Urbana-Champaign, 1957; Professor, Marketing
Domzal, Teresa, Ph.D., University of Cincinnati, 1981; Associate Professor, Marketing

English, Jon, Ph.D., University of Florida, 1972; Professor, Management

Entrikin, Richard, Ph.D., St. Louis University, 1976; Associate Professor, Marketing

Fagenson, Ellen A., Ph.D., Princeton University, 1981; Assistant Professor, Management

Ferri, Michael G., Ph.D., University of North Carolina, 1975; Associate Professor, Accounting

Godfrey, James T., Ph.D., University of Michigan, 1967; Professor, Accounting

Gopalakrishnan, V., Ph.D., North Texas State University, 1986; Assistant Professor, Accounting

Gulledge, Thomas R., Jr., Ph.D., Clemson University, 1981; Associate Professor, Decision Sciences

Hanweck, Gerald A., Ph.D., Washington University, 1971; Associate Professor, Finance

Harr, David J., Ph.D., University of Wisconsin, 1978; Assistant Professor, Accounting

Hartman, Freda A., Ph.D., North Texas State University, 1982; Visiting Associate Professor, Management

Harvey, James, Ph.D., Pennsylvania State University, 1977; Assistant Professor, Marketing

Heller, Kenneth H., Ph.D., University of Texas, Austin, 1977; Professor, Accounting

Hogan, Arthur M. B., Ph.D., University of Texas, Austin, 1988; Assistant Professor, Finance

Hogan, Eileen A., Ph.D., University of California, Berkeley, 1983; Assistant Professor, Management

Hysom, John L., Ph.D., The American University, 1973; Associate Professor, Finance

Johnston, Robert D., Ph.D., University of Alabama, 1974; Associate Professor, Finance

Kernan, Jerome B., Ph.D., University of Illinois, 1962; Professor, Marketing

Kovach, Kenneth A., D.B.A., University of Maryland, 1975; Professor, Management

McCrohan, Kevin F., Ph.D., City University of New York, 1978; Professor, Marketing

Millspaugh, Peter E., J.D., The American University, 1968; Associate Professor, Business Legal Studies

Patrick, Steven L., Ph.D., University of Georgia, 1987; Assistant Professor, Management

Pearce, John A., II, Ph.D., Pennsylvania State University, 1976; Professor, Management

Pugh, Robert E., Ph.D., American University, 1975; Assistant Professor, Decision Sciences

Quarles, N. Ross, Ph.D., North Texas State University, 1988; Assistant Professor, Accounting

Raphael, Coleman, Ph.D., Polytechnic Institute of Brooklyn, 1966; Dean of the School of Business Administration

Render, Barry, Ph.D., University of Cincinnati, 1975; Professor, Decision Sciences

Ruth, Stephen R., Ph.D., University of Pennsylvania, 1970; Professor, Decision Sciences

Samuels, Linda B., J.D., University of Virginia, 1975; Associate Professor, Business Legal Studies

Sands, Ben F., Jr., D.B.A., The George Washington University, 1975; Emeritus Associate Professor, Management

Sisodia, Rajendra S., Ph.D., Columbia University, 1989; Assistant Professor, Marketing


Sugrue, Timothy F., Ph.D., University of Massachusetts, 1985; Assistant Professor, Finance

Texter, Pamela A., Ph.D., Pennsylvania State University, 1986; Assistant Professor, Decision Sciences

Tongren, Hale N., D.B.A., The George Washington University, 1968; Professor, Marketing

Tucker, Michael J., Ph.D., University of Houston, 1980; J.D., New York University, 1974; Associate Professor, Accounting

Wardlow, Penelope J., Ph.D., University of Georgia, 1985; Assistant Professor, Accounting

Warkentin, Merrill E., Ph.D., University of Nebraska, Lincoln, 1986; Assistant Professor, Decision Sciences

Wongtada, Nittaya, Ph.D., University of Tennessee, 1986; Assistant Professor, Marketing

Yau, Jot K., Ph.D., University of Massachusetts, Amherst, 1988; Assistant Professor, Finance

Young, Margaret, Ph.D., Pennsylvania State University, 1985; Assistant Professor, Decision Sciences

Zahra, Shaker A., Ph.D., University of Mississippi, 1982; Associate Professor, Management

Business Administration, M.B.A.

The Master of Business Administration degree, offered by the School of Business Administration, provides a high-level professional education in several areas of business administration. The program is oriented to management in both business and government. The program is available in the
daytime for full-time students only and in the evening for full- or part-time students.

Admission Requirements
All students registering for graduate-level courses numbered 600 or higher offered by the School of Business Administration must have graduate standing (i.e., be admitted to the Graduate School).

Degree applicants must fulfill the general admissions requirements of the Graduate School.

Admission to the M.B.A. degree program is competitive. The admissions decision is based primarily on grades in undergraduate academic course work and on performance on the GMAT. These criteria are applied flexibly to assure that people with unusual academic qualifications are not denied admission.

Degree Requirements
The M.B.A. program requires between 36 and 60 semester hours of graduate course work. The exact number of credit hours for an individual's program is based on an evaluation by the associate dean for academic programs at the time of admission. The decision is based on the applicant's prior academic background, with particular emphasis on knowledge acquired in the foundation course work described below. The structure of the program is based on three levels of course work: foundation courses (0-24 hours); M.B.A. core courses (18 hours); and elective courses (18 hours). A student may elect a thesis option to substitute for 6 hours of course work with written approval of the associate dean, School of Business Administration.

Day Program
The day M.B.A. is a structured program for students who have completed all foundation course work and who wish to pursue their M.B.A. degree full time during the day. The day program provides an academically rigorous yet cost-efficient option for earning the M.B.A. degree. The day M.B.A. courses are staffed exclusively by full-time faculty members who have earned the appropriate doctoral degree. All students must take the same courses at the same time over the three semesters of the program unless an exception is approved in writing by the associate dean for academic programs.

The day program mirrors the content of the evening program but offers less scheduling flexibility. The program of study for the day program is spread over eleven months as follows:

Fall 1989 schedule: ACCT 611, MGMT 613, DESC 611, MKTG 611
Spring 1990 schedule: FNAN 611, MGMT 797, and three designated electives
Summer 1990 schedule: three designated electives

Students are accepted to the day program only for the fall term.

Evening Program
The evening program is available to both full-time and part-time students, although it is oriented toward the needs of part-time students. Students who have not completed all foundation course work must begin their studies in the evening program and may transfer to the next class of the day program upon completion of all foundation deficiencies.

Foundation Course Work (24 Hours)
Each graduate student must complete the course work identified in the foundation courses listed below, unless the material offered in the courses has been successfully completed prior to admission or the student has successfully passed the challenge exam for that course. An undergraduate degree in business administration usually satisfies most of the foundation course work requirements. Foundation courses may not be used for M.B.A. elective credit.

The foundation courses are:

ACCT 610 Accounting and Reporting (3)
FNAN 610 Financial Management (3)
MKTG 610 Marketing Concepts and Processes (3)
IRM 610 Computer Systems for Management (3)
DESC 610 Statistical Foundation for Business Decision Making (3)
BULE 610 Law and the Business Environment (3)
MGMT 612 Organizational Behavior (3)
FNAN 602 Managerial Economics (3)

M.B.A. Core (18 Hours)
Each candidate must complete the following M.B.A. core courses:

ACCT 611 Managerial Accounting (3)
FNAN 611 Cases in Financial Administration (3)
MKTG 611 Cases in Managerial Marketing (3)
DESC 611 Quantitative Analysis in Business and Operations Management (3)
MGMT 613 Management Theory and Practice (3)
MGMT 797 Business Policy (3)  
(See note on thesis option)

Electives (18 hours)  
Each candidate must complete at least 18 hours of  
M.B.A. electives with no more than three 700-  
level graduate courses in one of the following dis­  
ciplines: Accounting, Business Legal Studies,  
Decision Sciences, Finance, Information Resource  
Management, Management, or Marketing.

Thesis Option  
On completion of 30 hours of M.B.A. core and  
elective courses, the student may elect to fulfill the  
requirement for two elective courses by com­  
pleting a thesis.

Special School Regulations  
1. A maximum of 6 hours of elective credits in an­  
other graduate program of this university may  
be allowed provided they are in a related field  
and the student has prior written approval of  
the associate dean for academic programs,  
School of Business Administration.

2. Subject to general transfer policies of the Grad­  
uate School, up to 6 hours of graduate course  
work may be transferred from other institu­  
tions. However, to be considered for transfer,  
such work must have been completed within six  
years prior to the date of admission to the  
Graduate School.

3. Required foundation courses must be com­  
pleted before a student begins core courses.  
Core courses should be completed before elec­  
tives are taken.

4. All students must satisfy ALL course prerequi­  
sites listed in the Schedule of Classes for  
courses offered by the School of Business Ad­  
ministration. Students who register for such  
courses without the prerequisites or without a  
written waiver from the associate dean of the  
School of Business Administration may be  
dropped from those courses.

Accounting Courses (ACCT)  
Graduate courses in Accounting are listed under the Ac­  
counting section in the catalog.

Business Legal Studies  
Courses (BULE)  
General Prerequisite  
Students who have not gained admitted status from the  
Graduate School may not register for graduate-level  
courses numbered 600 or higher offered by the School of  
Business Administration.

610 Law and the Business Environment (3:3:0).  
Prerequisite: Graduate standing. Interrelationships between  
business organizations, their external environments, is­  
suess arising out of those environments, and the public  
policy process.

Prerequisite: Completion of all MBA foundation courses in­  
cluding BULE 610. Regulatory process as it affects busi­  
ness; emphasis on interaction of legislative,  
administrative, and judicial policies and procedures as  
they influence the formulation and interpretation of reg­  
ulations.

703 Land Use Control and Regulation (3:3:0).  
Prereq­  
site: FNAN 351 and completion of all MBA foundation  
courses including BULE 610. Basic principles of law af­  
flecting the use of land and natural resources including  
legal remedies and defenses available to the private citi­  
en. Emphasis on recent law and federal and state statu­  
estes.

770 Legal Aspects of Information Resource Manage­  
ment (3:3:0). Prerequisite: Completion of all MBA founda­  
tion courses including IRM 610. Examination of the  
special problems of applying existing laws and legal doc­  
trines to the management of information resources. Em­  
phasis on how the public policy process responds to the  
unique problems posed by information processing tech­  
nology as well as how managers can influence public pol­  
icy. Readings, case analysis, lecture, reports (same as  
IRM 770).

Decision Sciences Courses  
(DESC)  
General Prerequisite  
Students who have not gained admitted status from the  
Graduate School may not register for graduate-level  
courses numbered 600 or higher offered by the School of  
Business Administration.

610 Statistical Foundation for Business Decision  
Making (3:3:0). Prerequisite: 6 credits of math with cal­  
culus strongly recommended and graduate standing. The use  
of statistical methods as scientific tools in the analysis of  
practical problems in business decision making. Topics  
include descriptive statistics; probability theory; proba­  
bility distribution; sampling distribution, inference-esti­  
mation and hypothesis testing; elementary decision  
theory; time series analysis; linear regression and correla­  
tion; the analysis of variance.

611 Quantitative Analysis in Business and Opera­  
tions Management (3:3:0). Prerequisite: Completion of  
all MBA foundation courses including DESC 610 and grad­  
uate standing. Knowledge of calculus is strongly recom­  
mended. A systems approach which addresses a wide  
rage of operations management decisions from long­  
term policy and systems design questions to daily sched­  
uling, cost control, and quality control decisions.  
Emphasis is on modeling, quantitative analysis of sys­  
tems, case studies, and using computer programs to solve  
operations management problems.

735 Computer Simulation (3:3:0). Prerequisite: DESC  
611. Introduction to the basic concepts of simulating  
complex systems by computer. Topics include Monte  
Carlo methods, discrete-event modeling, a specialized  

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Areas of Study

Simulation language, and the statistics of input and output analysis.

742 Management Science (3:3:0). Prerequisite: DESC 611. Operations research techniques for systems analysis. Addresses prominent mathematical programming and stochastic process topics from linear programming, networks, integer programming, goal programming, decision theory, dynamic programming, Markov processes, inventory theory, and queuing theory. Use of computer software in problem solving and in case study analyses.

743 Seminar in Applications of Management Science (3:3:0). Prerequisite: DESC 742. Model development and implementation involved in the practice of operations research in management science.

744 Contemporary Issues in Decision Analysis (3:3:0). Prerequisite: DESC 611. Application of analytic reasoning skills to practical problems in business administration. Topics include problem structure, analysis, and solution implementation, emphasizing contemporary approaches to decision analytic techniques.

763 Seminar in Operations Management (3:3:0). Prerequisite: DESC 611. 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 611. By special arrangement with professor and approval of the Decision Sciences chair.

799 Thesis (6:0:0). Prerequisite: 30 hours of graduate course work beyond the foundation.

Finance Courses (FNAN)

General Prerequisite

Students who have not gained admitted status from the Graduate School may not register for graduate-level courses numbered 600 or higher offered by the School of Business Administration.

602 Managerial Economics (3:3:0). Prerequisite: DESC 610 and graduate standing. Provides a fundamental understanding of how economic principles are applied, along with mathematical and statistical analysis, to managerial decision making. Principles of microeconomic theory are thoroughly explored including models of theories of choice under conditions of risk, uncertainty and multiple goals, market supply and demand, production and cost functions, monopoly, oligopoly and perfect competition, product and resource pricing, capital budgeting and investment and general equilibrium.

610 Financial Management (3:3:0). Prerequisite: FNAN 602, ACCT 610, DESC 610, and graduate standing. Topics include management of working capital, determination of the cost of capital and optimal financial structure, capital budgeting processes, and the overall integration of financial management to achieve a maximization of wealth-decision criteria.

611 Cases in Financial Administration (3:3:0). Prerequisite: ACCT 611, completion of all MBA foundation courses including FNAN 610, and graduate standing. Applying the theories of finance to the formulation and application of policies. Internal financial analysis, financial forecasting, management of assets, rate-of-return, capital formation cases, financial management in the multinational environment.

711 Long-Term Financial Management (3:3:0). Prerequisite: FNAN 611. 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 611. 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 Security Analysis (3:3:0). Prerequisite: FNAN 611. The analysis of equity securities and debt instruments given the implications of the efficient market hypothesis and modern capital market theory.

722 Portfolio Analysis (3:3:0). Prerequisite: FNAN 611. Theory and mathematical techniques used in the management of investment portfolios.

731 Financial Markets (3:3:0). Prerequisite: FNAN 611. Allocation of funds process accomplished by financial markets. Money and capital markets, including the organization, relative efficiency and interaction between market segments.

732 Financial Institutions (3:3:0). Prerequisite: FNAN 611. Financial institutions as intermediaries within the financial markets. Organizational and regulatory forces in terms of influences upon management.

741 Current Topics in Finance (3:3:0). Prerequisite: FNAN 611. Topics of interest in finance, including industrial, governmental, international, or institutional applications. Techniques and methods of financial practice and influences of new legislation.

751 Real Estate Finance: Mortgage Markets and Investment (3:3:0). Prerequisite: FNAN 611. Mortgage banking with emphasis on markets, instruments, and financial environment and techniques; and the real estate investment decision-making process and skills with emphasis on analysis and strategy. Microcomputer applications.

752 Real Estate Market Analysis (3:3:0). Prerequisite: FNAN 611. Real estate market analysis and sources of data; problems and techniques that apply to each of the analysis of various types of real estate. Students will develop analytical skills involving the use of the microcomputer and appropriate software.

753 Land Development (3:3:0). Prerequisite: FNAN 611. The business of creating new communities of residential, commercial, and industrial space; includes land acquisition, overall planning, project management, financing, land preparation, and construction. Techniques involve site selection, location analysis, market feasibility studies, and legal and social analysis. Microcomputer applications.

772 Managerial Economics II (3:3:0). Prerequisite: FNAN 611. Application of economic analysis to business management; government economic policy; the use of national economic statistics; interpreting economic trends and developments; forecasting. Current economic problems and their effects.
796 Independent Study and Directed Readings (3:3:0). Prerequisite: FNAN 611. By special arrangement with professor and approval of the Finance Department chair.

799 Thesis (6:0:0). Prerequisite: 30 hours of graduate course work beyond the foundation.

**Information Resource Management Courses (IRM)**

**General Prerequisite**

Students who have not gained admitted status from the Graduate School may not register for graduate-level courses numbered 600 or higher offered by the School of Business Administration.

610 Computer Systems for Management (3:3:0). Prerequisite: Graduate standing. A course in computer programming is recommended. Examination of computer information systems and their interrelations with management processes. Emphasis on management information system life cycle from manager's perspective. Lecture and computing lab, including programming in BASIC and a variety of microcomputer software packages.

720 Analysis and Design of Computer Systems (3:3:0). Prerequisite: Completion of all MBA foundation courses including IRM 610. Computer systems life cycle with emphasis on information requirement analysis, feasibility studies, system design, equipment selection, and the implementation process. Student teams are assigned system development projects to work with users to define system requirements and to prepare implementation plans.

730 Decision Support and Expert Systems (3:3:0). Prerequisite: Completion of all MBA foundation courses including IRM 610. Use of decision support systems and expert systems in large organizations' data bases. Course concentrates on technical and administrative issues facing companies and agencies which need to go beyond MIS to meet more complex information needs. Integrates user and manager perspectives. Introduces micro-based and mainframe-based DSS and Expert Systems packages. Project and computer lab.

735 Management Information Systems (3:3:0). Prerequisite: Completion of all MBA foundation courses including IRM 610. Conceptual foundations, structure, and development of management information systems from an organizational perspective are featured. Information-based support systems for the management of knowledge work are also covered. Term project.

740 Distributed Systems Applications (3:3:0). Prerequisite: Completion of all MBA foundation courses including IRM 610. Technical and managerial issues in the planning, installation, support, use, and operation of business data communication systems. Term project and laboratory.

750 Managerial Applications of Microcomputers (3:3:0). Prerequisite: Completion of all MBA foundation courses including IRM 610. Selection and use of microcomputer hardware and software for management applications such as word processing, spread sheet analysis, graphics, communications, file management, and data base management. Term project and laboratory.

760 Human Engineering Issues in Computer Systems Design (3:3:0). Prerequisite: Completion of all MBA foundation courses including IRM 610. 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 on alternative human factors decisions examined in applied settings. Cases and laboratory.

770 Legal Aspects of Information Resource Management (3:3:0). Prerequisite: Completion of all MBA foundation courses including IRM 610. Examination of the special problems of applying existing laws and legal doctrines to the management of information resources. Emphasis on how the public policy process responds to the unique problems posed by information processing technology, as well as how managers can influence public policy. Readings, case analysis, lecture, reports. (Same as BULE 770).

780 Knowledge-Based Systems for Business (3:3:0). Prerequisite: Completion of all MBA foundation courses including IRM 610 and 720. Introduction for system developers and managers to the concepts and techniques for building knowledge-based systems. Emphasis is on the use and application of knowledge-based systems in business and public section organizations. Term project.

790 Contemporary Issues in Information Resource Management (3:3:0). Prerequisite: Completion of all MBA foundation courses including IRM 610. Introduction to the concepts, techniques, and implementation of information resource management in businesses, government agencies (federal, state, local), and other organizations. Emphasis is on the use of contemporary techniques in IRM applied to the full spectrum of information resource issues, including equipment, systems, hardware, software, training, data communications, and human factors. Term project.

792 Topics in Information Resource Management (3:3:0). Prerequisite: Completion of all MBA foundation courses including IRM 610. A significant information resource management topic is selected for detailed coverage. Examples of such topics are computer security, life cycle management of EDP systems, computer personnel management. Term Project.

795 Business Expert Systems (3:3:0). Prerequisite: Completion of all MBA foundation courses including IRM 610. Thorough introduction to applications of expert systems for advice, consultation and decision-making. Emphasis is on the use and application of expert systems in business and public sector organizations. Term project.

**Management Courses (MGMT)**

**General Prerequisite**

Students who have not gained admitted status from the Graduate School may not register for graduate-level courses numbered 600 or higher offered by the School of Business Administration.

612 Organizational Behavior (3:3:0). Prerequisite: Graduate standing. Study and application of principles of individual and group behavior to the solution of human problems in business organizations, domestic and inter-

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national. Relationships with superiors and subordinates in formulating and accomplishing personnel policies.


722 Human Resource Planning (3:3:0). Pre-requisite: MGMT 613. This course examines the personnel/human resource process which provides adequate human resources to meet current and future organizational objectives. Emphasis on forecasting internal labor supply and demand; programming to meet objectives; and evaluation and control. Readings, research, discussion, and lecture.

731 Seminar in Labor Management Relations (3:3:0). Pre-requisite: MGMT 613. The U.S. labor movement and its present political-economic status. Legal environment surrounding labor relations and recent rulings by regulatory bodies. Executive orders and political forces influencing unions in the public sector. Emphasis on negotiations and administration of labor contracts at the local level.

741 Strategic Planning and Control (3:3:0). Pre-requisite: MGMT 613. Theories and applications of modern strategic planning. Strategic decision making within the supportive framework of a strategic planning system. Emphasizes the methodological "how to do it" aspects of strategic decision making, planning, and control. Lecture, readings, discussion, case analysis, and projects.


761 Management of Research and Development (3:3:0). Pre-requisite: MGMT 613. Study of management concepts in R & D, including examination of selected international practices (e.g. Japan, West Germany, etc.) and possible adaptation, recognizing cultural differences. Emphasis on the incentives and disincentives for R & D climate and the organizational and management techniques which affect R & D performance. Economics affecting R & D programs, role of government and universities in industrial R & D activities.

771 Organizational Management and Public Policy (3:3:0). Pre-requisite: MGMT 613. An examination of contemporary organizational management reflecting economic, social, political, and technological public policy concerns. Management issues treated include disclosure, governance, ethical behavior, employee citizenship rights, working life, governmental relations and political involvement, health, safety, and the environment.

781 Seminar in Comparative Business Management (3:3:0). Pre-requisite: MGMT 613. Comparative analysis of business practices and management systems in different economic, social, and political systems. Generic characteristics of management and business enterprises as modified in varying environments.

785 Business and Organizational Interviewing (3:3:0). Pre-requisite: MGMT 613. Study of management theory and concepts relevant to business and organizational interviewing. Introduction to relevant theory and research on the most commonly used forms of the business interview. Videotaping and role playing train students in the correct uses of the business interview. Focus on survey, selection, appraisal, counseling, discipline, and exit interviews from the perspective of the interviewer.


795 Managerial and Business Communication (3:3:0). Pre-requisite: MGMT 613. Study of the concepts and issues in managerial and business communication. Introduction to the study of managerial communication as preparation for a career in human resource development. The study of managerial communication is a natural base for work in the general personnel function of an organization.

796 Independent Study and Directed Readings (3:0:0). Pre-requisite: MGMT 613. By special arrangement with professor and approval of the Management Department chair.

797 Business Policy (3:3:0). Pre-requisite: 24 graduate semester hours beyond foundation course work including completion of ACCT 611, FNAN 611, DESC 611, MKTG 611, and MGMT 613. Examines entrepreneurial functions in business; determination of the field of business in which the firm will operate, its goals, corporate strategy to reach these goals, and major policies to implement the corporate strategy.

798 Seminar in Business Research (3:3:0). Pre-requisite: 30 graduate semester hours beyond foundation course work. Study of research design plans, methodologies, data collection and analyses and their application to business research projects. Students prepare a written report covering an approved research topic in a specialty area.

799 Thesis (6:0:0). Pre-requisite: 30 hours of graduate course work beyond the foundation.

Marketing Courses (MKTG)

General Prerequisite

Students who have not gained admitted status from the Graduate School may not register for graduate-level courses numbered 600 or higher offered by the School of Business Administration.

610 Marketing Concepts and Processes (3:3:0). Pre-requisite: FNAN 602, ACCT 610, and graduate standing.

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Decision making in the marketing areas of product development, pricing, promotion, and physical distribution. Emphasis on analysis of marketing situations and on data-based decision making.

**611 Cases in Managerial Marketing (3:3:0). Prerequisite:** Completion of all MBA foundation courses including MKTG 610, and graduate standing. The application of qualitative and quantitative techniques in approaching various marketing situations. Emphasis on use of marketing research, product planning, pricing, and target market determination.

**723 Marketing for Public and Private Non-profit Organizations (3:3:0). Prerequisite:** MKTG 611. Study of the application of conceptual systems of marketing as they apply to public and private non-profit organizations. Emphasis on ideas and concepts vs. products and services for such organizations as government agencies, charitable organizations, national parks, and zoos. Lectures, discussions, and case analyses.

**724 Promotional Strategy in Marketing (3:3:0). Prerequisite:** MKTG 611. Promotion activities as applied to both profit and nonprofit organizations. The approach is to develop basic issues in promotional strategy, then to focus on managerial issues and problems as encountered by promotion executives.

**725 Marketing Research (3:3:0). Prerequisite:** MKTG 611 and DESC 611. Concepts, theories, principles, techniques, and models underlying the marketing research process.

**726 Advanced Consumer Behavior (3:3:0). Prerequisite:** MKTG 611. Advanced study of the concepts and propositions that comprise consumer decision processes. Examination of extant literature and research applications for marketing strategy and public policy are stressed. Lecture and case analysis.

**775 Theory and Policies of International Business (3:3:0). Prerequisite:** FNAN 611, MKTG 611, MGMT 613. Introduction to the theory, environments, and practices of international business. Emphasis on international entry strategies and environmental risk assessment. Lecture, cases and discussion.

**796 Independent Study and Directed Readings (3:0:0). Prerequisite:** MKTG 611. By special arrangement with professor and approval of the Marketing Department chair.

**799 Thesis (6:0:0). Prerequisite:** 30 hours of graduate course work beyond the foundation.

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**Chemistry, M.S.**

The Master of Science program 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 of the Graduate School.

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. Acceptable scores on the Graduate Record General and Subject Chemistry Examinations must also be submitted unless this requirement is waived on the basis of the applicant's record and experience.

Each entering student may be required to take proficiency examinations before registering for the first time. The results of these examinations are used in planning the program of study. A student whose performance on these examinations reveals serious deficiencies may be required to register for one or more remedial undergraduate courses, which may not be used to satisfy the requirements for the M.S. degree. Each student must present evidence of computer literacy before completing 12 credit hours of graduate work.

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**Chemistry Faculty**

**Chen, Holly Ho,** Ph.D., University of California, San Diego, 1969; Associate Professor

**Cozzens, Robert F.,** Ph.D., University of Virginia, 1966; Professor

**Davies, Keith M.,** Ph.D., University of Wales, 1967; Associate Professor

**Davis, Stephen L.**, Ph.D., Yale University, 1976; Associate Professor, Associate Chair

**Hussam, Abul**, Ph.D., University of Pittsburgh, 1982; Assistant Professor

**Meites, Louis**, Ph.D., Harvard University, 1947; Professor

**Mushrush, George W.**, Ph.D., George Washington University, 1968, Professor, Department Chair

**Roth, Ronald J.**, Ph.D., Columbia University, 1972; Associate Professor

**Slayden, Suzanne W.**, Ph.D., University of Tennessee, 1976; Associate Professor

**Stalick, Wayne M.**, Ph.D., Northwestern University, 1969; Professor

**Weber, Jon P.**, Ph.D., University of California, Santa Cruz, 1980; Assistant Professor
Degree Requirements

Two tracks are available. The laboratory track is for students planning to continue work for the Ph.D. degree or to begin or continue careers in chemical research. The thesis written by a student on this track may be based on either experimental or theoretical research. The non-laboratory track 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 but which do not involve laboratory work.

A student must complete at least 30 credit hours of graduate course work. Of these, 12 must be in core courses in chemistry (one in each of four different areas chosen from analytical, biological, inorganic, organic, and physical chemistry), 3 must be in an elective course in chemistry, 6 must be in elective courses in chemistry or related fields, 3 must be in CHEM 690 (Graduate Seminar in Chemistry), and 6 must be in either CHEM 798 (for a student on the non-laboratory track) or CHEM 799 (for a student on the laboratory track). Courses acceptable toward the core-course requirement are identified in the following list of courses.

A final oral examination is required on each track. Each student on the laboratory track presents a thesis on an experimental or theoretical research project and takes final examination given by a thesis committee. Each student on the non-laboratory track presents a written report on a non-laboratory research project and takes final examination given by an advisory committee. The student's thesis or advisory committee is appointed during the first semester of registration in CHEM 798 or 799.

Chemistry Courses (CHEM)

500 Selected Topics in Modern Chemistry (3:3:0). Topics of interest in analytical, biological, inorganic, organic, and physical chemistry. Recommended for teachers of chemistry and general science.

501 Laboratory Demonstration Techniques in the Teaching of Chemistry (3:3:0). Course develops proficiency in conducting lab demonstrations. Recommended for teachers of chemistry and general science.

502 General Biochemistry (3:3:0). Prerequisite: CHEM 313 and 314, BIOL 383 or permission of department. Survey course for graduate students in biology and chemistry that examines the chemical basis of biological systems emphasizing structure, function, and regulation of metabolic systems.

513 Synthetic and Mechanistic Organic Chemistry (3:3:0). Prerequisite: CHEM 313 and 314. Emphasis on topics such as heterocyclics, natural products, and biologically active compounds. Relation of applied organic chemistry to consumer products, including drugs and agricultural chemicals. Satisfies the core-course requirement in organic chemistry, or may be taken as an elective course if CHEM 514 is used to satisfy the core-course requirement in that field.

514 Physical Organic Chemistry (3:3:0). Prerequisite: CHEM 313, 314, or permission of instructor, but not 513. The principles underlying molecular structures, reactivities, 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. Satisfies the core-course requirement in organic chemistry, or may be taken as an elective course if CHEM 513 is used to satisfy the core-course requirement in that field.

521 Theory of Analytical Processes (3:3:0). Prerequisite: CHEM 422 or permission of instructor. Physicochemical principles and analytical techniques applicable to the analysis of solutions, including activity coefficients, solvation and ionic size, titration-curve theory, acidity functions and pH-scales, kinetic analysis, and modern techniques for designing experiments and interpreting data. Satisfies the core-course requirement in analytical chemistry.

523 Trace and Microanalysis (3:3:0). Prerequisite: CHEM 422 or permission of instructor. Principles and applications of currently used methods of analysis, including differential pulse polarography, stripping voltammetry, atomic absorption and emission spectrometry, fluorescence analysis, neutron activation analysis, and spark-source mass spectrometry. Applications to the determinations of traces of metals in environmental samples.

524 Principles of Chemical Separation (3:3:0). Prerequisite: CHEM 321 and 422 or 521, or permission of department. Theories and models of separation, with applications to the analyses of a wide range of chemical, biological, and environmental samples. Topics include capillary and high resolution gas chromatography, and high performance liquid chromatography. Emphasis on the theory of reversed-phase, normal-phase, ion-exchange, size-exclusion, and affinity-based separations. Instrumentation such as detectors, pumps, column, and data acquisition and analysis is also presented.

525 Electroanalytical Chemistry (3:3:0). Prerequisite: CHEM 422 or permission of instructor. Theory of polarography, stationary-electrode and hydrodynamic voltammetry, chronopotentiometry, controlled-potential electrolysis and coulometry at controlled potential, coulometric titration, and a number of related techniques, with emphasis on their use in analysis and research.

529 Instrumental Techniques of Analysis (2:0:6). Prerequisite: 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, magnetic resonance spectroscopy, atomic emission absorption spectrometry, and electroanalytical methods. The student, with approval of his or her research committee, is free to choose the methods studied.

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531 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.

533 Chemical Thermodynamics and Kinetics (3:3:0). Prerequisite: CHEM 331 and 332. Advanced study of thermodynamics and kinetics. Satisfies the core-course requirement in physical chemistry.


546 Bioinorganic Chemistry (3:3:0). Survey of the structures, functions, and properties of metal ions in biological systems. Modern inorganic coordination chemistry and the study of metal-ion sites in metalloenzymes and metalloproteins. Enzymatic catalysis, oxygen carriers, electron-transport phenomena, and inorganic model systems. Satisfies the core-course requirement in inorganic chemistry.

563, 564 Biochemistry (3:3:0), (3:3:0). Prerequisite: CHEM 313 and 314. CHEM 563 is prerequisite to CHEM 564. A previous course in biology is recommended but not required. Important biological compounds, including proteins, carbohydrates, lipids, and nucleic acids, and their interrelations. CHEM 563 satisfies the core-course requirement in biochemistry.

565, 566 Biochemistry Lab (2:1:3) (2:1:3). Prerequisite or corequisite: CHEM 563. CHEM 565 is prerequisite for CHEM 566. Introduction to experimental methods used to study the chemical and physical properties of proteins, carbohydrates, lipids, and nucleic acids. Complements the corresponding lecture courses (CHEM 563 and 564). Designed for those who have had no previous exposure to the specialized techniques used in biochemical research. One hour recitation.

567 Protein Biochemistry (3:3:0). Prerequisite: CHEM 563 and 564, or permission of instructor. Topics include the structural, transport, and immunological behaviors of proteins with emphasis on their roles as biological catalysts. Current theories of enzyme catalysis as well as pertinent experimental techniques. Important structural proteins from muscle and connective tissue as well as free and membrane-bound transport proteins.

690 Graduate Seminar (1:1:0). Selected topics from recent chemical theory and applications, designed to inform students about current developments in the chemical sciences. A seminar presentation on the student's own research or another topic acceptable to the department is required in the student's last semester. Each graduate student in chemistry must register for this course each semester. Three credits of CHEM 690 are required for the M.S. degree.

798 Research Project (3-6:0:0). Prerequisite: Permission of department. An experimental or theoretical research project is chosen and completed under the guidance of a graduate faculty member. A 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 for the M.S. degree, but credit will not be given for both.

799 Master's Thesis (3:6-0:0). Prerequisite: Permission of department. A laboratory research project is chosen and completed under the guidance of a graduate faculty member. A thesis acceptable to the student's thesis committee and a final oral defense of that thesis are required. Six credits of either CHEM 798 or 799 are required, but credit will not be given for both.

800 Studies for the Doctor of Arts in Education (variable credit). Prerequisite: DAEd. student admission to study in chemistry. Program of studies, designed by student's discipline director and approved doctoral committee, which allows the student to participate in the current research of the discipline director and results in a paper reporting the original contributions of the student. The paper is presented in a subsequent D.A.Ed. summer seminar. Enrollments are repeated according to each student's program.

Community College Education

Faculty

Beyer, Barry K., Ph.D., University of Rochester, 1962; Professor of Education and Program Coordinator

Boileau, Don M., Ph.D., University of Oregon, 1972; Professor and Chair, Department of Communication

Chickering, Arthur W., Ph.D., Columbia University, 1958; Professor, Educational Leadership and Human Development

Edwards, Randall, Ph.D., Virginia Polytechnic Institute and State University, 1970; Executive Vice President for Administration and Senior Scholar in Community College Education

Gilley, J. Wade, Ph.D., Virginia Polytechnic Institute and State University, 1966; Senior Vice President, Professor of Engineering, Professor of Higher Education, and Senior Scholar in Community College Education

Jacob, Evelyn S., Ph.D., University of Pennsylvania, 1977; Associate Professor of Education

Thaiss, Christopher J., Ph.D., Northwestern University, 1975; Associate Professor of English

Vaughan, George B., Ph.D., Florida State University, 1970; Professor and Director, Center for Community College Education
Doctor of Arts in Community College Education

The Doctor of Arts in Community College Education is administered by the Center for Community College Education. Course work leading to the degree enables community college faculty members to become more effective teachers and to educate prospective community college teachers. The program emphasizes a broad knowledge base in teaching as well as courses in research and the history and philosophy of the community college. Students select courses from designated departments in the university to develop a program of study. Knowledge areas include business, biology, chemistry, computer science, economics, English, foreign languages and literatures, health and physical education, history, information systems, nursing, operations research and applied statistics, psychology, and sociology. Applications for other fields are considered where appropriate course work is available. Under the guidance of faculty advisers and the center’s staff, students entering the program develop educational contracts that formalize their programs of study.

Admission Requirements

In addition to meeting the general admissions requirements of the Graduate School, applicants must fulfill the following:

1. Have experience in teaching at the community college level, or have teaching at the community college level as a career objective;
2. Submit a completed application (applications are available from the Center for Community College Education);
3. Submit a short statement (500 to 1,000 words) describing the applicant’s interest in the program and how it will help achieve career objectives;
4. Submit a writing sample if English is the applicant’s knowledge area;
5. Schedule an interview with the staff of the Center for Community College Education.

Degree Requirements

The program requires a minimum of 55 hours beyond the master’s degree. The basic components of the program for a faculty member holding a master’s degree in the current or proposed teaching field are as follows:

Minimum Requirements

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Minimum Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Knowledge Area</td>
<td>24</td>
</tr>
<tr>
<td>Core Curriculum</td>
<td>10</td>
</tr>
<tr>
<td>Internship</td>
<td>3</td>
</tr>
<tr>
<td>Doctoral Project</td>
<td>9</td>
</tr>
<tr>
<td>Total</td>
<td>46</td>
</tr>
</tbody>
</table>

The remaining 9 hours 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 9 hours are determined by the director of the Center for Community College Education in consultation with the student and the knowledge area adviser. The 9 hours 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 educational contract outlines the student’s approved program of study. This contract must be approved prior to the student’s completing 12 hours of course work.

The number of credits assigned to the knowledge area, core curriculum, internship, and doctoral project may vary for individual students 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.

Knowledge Area

The knowledge area consists of courses in a student’s discipline and may contain courses in related fields when appropriate and when approved by the knowledge area adviser. All students must successfully complete the following courses: (a) a course in the theory and philosophical concepts of the discipline, (b) a course in the research methodology by which the discipline generates knowledge, and (c) a “new developments” course that focuses on recent significant advances in the knowledge area.

Core Curriculum

Students who currently teach in a community college or who have previously taught in a community college must complete a minimum of 10 credits in the core curriculum including EDCC 801 The Community College (3 credits), and EDCC 850 Research: Methods and Application (4 credits). Each student also chooses at least one 3-credit hour elective course from the list below. Students who are not experienced community college teachers must complete the two required core courses and at least 6 credits of core elective courses from the following:
EDCC 802 Community College Teaching through Learning Styles (3 credits)
EDCC 805 Teaching Thinking (3 credits)
EDCC 806 Communication Skills for Teaching (3 credits)
EDCC 892 Special Topics in Community College Education (3 credits)
EDUC 840 Adult Development and Learning (3 credits)
EDUC/ENGL 695 Writing Across the Curriculum (3 credits)

Internship
Students must satisfactorily complete a minimum of 3 credit hours in an internship. A maximum of 6 credits may be earned through the internship. This may be in a teaching internship in a community college or a non-teaching internship. Such internships may be in government or business organizations in which community college graduates are employed. Internships for experienced community college faculty also may involve work in course development.

Comprehensive Examination/Experience
Upon satisfactory completion of all course work and the internship, a student completes either a traditional comprehensive examination or a more nontraditional comprehensive experience 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.

Doctoral Project
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. The project is synthesizing in nature and must contribute new knowledge or a reinterpretation of existing knowledge to the area being investigated. 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.

Advising
All students are advised by the staff of the Center for Community College Education. In addition, each student is assigned an adviser in the knowledge area. Working with these advisers, each student prepares a program of study and completes all program requirements.

Residence
Doctoral students are required to spend a minimum of two consecutive semesters, not including summer session, in continuous registration. The doctoral program of study must include a minimum of 36 semester hours of graduate work taken at the university after admission to degree-seeking status.

Course Work at Other Institutions
Twelve hours of credit beyond the master's degree may be applied toward the Doctor of Arts in Community College Education degree 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 prior to admission to the doctoral program. Students who have not used this provision at the time of admission to the program may complete up to 12 hours of approved course work at other institutions while enrolled in the doctoral program, and apply these credits to program requirements.

Community College Education Courses (EDCC)
801 The Community College (3:3:0). Prerequisite: Admission to the D.A.C.C.E. program or permission of instructor. Study of 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 Style (3:3:0). Prerequisite: Admission to the D.A.C.C.E. program or permission of instructor. Focus 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 placed on study, analysis, and application to teaching in the community college. Classroom format emphasizes participation by the student and application of course content to community college teaching.
805 Teaching Thinking (3:3:0). Prerequisite: Admission to the D.A.C.C.E. program or permission of instructor. Through lecture, discussion, and demonstration, students design, analyze, apply, and evaluate practical approaches to teaching critical thinking at the post-secondary 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.C.C.E. program or permission of instructor. Study of 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.
850 Research: Improving Teaching through Research (4:4:0). Prerequisite: Admission to the D.A.C.C.E. program or permission of instructor. Course helps community college faculty members improve their teaching by developing skills as teacher-researchers and increasing knowledge of research methodology. Students conduct a research study related to their teaching.

892 Special Topics in Community College Education (3:3:0). Prerequisite: Admission to the D.A.C.C.E. program or permission of instructor. Content varies depending on interests of the center. May be repeated for credit when topics vary.

**Computer Science**

**Faculty**

Acquah, James B., D.Sc., George Washington University, 1989; Assistant Professor

Bottega, Thomas B., D.Sc., George Washington University, 1985; Assistant Professor

De Jong, Kenneth A., Ph.D., University of Michigan, 1975; Associate Professor

Diaz-Herrera, Jorge I., Ph.D., University of Lancaster, 1981; Assistant Professor

Gonzalez, Carlos M., Ph.D., Case Western Reserve University, 1975; Assistant Professor

Hamburger, Henry J., Ph.D., University of Michigan, 1971; Associate Professor

Kjell, Bradley P., Ph.D., University of Wisconsin, 1985; Assistant Professor

Ko, Heedong, Ph.D., University of Illinois, 1989; Visiting Assistant Professor

Kodratoff, Yves, Ph.D., France; Visiting Professor and Visiting Research Scholar (joint appointment with the University of Paris)

Littman, David, Ph.D., Yale University, 1989; Ph.D. Cornell University, 1976; Assistant Professor

Michalski, Ryszard, Ph.D., Polytechnical University of Silesia, Poland, 1969; PRC Professor

Norris, Eugene M., Ph.D., University of Florida, 1969; Associate Professor

Qu, Yaoshuang, Ph.D., University of Wisconsin, 1985; Assistant Professor

Quammen, Donna J., Ph.D., University of Pittsburgh, 1986; Assistant Professor

Rice, Michael D., Ph.D., Wesleyan University, 1973; Associate Professor

Rine, David C., Ph.D., University of Iowa, 1970; Professor, Department Chair

Seidman, Stephen B., Ph.D., University of Michigan, 1969; Professor

Sood, Arun K., Ph.D., Carnegie-Mellon University, 1972; Professor

Wang, Pear Y., Ph.D., University of Wisconsin, 1980; Assistant Professor

Wechsler, Harry, Ph.D., University of California, Irvine, 1980; Professor

Zytkowski, Jan, Ph.D., The University of Warsaw, 1972; Visiting Professor

**Computer Science, M.S.**

The Master of Science in Computer Science, offered by the Computer Science Department, is for individuals who are or wish to become involved in the expanding fields of computer technology. The program encompasses the depth of knowledge needed to pursue more advanced work in computer science or allied areas.

Many 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 students.

Students may take courses through the Cooperative Graduate Engineering Program, which is affiliated with the University of Virginia and Virginia Tech. Appropriate courses may be transferred, with adviser approval, into the GMU degree program. Refer to section on Certificates, Programs, and Additional Graduate Courses in this catalog.

**University Computing Capability**

The major academic computing capability at the university is provided by a VAX 8800 running under VMS and a VAX 8530 running under ULTRIX, plus local area networks with access to most national/international electronic mail services. Computer Science also has access to Pyramid and microvax UNIX machines. The Computer Science laboratories have minicomputers, an HP 9040 for computer graphics, SUN and MAC workstations for AI and software work, transputer/MNOS workstations for parallel algorithms research, and Symbolics workstations for high-performance AI work. Through the Science and Technology LAN, Computer Science also has access to an Intel hypercube and a DEC distributed system. Systems such as connectionist machines and supercomputers are available by networks to industrial/government laboratories. Several microcomputer/workstation laboratories, including engineering software and a large graphics facility, are also available. Additional research
equipment is in artificial intelligence, parallel computation, and image processing/computer vision laboratories.

**Admission Requirements**

Students seeking admission to the M.S. in computer science program must satisfy the following requirements:

1. Fulfill admission requirements of the Graduate School of George Mason University.
2. Hold a baccalaureate degree that includes the following courses or their equivalents in practical experience: Data Structures and Algorithms (CS 211, 312), Assembly Language Programming (CS 311), and Computer Architecture (CS 365). In addition, students should have completed one year of mathematics beyond first-year calculus, including a substantial course in discrete mathematics (MATH 305). Students with 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 degree.
3. Have a cumulative grade point average of 3.0 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 post-secondary 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 showing verbal and quantitative scores.

**Degree Requirements**

In addition to the general requirements of the university, completion of this program requires the following:

1. Completion of 33 hours of graduate course credit, including:
   a. 9 hours comprising the following courses: CS 540 Language Processors, CS 571 Operating Systems, CS 583 Data Structures and Analysis of Algorithms
   b. 12 or more hours of computer science courses at the 600 level or above, excluding CS 798 and 799
   c. 3 hours of project work or 3 to 6 hours of thesis for a total of not more than 6 hours; or 3 additional hours of course work at the 600 level or above
   d. Additional graduate-level courses in computer science or in closely related fields, chosen in consultation with the adviser
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.
3. For students electing a concentration in bioinformatics, 9 hours of graduate biology including biochemistry, organismic biology, and cellular biology. These courses may be taken only after students consult with the bioinformatics adviser in the CS Department. Students entering the bioinformatics area must have taken one year of biology and one year of organic chemistry.

**Course Work**

The department offers computer science courses in general areas of software engineering, artificial intelligence, parallel processing, image processing and computer vision, and foundations of computer science. A complete list appears below and is available from the department.

The department actively participates in the program leading to the Ph.D. degree in information technology in the School of Information Technology and Engineering.

**Specialization in Software Systems Engineering**

Students in the systems engineering and the computer science programs may pursue a specialization in software systems engineering. To complete the software engineering track, students must complete the required courses and Option A, B or C in systems engineering. Within Option A, B or C students must complete the following four graduate-level CS/SYST courses in software engineering rather than completing four electives: CS/SYST 520 Principles of Software Systems Engineering; CS/SYST 623 Formal Methods and Models; CS/SYST 624 Requirements Analysis, Prototyping, and Design; and CS/SYST 625 Software Project Management.

**Computer Science Courses (CS)**

CS 520/521 (formerly 521). Introduction to Software Engineering (3:3:0). Prerequisite: Admission to the MSCS or MSSE program or permission of instructor. The software product lifecycle. Process models and metrics. Modern language concepts including information hiding, inheritance, message passing, and concurrency as exemplified by Ada programming language. Computer-based tools to support modern software development practices are emphasized.
531 Theory of Computation (3:3:0). Prerequisite: CS 311 and MATH 305. CS 331 is strongly recommended. Theory of computability, Turing machines, computable functions, recursive functions, unsolvable decision problems and Godel's Incompleteness Theorem, computational complexity.

540 Language Processors (3:3:0). Prerequisite: MATH 305; CS 311 and 312. Basic programming language processors: 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.


555 Data Communication Systems (3:3:0). Prerequisite: CS 365 or equivalent. Techniques and systems for the communication of data among computational devices. Topics include the role of exchanges, concentrators, multiplexers, buffering; network analysis, cost and design, software considerations.

568 Computer Systems Programming (3:3:0). Prerequisite: CS 211 and 311. Introduction to assemblers, compilers, system structures, operating systems, and machine architecture.


580 Introduction to Artificial Intelligence (3:3:0). Prerequisite: CS 312 and MATH 305. Principles of representation, heuristic search and control in the context of specific intelligent systems in such areas as problem solving, vision, medical diagnosis, and natural language. The LISP PROLOG, or expert systems programming languages as a means of representation.

583 Data Structures and Analysis of Algorithms (3:3:0). Prerequisite: CS 312 and MATH 305. Introduction to the design and analysis of algorithms. Topics covered include review of basic data structures and their implementation, measures of time and space complexity, algorithms for internal and external sorting and searching, graph algorithms, and introduction to computational complexity.

611 Introduction to Computers (3:3:0). Design-oriented programming languages. Provides experience in multiprogramming or personal computing modes. Primarily for individuals with no prior computer experience. Credits are not applicable toward the 30 credits required for the M.S. in mathematics or the 33 credits required for the M.S.C.S., but may be applicable toward a degree in some other fields.

612 The Use of Computer Statistical Packages (3:3:0). Prerequisite: Course in statistics. Introduction to use of computer packages in the statistical analysis of data. Emphasizes techniques common to use of all statistical packages, including data checking, cleaning, manipulation, and transformation. 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 perform computer statistical analyses of data relevant to their respective fields of study. Credits are not applicable toward the 30 credits required for the M.S. in mathematics or CS, but may be applicable toward a degree in some other fields.

621 Software Design Methodologies (3:3:0). Prerequisite: CS 521. Methodologies that affect the development of reliable and portable software. The methods discussed include strategies and formal approaches to software specification, design, and verification that produce software systems with a minimum of cost and time and that show high reliability, portability, and user friendliness and effectiveness. Also highlighted are specific managerial issues raised by large, complex software projects.


624/SYST 624 Software Requirements, Prototyping, and Design (3:3:0). Prerequisite: SYST 520 or permission of instructor. In-depth study of methods, notations, documentation, and validation techniques for the analysis and design phases of software systems engineering. Topics include needs analysis, requirements specification, prototyping techniques, and design methods. Preparation and validation of requirements specifications, design documentation, test plans, and system test acceptance criteria are presented. Computer-based tools for analysis, prototyping, and design of software systems are emphasized.

625/SYST 625 Software Project Management (3:3:0). Prerequisite: SYST 520 or permission of instructor. Lifecycle and process models; process metrics; planning for a software project; methodologies for project monitoring and controlling schedule, budget, quality, and productivity; and leadership, motivation, and team building. Computer-based tools to support software project management are emphasized.
631 Object-Oriented Software Development (3:3:0). 
Prerequisite: CS 520, 540, or permission of instructor. 
Principles of object-oriented design, development, and programming. Includes relationships between object-oriented design concepts and software engineering principles, techniques of object-oriented design and programming, and applying object-oriented techniques in other environments.

635 Foundations of Parallel Computation (3:3:0). 
Prerequisite: CS 583 and CS 540 or 571, or permission of Instructor. 
Survey of the field of parallel computation. Three major parallel computing paradigms (MIMD computation, SMID computation, and dataflow 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 Theory of Programming Language Translation (3:3:0). 
Prerequisite: CS 540. Programming language translation and concepts in compiler design. Topics include formal grammars, finite state automata as recognizers for finite state grammars, lexical scanning, context-free languages and push-down automata, context-free parsing techniques, run-time environments necessary to support language techniques of code generation. Students work on projects that demonstrate the various concepts and consult the current literature concerning recent advances in the theory and practice of programming language translation.

651 Interactive Graphics Software (3:3:0). 

655 Performance Analysis of Computer Networks (3:3:0). 

668 Computer Architecture and Microprogramming (3:3:0). 
Prerequisite: CS 468 or a graduate course in systems programming. Instruction sets and the hardware organization of a microprogrammable central processor. Assembly languages, instruction set modification, I/O programming, interrupt handling, DMA programming, microprogram development. Substantial hands-on microprogramming experience using a dedicated computer architecture lab.

671 Computer Systems Theory (3:3:0). 
Prerequisite: CS 571, MATH 351, or permission of instructor. Advanced computer systems concepts, including models and mechanisms of operating and distributed system structure and techniques of modeling and analysis.

672 Computer System Performance Evaluation (3:3:0). 
Prerequisite: CS 571, MATH 351. Theory and practice of measuring and evaluating digital computer systems. Topics include systems analysis techniques, simulation techniques, data acquisition, programmed measurement techniques, instrumented measurement techniques and presentation of data.

680 Natural Language Processing (3:3:0). 
Prerequisite: CS 580 or permission of instructor. 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.

Prerequisite: CS 580. Design, construction, and evaluation of software systems that solve problems generally deemed to require human expertise. Study and use of relevant languages, environments, mathematics, and logic. Case studies of successful systems. Programming projects: development of tools or small-scale systems.

682 Computer Vision (3:3:0). 
Prerequisite: CS 580. 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 Analysis of Algorithms (3:3:0). 
Prerequisite: CS 563. A second course on the analysis of algorithms. 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, image processing), the analysis of specific algorithms falling into these classes, NP-Hard and NP-Complete problems.

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.

686 Image Processing and Applications (3:3:0). 
Prerequisite: CS 312 and MATH 351 or equivalent, or permission of instructor. 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.

688 Neural Network Principles (3:3:0). 
Prerequisite: CS 580 or permission of instructor. Study of neural network models, algorithms and applications. Several connectionist and biologically based models are introduced, and their capabilities and limitations are discussed. A variety of application areas are presented. A network simulation project is required.

697 Independent Reading and Research (1-3:0:0). 
Prerequisite: Graduate standing, completion of at least two core courses (CS 540, 571, 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. A 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. A literature review, project report, or other written product is normally required.
Areas of Study

699 Advanced Topics in Computer Science (3:3:0). Prerequisite: Permission of instructor. Special topics in computer science not occurring in the regular computer science sequence. The course may be repeated for credit when the subject is distinctly different.

735 Concurrency (3:3:0). Prerequisite: CS 635 or permission of instructor. 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 for the implementation of formal specifications of concurrent systems.

773 Real-time Systems Design and Development (3:3:0). Prerequisite: CS 571 and 621 or permission of instructor. Real-time systems and the fundamental principles supporting the design of real-time systems and specific techniques for their implementation. Emphasis is placed on modern higher-order language features and describing asynchronously executing processes, for accessing underlying low-level hardware features, and for controlling process synchronization and time deadlines. Three of the most important real-time software design and development aspects are covered: design approaches, higher-order language support and run-time Kernel implementation requirements.

782 Machine Learning (3:3:0). Prerequisite: CS 580 and permission of instructor. Survey of the field of machine learning. Topics provide broad coverage of past and current developments in machine learning.

798 Project Seminar (3:3:0). Prerequisite: 18 hours of credit 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. The project is intended to meet the project or thesis requirement for the M.S. in computer science.

799 Thesis (3-6:0:0). Prerequisite: 18 hours of credit applicable toward the M.S. in computer science. Original or expository work is evaluated by a committee of three faculty members.

Conflict Resolution

Core Faculty

Burton, John W., Ph.D., London School of Economics, 1942; University Professor of Conflict Resolution

Laue, James H., Ph.D., Harvard University, 1966; Lynch Professor of Conflict Resolution

Mitchell, Christopher R., Ph.D., University of London (University College), 1977; Professor of Conflict Resolution and International Relations

Rubenstein, Richard E., M.A., Oxford, 1961; J.D., Harvard University, 1963; Professor of Conflict Resolution and Public Affairs

Sandole, Dennis, J.D., Ph.D., University of Strathclyde, Scotland, 1979; Associate Professor of Conflict Resolution and International Relations

Scimecca, Joseph A., Ph.D., New York University, 1972; Professor of Conflict Resolution and Sociology; Director, Center for Conflict Analysis and Resolution

Faculty from Other Disciplines

Avruch, Kevin A., Ph.D., University of California, San Diego, 1978; Associate Professor, Anthropology

Black, Peter W., Ph.D., University of California, San Diego, 1977; Associate Professor, Anthropology

Broome, Benjamin J., Ph.D., University of Kansas, 1980; Associate Professor, Communication

Burns, Tom R., Ph.D., Stanford University, 1969; Robinson Professor of Sociology

Clark, Robert P., Ph.D., Johns Hopkins University, 1969; Professor of Government and Politics

Dietz, Thomas M., Ph.D., University of California, Davis, 1979; Associate Professor, Sociology

Fisher, Joseph L., Ph.D., Harvard University, 1947; Distinguished Visiting Professor of Political Economy

Gessner, Theodore L., Ph.D., University of Maryland, 1971; Associate Professor, Psychology

Gortner, Harold F., Ph.D., Indiana University, 1971; Associate Professor, Public Administration; Chair, Department of Public Administration

Horton, Lois E., Ph.D., Brandeis University, 1977; Associate Professor, Sociology

Levy, Jack, Ph.D., University of Southern California, 1973; Associate Professor, Education

Paden, John N., Ph.D., Harvard University, 1968; Robinson Professor of International Studies

Rader, Victoria F., Ph.D., University of Chicago, 1973; Associate Professor, Sociology

Rosenblum, Karen E., Ph.D., University of Colorado, 1979; Associate Professor, Sociology

Taylor, Anita, M.G.B., Ph.D., University of Missouri, 1971; Professor, Communication

Wilkins, Roger W., LL.B., University of Michigan, 1956; Robinson Professor of History and American Culture

Conflict Management, M.S.

The Master of Science in Conflict Management, offered by the Center for Conflict Analysis and Resolution, is a two-year professional M.S. degree
program offering advanced training in the theories, concepts, methods, and application of conflict management skills. Students are trained to understand conflict and to apply tested methods (e.g., conciliation, mediation, arbitration, and negotiation) in the management of conflict. Intensive classroom study is combined with practical work in laboratory, simulation, fieldwork, and internship courses. Nearly half the degree courses concern learning practical skills in conflict management. The degree program, the first to be offered in the United States, provides an opportunity for a professional career in the emerging discipline of conflict management through work and service in public and private organizations, institutional settings, firms, and agencies, and opportunities for professionals now engaged in conflict management work to further advance their knowledge and skills.

Admission Requirements
In addition to meeting all Graduate School requirements for admission, applicants to the M.S. program must have a GPA of no less than 2.75 in all undergraduate work and must submit the following:

1. All undergraduate and graduate transcripts;
2. GRE verbal and quantitative scores from within the past seven years;
3. Three letters of recommendation, one of which must be from a faculty member in the applicant's undergraduate major department; and
4. A four- to-five-page essay in which the applicant states his or her reasons for seeking admission to the program.

Applicants who have earned an M.B.A. may substitute the GMAT for the GRE scores, and those who have earned a law degree may substitute LSAT scores. Background courses in the social sciences and prior work experience are recommended. A personal interview may be required by the admissions committee.

Students may enroll in the program on a full- or part-time basis. Because this is a professional program, applicants should not expect to substitute transfer credit for a course or a particular degree requirement.

Degree Requirements
Each student is required to successfully complete 48 credits, 6 of which are electives. Within CONF 642, an "exit" paper of publishable quality on an approved research or demonstration project is required.

Directed reading and research courses (CONF 697) and the optional master of science thesis course (CONF 699) may not be substituted for the required written and oral examinations.

Conflict Analysis and Resolution, Ph.D.

Admission Requirements
In addition to meeting all GMU Graduate School requirements for admission, an applicant to the Ph.D. program must submit the following:

1. All undergraduate and graduate transcripts;
2. GRE verbal and quantitative scores from within the past seven years;
3. Three letters of recommendation, two of which must be from faculty members in the applicant's undergraduate or graduate program;
4. A four- to-five-page essay in which the applicant states his or her reasons for seeking admission to the program; and
5. A written sample of work that shows the applicant's potential for doing research in a doctoral program.

Applicants who have earned an M.B.A. may substitute the GMAT for the GRE scores, and those who have earned a law degree may substitute LSAT scores. Background courses in the social sciences and prior work experience are recommended. A personal interview may be required by the admissions committee.

Although students may enroll in the Ph.D. program on a full- or part-time basis, students are admitted to the program only in the fall semester of each year.

Degree Requirements
The Ph.D. degree in Conflict Analysis and Resolution is not granted automatically upon completion of a set of course requirements. It is granted only to candidates who have shown a thorough knowledge of conflict theory and processes of conflict resolution, and the ability to conduct sound independent research.

Students who complete the M.S. in Conflict Management degree are awarded 42 credits toward the required total of 78. Those entering the program with an alternative master's degree must take a minimum of 18 credits in the M.S. program: CONF 501, 601, 602, 613, 623, and 642, unless waivers are given by the student's faculty adviser and the director of the program. In addition, these students must demonstrate competence in social statistics and in qualitative and quantitative research methods through previous course work.
tests of competency, or completion of the relevant M.S. courses (CONF 610 and 617) before being admitted to Ph.D. candidacy.

The doctoral program includes four required courses: CONF 701, 711, 712, and 801. Twelve credits of doctoral research (CONF 999) are also required. The remaining 12 credits beyond the master's degree are taken from electives in conjunction with the student's doctoral program of study approved by the adviser and the program coordinator.

Preparing for and passing comprehensive exams are an integral part of the Ph.D. program. Ph.D. candidates are required to pass examinations in the areas of theory, methods, process, and a substantive area of specialization. The comprehensive exams are given once a year.

Students are also expected to demonstrate proficiency in one foreign language.

**Conflict Management Courses (CONF)**

501 Introduction to Conflict Resolution (3:3:0). Prerequisite or corequisite for all courses in the program. Conflict resolution as an emerging field; the analytical and problem-solving approach and its origins in theory and in practice; similarities to and differences from other means of dispute management; moving from institutions to individuals as unit of analysis; implications of conflict resolution processes for intergroup, industrial, communal, and international relations.

601 Theories of Conflict and Conflict Resolution (3:3:0). Prerequisite: CONF 501 or permission of instructor. Introduction to the major behavioral and social scientific theories of conflict. These theoretical models are analyzed and critiqued in terms of their applicability to conflict resolution.

602 Third Party Roles, Resources, and Ethics (3:3:0). Prerequisite: CONF 501 and 613, or permission of instructor. Analysis and critique of the nature and purposes of third party behavior in conflicts. Theoretical perspectives and case histories are used to understand the settings in which third parties may operate; such third party roles as mediator, conciliator, arbitrator and facilitator; and types of intellectual and other resources third parties are able to bring to conflicts. Frameworks for assessing the ethics of third party intervention are applied in a variety of conflict settings.

603 War, Violence, and Conflict Resolution (3:3:0). Prerequisite: CONF 501 or permission of instructor. Investigation of the causes and consequences of political violence (civil disorder, terrorism, revolution, and war), focusing on how the insights gained may be applied to the resolution of deep-rooted conflicts. Students study the historical materials, theory, and application of theory to the resolution of specific disputes.

610 Philosophy and Methods of Conflict Research I (3:3:0). Prerequisite: CONF 501 or permission of instructor. Introduction to comprehensive research design including a critical assessment of quantitative strategies used in conflict and conflict resolution research (e.g., sample design, theory and techniques of measurement, questionnaire design, data collection and analysis, interpretations).

613 Laboratory and Simulation I: Interpersonal and Intergroup Conflict (3:3:0). Prerequisite: CONF 501 or permission of instructor. Survey of strategies that can be employed to more effectively understand and attempt the resolution of conflicts at the interpersonal and intergroup levels.

617 Philosophy and Methods of Conflict Research II (3:3:0). Prerequisite: CONF 501 or permission of instructor. Introduction to basic qualitative research methods, including participant observation, case studies, non-obtrusive measures and techniques of fieldwork. The course also provides cross-cultural fieldwork experience, working with social and cultural groups unfamiliar to students.

620 Law and Jurisprudence in Conflict Resolution (3:3:0). Prerequisite: CONF 501 or permission of instructor. Examination of the ways in which legal processes and institutions are related to the definition, analysis, and resolution of human conflicts. Compares conventional methods of legal dispute resolution with newer methods of "alternative dispute resolution," contrasting both with the method of analytical conflict resolution.

621 Ethnic and Cultural Factors in Conflict Resolution (3:3:0). Prerequisite: CONF 501 or permission of instructor. Examination of 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.

623 Laboratory and Simulation II: Community and Organizational Conflicts (3:3:0). Prerequisite: CONF 501 and 613, or permission of instructor. Survey of strategies and skills that can be used to understand and attempt to resolve conflicts at the community and organizational levels.

633 Laboratory and Simulation III: International Conflict (3:3:0). Prerequisite: CONF 501, 613, and 623, or permission of instructor. Students observe demonstrations of techniques and processes of third-party intervention in conflicts at the international level. Students also have role-playing opportunities to simulate and thereby experience the use of these techniques and processes.

635 Structural Sources of Conflict (3:3:0). Prerequisite: CONF 501, 601, and 603, or permission of instructor. Examination of the ways structures and institutions affect behavior and give rise to conflictual relationships at all social levels, from the interpersonal to the international. The role of conflict resolution as a means of gradual system change is examined.

642 Integration of Theory and Process (3:3:0). Taken in the last semester of student's course work. Course to assist students in bringing the different aspects of conflict resolution together into an integrated whole, and to be a final assessment. A major essay of publishable quality describing an approved research or demonstration project is required.
694 Internship (3:3:0). Prerequisite: 21 hours of course work. 160 hours of work within a chosen agency or institution directed with conflict resolution processes at the individual, community, organizational, or international level. (Summer session only.)

695 Special Topics in Conflict and Conflict Resolution (3:3:0). Prerequisite: CONF 501 or permission of instructor. Course content varies depending upon interests of instructor and students. May be repeated once.

697 Directed Reading and Research (3:0:0). Independent reading on a specific topic related to conflict and conflict resolution as agreed to by a student and a faculty member. May be repeated once.

701 Proseminar in Conflict Resolution: Survey of the Field (3:3:0). Introduction to and history of the field of conflict resolution. The origins of conflict resolution are traced from the early works in industrial relations and international relations to the present.

711 Advanced Quantitative Research Methods in Conflict Resolution (3:3:0). Review of the methods and quantitative analysis commonly used in research on conflict and conflict resolution. Game theory, n-way analysis of variance, multiple regression, and other methods are covered in detail, including discussion of basic applications and special techniques to deal with practical problems. Multivariate analysis of variance, path analysis, and systems of equations incorporating measurement error are also considered.

712 Advanced Qualitative Research Methods in Conflict Research (3:3:0). In-depth study of such qualitative research methods as participant observation, case studies, and grounded theory, and how these research methods can be used in conflict situations where experimental design and traditional quantitative methods of research are not appropriate.

730 The Persistence of Evil (3:3:0). Introduction to the major theological, psychological, and social theory of the causes of evil. These theories are applied to case studies of evil acts at the international, group, and individual levels. Possible case studies include the holocaust, genocide in Cambodia, and the massacre at My Lai.


751 Conflict Termination; Dynamics of the Peace Process (3:3:0). Analytical study of 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.

801 Integrating Theory and Method in Conflict Resolution (3:3:0). Analysis of 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.

999 Doctoral Dissertation Research (credits vary). Research on an approved dissertation topic under the direction of a committee. May be repeated. 12 credit hours may be applied to the doctoral degree requirement.

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**Economics**

**Faculty**

Alexeev, Michael, Ph.D., Duke University, 1984; Assistant Professor

Bennett, James T., Ph.D., Case Western Reserve University, 1970; Professor

Bloch, Howard R., Ph.D., Princeton University, 1964; Professor

Boudreaux, Donald J., Ph.D., Auburn University, 1986; Assistant Professor (on leave 1989-90)

Buchanan, James M., Ph.D., University of Chicago, 1948; Holbert Harris Professor of Economics

Chung, Jae W., Ph.D., New York University, 1972; Associate Professor

Congleton, Roger D., Ph.D., Virginia Polytechnic Institute and State University, 1978; Associate Professor

Crain, W. Mark, Ph.D., Texas A & M University, 1976; Professor

Grier, Kevin, Ph.D., Washington University in St. Louis, 1984; Assistant Professor

High, Jack C., Ph.D., University of California, Los Angeles, 1980; Associate Professor

Lavoie, Donald C., Ph.D., New York University, 1981; Associate Professor

Levy, David M., Ph.D., University of Chicago, 1979; Associate Professor

Meyer, Carrie A., Ph.D., University of Illinois, 1988; Assistant Professor

Phillips, Samuel H., Ph.D., University of Virginia, 1966; Professor

Reid, Joseph, Ph.D., University of Chicago, 1974; Associate Professor

Roback, Jennifer, Ph.D., University of Rochester, 1980; Associate Professor

Rowley, Charles, Ph.D., University of Nottingham, 1964; Professor

Thorbecke, Willem, Ph.D., University of California, Berkeley, 1988; Assistant Professor

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http://catalog.gmu.edu
Tollison, Robert, Ph.D., University of Virginia, 1969; Duncan Black Professor of Economics
Vanberg, Viktor, Dr. Phil., Technische Universität Berlin 1974; Dr. habil., Universität Mannheim, 1981; Professor
Vaughn, Karen L., Ph.D., Duke University, 1971; Professor
Wagner, Richard E., Ph.D., University of Virginia, 1966; Holbert Harris Professor of Economics
Wiest, Philip R., Ph.D., University of Pittsburgh, 1976; Associate Professor
Williams, Walter E., Ph.D., University of California, Los Angeles, 1972; John M. Olin Distinguished Professor of Economics

**Economics, M.A.**

The Master of Arts in Economics gives students a strong foundation in applied economic theory. Graduates of the program are competent users and interpreters of economic research, who are well-qualified to be 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;
- Grade point average of 3.0 in the last two years of undergraduate work and in all economics courses; and
- Satisfactory scores on the Graduate Record Examination, including the economics subject test.

At the discretion of the department, the GRE scores may be waived if an applicant holds a graduate degree in a related field or has completed 6 to 12 hours of graduate course work in nondegree status or extended studies enrollment with a GPA of at least 3.0.

Students with undergraduate degrees in fields other than economics are welcome to apply. These students may substitute the subject test from their major field for the economics subject test. They also must satisfactorily complete ECON 306 and 311 or equivalents before enrolling.

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 Economics Department no longer permits admission for the spring semester, although exceptional students are considered.

**Degree Requirements**

Students must complete 30 semester hours of graduate credit and pass a comprehensive examination in micro- and macroeconomics. The examinations are offered twice each year, usually in August and January. All students are required to take ECON 611, 615, and 812 in the first year. In addition, ECON 630, Mathematical Economics, is strongly recommended. Although the university does not guarantee the availability of these courses every semester, a typical first-year sequence would include ECON 611, ECON 630, and an elective in the fall; ECON 812, ECON 615, and an elective in the spring; and comprehensive examinations in August.

Part-time students are encouraged to apply. If possible, part-time students should arrange their work schedules to take two courses per semester in the first year. If this is impossible, the first year should include ECON 630 and 615; the second year, ECON 611 and 812; and the comprehensive examinations taken in August of the second year.

Master’s degree students are encouraged to enroll at the Arlington Campus for their core theory courses.

Up to 21 hours of electives may be chosen from any of the fields offered by the department. Students may receive departmental permission to substitute up to 6 hours of electives taken outside economics in closely related fields. Students may also elect the thesis track, which offers up to 6 hours of credit for independent research and writing under the supervision of a faculty member; that is, students may choose 15 hours of classroom electives and 6 hours of credit for thesis research (ECON 799).

**Economics, Ph.D.**

The Ph.D. in economics is designed to prepare students for a career of high-level independent research in applied economics. Graduates of the program are prepared to pursue research in academia, government, or business as principal investigators or directors of research teams. Doctoral students are trained to write for scholarly journals. Research in the Economics Department focuses on applications of economic theory. Some students work with faculty on problems of immediate policy relevance, while others prefer to apply economics to fundamental questions of economic and social organization and political and moral philosophy.
Admission Requirements

- Undergraduate degree from an accredited institution;
- MATH 113 and 114, DESC 200 and 202, or equivalent;
- Grade point average of 3.0 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.

At the discretion of the department, the GRE scores may be waived at the written request of an applicant who has earned an M.A. degree in economics from an accredited institution.

Students with undergraduate degrees in fields other than economics are welcome to apply. These students may substitute the subject test from their major field for the economics subject test. They must satisfactorily complete ECON 306 and 311 or equivalents before enrolling.

Applications 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. The Economics Department no longer permits admission for the spring semester.

Degree Requirements

Students are required to pass 72 semester hours of course work, of which no more than 24 hours may be dissertation credits. Students must pass preliminary examinations in microeconomics and macroeconomics. In addition, students must pass field examinations in two of the fields listed below. Examinations are normally given in August and January. Students who enter with a master’s degree may transfer up to 30 semester hours of credit at the discretion of the department. Credit is not given for preliminary and field examinations from other universities. Students may receive departmental permission to substitute up to 6 hours of electives taken outside economics in closely related fields.

All doctoral students must take a year of microeconomics (ECON 611 and 812), a year of macroeconomics (ECON 715 and 816), mathematical economics (ECON 630), econometrics (ECON 637), economic history (ECON 623 or 823), and history of economic thought (ECON 820 or 821). Also required are two courses in each of the students’ two chosen fields in preparation for field examinations.

Although the university does not guarantee the availability of these courses every semester, a typical first-year program of study for a full-time doctoral student would include ECON 630, 611, 715, and 623 or 821 in the fall; ECON 637, 812, 816, and 820 or 823 in the spring; and micro or macro preliminary examinations in August. A typical second-year program would include Field 1, Field 2, and electives in the fall; Field 1 (continued), Field 2 (continued), and electives in the spring; and field examinations in August. Students desiring financial aid must adhere to this schedule.

Part-time students are encouraged to apply. If possible, part-time students should arrange their work schedules to take two courses per semester in the first year. A two-course schedule should include ECON 630 and 611 in the fall, ECON 637 and 812 in the spring, and the micro prelim in August. The second year should include ECON 715 and 816, with the macro prelim in August. Part-time students who can only take one course each semester should take ECON 630 and 637 in the first year and continue with micro and macro.

Doctoral students may not enroll at the Arlington Campus for their required theory and mathematics courses.

The department offers examinations in the following fields of study:

- Austrian Economics
- Comparative Economic Systems
- Constitutional Economics/Economic Philosophy
- Economic Development
- Economic History
- Econometrics
- History of Economic Thought
- Industrial Organization
- International Trade and Finance
- Labor Economics
- Macroeconomics
- Monetary Theory
- Public Choice
- Public Finance

Economics Courses (ECON)

Departmental Course Prerequisites

ECON 306 and 311, or equivalent, are prerequisites for all graduate courses except ECON 600 and 602. Additional prerequisites are noted. With permission of the instructor prerequisites may be waived.

535 Survey of Applied Econometrics (3:3:0). Prerequisite: DESC 200 and 202 or permission of instructor. Applied introduction to estimating economic relationships. Simple equation and simultaneous equation system estimation along with their associated problems.
600 Current Issues in Economics (3:3:0) (B). Prerequisite: Graduate standing or permission of instructor. For students with little economic background. Topics include supply and demand, operation of a free market system, stock and bond markets, and U.S. role in world economy. May be used in partial fulfillment of the course requirement in the teaching discipline for the master's degree in education.

602 Economic Analysis (3:3:0). Prerequisite: Baccalaureate degree. This 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, 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. Master’s-level survey course. Topics include 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). Prerequisite: 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. Topics include set theory, function, differential calculus, integration, series, and matrix algebra, with special emphasis on the economic applications.

637 Econometrics I (3:3:0). Prerequisite: DESC 200 and 202 or permission of instructor. Techniques of estimating relationships among economic variables. Introduction to multiple regression and problems associated with the single equation model-autocorrelation, multicollinearity, and heteroscedasticity.


715 Macroeconomic Theory I (3:3:0). Prerequisite: Admission to the doctoral program or permission of instructor. 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.


816 Macroeconomic Theory II (3:3:0). Prerequisite: ECON 611 and 615 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). Prerequisite: 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). Prerequisite: 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.

825 Political Economy and Public Policy I (3:3:0). Prerequisite: ECON 611 or permission of instructor. Economic process of public policy formulation and implementation. Economic behavior of principals in policy making and execution.

826 Political Economy and Public Policy II (3:3:0). Prerequisite: ECON 611, 615, and 825 or permission of instructor. Specific issues related to political economy of public policy. Topics include privatization, political economy of deficit spending, regulation and deregulation, and the economics of rent seeking.

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.

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techniques such as Lagrangian multipliers, linear programming, nonlinear programming, and game theory.

838 Econometrics II (3:3:0). Prerequisite: ECON 637 or permission of instructor. Econometric models and simultaneous equation systems. Identification of parameters and least squares bias; alternative estimation methods and block recursive systems.

842 Labor Economics (3:3:0). Prerequisite: ECON 611 and 615 or permission of instructor. ECON 637 is recommended. Formal models of labor demand, supply, utilization, and wage determination. The determination of factor shares in an open economy. The theory of collective bargaining and the impact of trade unions on wage rates and resource allocation. The 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 government expenditure, taxation, debt management and intergovernmental fiscal relations. Allocative and distributional effects of alternative tax and subsidy techniques. Principles of benefit-cost and cost-effectiveness analysis for government decisions.

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 the provision of specific state and local services, including education and police and fire protection.

852 Public Choice (3:3:0). Prerequisite: ECON 611 or permission of instructor. Application of economic theory and methodology to the study of nonmarket decision making.

853 Special Topics in Public Finance (3:3:0). Prerequisite: ECON 611 and 849. Topics vary; announced in Schedule of Classes.

854 Public Choice II (3:3:0). Prerequisite: ECON 611 or permission of instructor. This is the second course in the two course sequence in public choice. The public choice approach will be 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.

858 The Economics of Urban Transportation Planning (3:3:0). Issues and problems in urban transportation planning using various analytical techniques; planning for the future; techniques of evaluation; environmental and socioeconomic impact.

860 Resource Economics (3:3:0). Resource management in the public sector with emphasis on development of water resources. Problems of uncertainty, time horizon considerations, joint costs, multiple benefits, non-quantifiable benefits and costs.


866 Economic Development (3:3:0). Prerequisite: 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, neo-classical, and modern theories of international trade. A study of the theory and practice of world trade models such as project LINK. Analysis of foreign investment and economic growth, tariffs and nontariff barriers, and economic integration; recent developments with emphasis on natural resources.

871 International Monetary Economics (3:3:0). Prerequisite: ECON 611 or permission of instructor. Examination of the international adjustment mechanism, price and income effects, controls and the monetarist approach. Development of the international monetary system, the demand for international reserves, capital movements, and the role of the International Monetary Fund.

872 Managerial Economics (3:3:0). Prerequisite: ECON 602 and BUAD 641. Economic theory as it applies to specific business situations and decisions. Production levels, price determination, cost, competition, profits, supply/demand.

876 Marxian Economics (3:3:0). Prerequisite: ECON 611 and 615. Major Marxian economic theories and criticisms of Marxian economics.


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 to other currently popular theories.

881 Austrian Theory of Market Process II (3:3:0). Prerequisite: ECON 611, 615 (ECON 880 is recommended). Continuation of ECON 880. Topics vary and include emphasis on market-process approach to analysis of capital accumulation, growth, money and credit institutions, inflation, unemployment, and industrial fluctuations.

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895 Special Topics in Economics (3:3:0). Topics vary according to interests of instructor. Emphasis on new areas of the discipline. May be repeated for credit as topics vary.

896 Directed Reading and Research (3:0:0). Independent reading and research paper on a topic agreed on by student and faculty member.

799 Thesis (3-6:0:0). 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.

800 Studies for the Doctor of Arts in Education (variable credit). Prerequisite: D.A.Ed. student admission to study in economics. 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. The paper is presented in a subsequent D.A.Ed. summer seminar. Enrollments are repeated according to each student’s program.

918 Seminar in Monetary Theory and Policy (3:3:0). Prerequisite: ECON 817. Selected topics of current interest are discussed.

940 Seminar in Labor Economics (3:3:0). Prerequisite: ECON 611 and 615 or permission of instructor. ECON 637 is recommended. Union and management decision-making processes, government’s role in labor negotiations and dispute settlement, economic analysis of discrimination and poverty, and effectiveness of wage-price controls.

945 Seminar in Industrial Organization (3:3:0). Prerequisite: ECON 611 or permission of instructor. Topics include centrifugal and centripetal forces affecting aggregate and industry concentration; the impact of market structure on the rate of innovation, concentration, and oligopolistic price behavior; constraints on oligopolistic pricing; vertical integration; traditional antitrust policy, regulation, and state ownership.

950 Seminar in Public Finance (3:3:0). Prerequisite: ECON 611 and 6849. Important public finance issues treated in seminar format.

955 Seminar in Urban and Regional Economics (3:3:0). Prerequisite: ECON 611. Development of regional economics of metropolitan areas and larger regions.

965 Seminar in Economic Development (3:3:0). Prerequisite: ECON 611 and 615. Topics vary and include macroeconomic and trade policies, inflation and labor migration.

970 Seminar in International Economics (3:3:0). Prerequisite: ECON 869 and 871. Topics vary and include subjects of current research and policy interests.

999 Doctoral Dissertation Research (credits vary). Prerequisite: Admission to Ph.D. economics program and permission of dissertation adviser. Research on an approved dissertation topic under the direction of dissertation committee. May be repeated. 24 credit hours may be applied to doctoral degree requirement.

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Education: Curriculum and Instruction

Faculty

Behrmann, Michael M., Ed.D., Columbia University, 1978; Associate Professor

Bindel, Henry J., Ed.D., University of Maryland, 1971; Professor

Bowen, Larry S., Ph.D., Ohio State University, 1970; Professor

Brown-Azarowicz, Marjory, Ph.D., University of Washington, 1961; Professor Emeritus

Burger, Christine, Ph.D., Iowa State University, 1984; Research Assistant Professor

Cameron, Carl T., Ph.D., University of Florida, 1979; Associate Professor

Chu, Harold, Ph.D., University of Minnesota, 1973; Associate Professor

Collier, Virginia P., Ph.D., University of Southern California, 1980; Associate Professor

Duck, Lloyd E., Ph.D., University of Virginia, 1974; Associate Professor

Dzama, Mary A., Ed.D., University of Virginia, 1972; Associate Professor

Gilstrop, Robert L., Ed.D., George Peabody College, 1963; Professor

Given, Barbara K., Ph.D., Catholic University of America, 1974; Associate Professor

Isenberg, Joan P., Ed.D., Rutgers University, 1978; Associate Professor

Jones, Edward, Ed.D., Virginia Polytechnic Institute and State University, 1977; In-Service Education Coordinator; Associate Professor

Jones, Julie K., Ph.D., University of Pittsburgh, 1978; Assistant Professor

Martin, William R., Ph.D., University of Minnesota, 1968; Professor

Montebello, Mary S., Ph.D., Ohio State University, 1964; Professor

Raines, Shirley C., Ed.D., University of Tennessee, 1979; Associate Professor

Sears, Carol J., Ph.D., The American University, 1976; Associate Professor

Smith, Donald F., Ed.D., The American University, 1968; Associate Professor

Spikell, Mark A., Ed.D., Boston University, 1972; Professor

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White, Charles, Ph.D., Indiana University, 1985; Assistant Professor

Master of Education Programs, M.Ed.
The Department of Curriculum and Instruction offers the Master of Education degree in the following two majors: (1) curriculum and instruction and (2) special education. Both of these majors have specializations for the following:

1. Students seeking initial certification (These programs provide the option of completing a master’s degree but this is not a requirement.)
2. Students who are certified and want a master’s degree
3. Students who are not certified and not seeking certification, but are seeking master’s degrees.

The catalog has been organized so that students may locate the specialization that best fits their needs.

Program Approval and Accreditation
All of the graduate programs listed above have been approved by the State Department of Education and are accredited by the Southern Association of Colleges and Schools and by the National Council for the Accreditation of Teacher Education.

Admission Requirements
In addition to fulfilling the Graduate School admission requirements, the applicant must:

1. Meet specific requirements for the program desired; the admission requirements for each program are shown in the following pages.
   Students admitted provisionally because of low grade point averages normally are required to demonstrate academic skills by taking courses in introductory and foundations courses in the program before being considered for admission as degree students.
2. If seeking graduate course work toward initial certification in teacher education, possess a temperament appropriate for a teacher as required by Virginia Certification Regulations.

Degree Requirements
In addition to fulfilling the Graduate School degree requirements, all candidates must:

1. Complete the number of semester hours and course requirements for the graduate program in which they are enrolled. Since these require-
4. Teaching English as a Second Language (K-12)

In the special education major, these specializations are:
1. Emotionally disturbed (K-12)
2. Learning disabled (K-12)
3. Severely and profoundly handicapped (K-12)

General Admission Information
The Teacher Education Screening Committee (TESC) selectively grants admission to the teacher education program. Students seeking secondary initial certification must meet all program entrance requirements prior to applying for admission to the program. Admission is a prerequisite for practica and internships. Application forms and detailed policies and procedures are available in the Office of Teacher Education.

Deadlines
Completed and signed application forms must be submitted to the Office of Teacher Education by January 1, March 15, August 1, or November 1 of the semester preceding that in which all prerequisites will be met.

Academic Requirements
1. Admission to the Graduate School.
2. Good academic standing in accordance with the policies of the Graduate School.
3. A minimum professional GPA of 2.75 as required by program entrance requirements.
   (No grade below C is accepted for satisfactory completion of course work in the professional sequence. Grades of C or below may be remedied in accordance with Graduate School policy.)

Competency Exams
1. Submission of scores for the General Knowledge and Communications Skills components of the National Teachers Exam (NTE) that meet the minimum standards for teacher certification in Virginia.
2. Successful demonstration of competency in written English and computer literacy. Those seeking certification in Early Childhood and Middle Education must show competency in mathematics.

Retention in Teacher Education Programs
Upon admission to teacher education programs, the student's progress and development as a teacher is monitored by the director of teacher education and the department faculty. If a student's GPA falls below the required level, admission status is revoked until the student presents appropriate evidence that the deficiency has been remedied.

Academic Requirements
To be retained in teacher education programs, students must meet the following requirements:
1. Continue academic performance at or above the admission requirement standards;
2. Include in the computation of the professional GPA all courses taken through the Department of Curriculum and Instruction or accepted by the department for transfer credit.

Suitability for Teaching
Students must continue to demonstrate suitability for teaching as stated in the admission requirements. Special focus is placed on the student's performance in methods courses and related field experience activities. When Curriculum and Instruction Department faculty notify the director of teacher education of concerns about a student's performance, a review is conducted and the student is notified of the results in accordance with committee policy.

Admission to Practica/Internships
In addition to maintaining all teacher education program requirements for admission and retention, students must apply and be accepted for placement in practica or internships. The semester prior to practica or internships is critical. Academic or performance deficiencies (i.e., incompletes, graduation deficiencies) may cause students' practica or internships to be postponed.

Requirements for admission to practica or internships follow.

Deadlines
Applications must be filed in the Office of Teacher Education by February 15 for the fall semester, September 15 for the spring semester, and February 15 for summer session.

Academic Requirements
1. Students must complete all degree or program requirements, except for practicum or internship, as determined by their graduation catalog or plan of study.
2. Students must earn grades of C or above in all professional sequence courses.

Suitability for Teaching
Students are required to schedule and complete an interview through the Office of Teacher Education that results in a recommendation for admission to a practicum or internship. If a student is
denied admission, a review is presented to the Teacher Education Screening Committee (TESC) for action in accordance with committee policy.

**Early Childhood Education (NK-3) Certification Program**

To become certified teachers in early childhood education, students must first earn a degree from the GMU College of Arts and Sciences or from another undergraduate institution. They apply during their senior year to be admitted to the Graduate School for a fifth year of professional study as a post-baccalaureate student. Early childhood education students may select any undergraduate major.

Students may apply for admission to the new post-baccalaureate certification program during 1990-91. Prerequisite 300-level courses may be taken in the fall and spring of that year. Required 500-level courses will be scheduled for the first time in the summer of 1991. This program includes the option of taking additional hours beyond the certification requirements to earn an M.Ed. in curriculum and instruction. For more information, contact the coordinator of advising in the Department of Curriculum and Instruction in the College of Education and Human Services.

**Middle Education (4-8) Certification Program**

Students who wish to become certified in middle education (4-8) must first earn a degree from the GMU College of Arts and Sciences or from another undergraduate institution. They apply during their senior year to be admitted to the Graduate School for a fifth year of professional study as a post-baccalaureate student. Middle Education students are encouraged to select a discipline commonly taught in a middle school (for example, English, math, science, foreign language, history).

Students may apply for the new post-baccalaureate certification program during 1990-91. Prerequisite 300-level courses may be taken in the fall and spring of that year. Required 500-level courses will be scheduled for the first time in the summer of 1991. This program includes the option of taking additional hours beyond the certification requirements to earn an M.Ed. in curriculum and instruction. For more information, contact the coordinator of advising in the Department of Curriculum and Instruction.

**Secondary Education Certification Program (8-12)**

To be certified in a secondary school discipline, students must apply as degree students and complete a graduate-level certification program as outlined by the certification specialists in the College of Education and Human Services (323-2440). They must also complete the general education and discipline courses needed to meet GMU certification program requirements. These courses may be either undergraduate or graduate courses.

To earn a Master of Education degree in Secondary Education, students must complete 18 hours beyond the certification requirements for a total of 48 hours. The total number of hours a student completes depends on his or her prior preparation in general education and in the chosen teaching discipline.

**Admission Requirements**

Students must meet the general admission requirements of the Graduate School and must have an approved Plan of Study of course work needed for certification.

**Certification courses in education**

- EDUC 522 Introduction to Secondary Education
- EDUC 539 Psychological Foundations of Adolescent Learning and Development
- EDUC 529 Pluralism and Exceptionality in U.S. Education
- EDRS 531 Educational Tests and Measurements
- EDUC 593 Utilization of Instructional Technology
- Curriculum and Methods*
- Select one from the following:
  - EDCl 567 Social Studies
  - EDCl 569 English
  - EDCl 572 Math
  - EDCl 573 Science
  - EDCl 550 Foreign Language
  - EDCl 519 English as a Second Language
- Practicum
- EDUC 515 Practicum in Secondary Education

*Prerequisites: EDUC 522, 510, 539, 529, EDRS 531

**Additional Course Work for M.Ed. in Curriculum and Instruction**

**Course work**

- Required courses:
  - EDUC 521 Foundations of Education

[Gradient Catalog 1989-1990](http://catalog.gmu.edu) George Mason University
Teaching English as a Second Language Certification Program (NK-12)

In addition to the following 30 hours required for the master's degree, certification students must complete all general education and professional education requirements listed earlier for Early Childhood Education (NK-3), Middle Education (4-8), and Secondary Education (8-12).

Foundations requirements

- EDUC 521 Advanced Foundations of Education
- EDRS 590 Education Research

Required specialization courses in education

- Methods
- EDCI 519 Methods of Teaching in Bilingual/ESL Settings
- Applied linguistics
  - (choose at least two courses)
  - EDUC 532 Bilingualism and Language Acquisition Research (3)
  - EDCI 520 Assessment in Bilingual/ESL Settings (3)
  - EDCI 521 Curriculum Development in Bilingual/ESL Settings (3)
  - EDRD 615 Teaching Reading in Multicultural/Multilingual Settings (3)
- Culture
  - (choose at least one course)
  - EDCI 518 Introduction to Multicultural Education (3)
  - EDUC 506 Education and Culture (3)
  - EDUC 529 Pluralism and Exceptionality in U.S. Education (3)

Open elective in education or English linguistics

(Title VII students must take EDCI 517)

Exit requirement

EDCI 781, 782 or 783 Advanced seminar in early childhood, middle, or secondary education

Emotional Disturbance Certification Program

Certification courses in education

Foundations course work

- EDUC 300: Introduction to Teaching or Education
- EDUC 302 Human Growth and Development or EDUC 539 Psychological Foundations of Adolescent Learning and Development
- EDUC 301 Educationally Diverse Populations: Handicapped, Gifted, Multicultural or EDUC 529 Pluralism and Exceptionality in U.S. Education
- PSYC 325 Abnormal Psychology

Specialization course work

- (graduate level only)
- EDSE 644: Characteristics of Students with Emotional Disturbances and Learning Disabilities
- EDSE 648 Introduction to Psychoeducational Assessment
- EDSE 553 Teaching Mathematics to Special Needs Populations
- EDSE 655 Curriculum and Methods—Emotional Disturbance/Learning Disabilities
- EDSE 551 Classroom Management: Theory and Practice
- EDSE 554 Adaptive Methods in Education
- EDSE 620 Advanced Applied Behavior Analysis and Social Learning Theory
- EDSE 658 Cognitive Instruction and Learning Strategies or EDSE 665 Family Intervention Programs for Handicapped
- EDCI 529 The Teaching and Learning of Social Studies and Humanities in the Middle Grades
- EDCI 608 The Teaching and Learning of Science in the Middle Grades
- EDCI 663 The Teaching of Science in the Elementary School
EDSE 790 Internship in Special Education: ED 6-3-9

Additional Course work for M.Ed.
Special Education
EDRS 590 Education Research 3
Comprehensive examinations 0
or EDUC 599 Master's Thesis 6

Total course work for Initial Certification and M.Ed. in Special Education—Emotional Disturbance 51-57

Learning Disabilities Endorsement. To complete a learning disabilities endorsement in addition to the emotional disturbances certification, students must complete the following courses:

EDSE 552 Language Development and Disorders 3
EDSE 649 Clinical Psychoeducational Assessment in Special Education 3
EDSE 790 Internship in Special Education: LD 3

Learning Disabilities Certification Program
Certification courses in education 48

Foundations course work 12
EDUC 300 Introduction to Teaching or EDUC 521 Advanced Foundations in Education 3
EDUC 302 Human Growth and Development or EDUC 539 Psychological Foundations of Adolescent Learning and Development 3
EDUC 301 Educationally Diverse Populations: Handicapped, Gifted, Multicultural or EDUC 529 Pluralism and Exceptionality in U.S. Education 3
EDSE 552 Language Development and Disorders 3

Specialization course work 36 (graduate level only)
EDSE 644 Characteristics of Students with Emotional Disturbances and Learning Disabilities 3
EDSE 648 Introduction to Psychoeducational Assessment 3
EDSE 553 Teaching Mathematics to Special Needs Populations 3
EDSE 655 Curriculum and Methods—Emotional Disturbances and Learning Disabilities 3
EDSE 551 Classroom Management: Theory and Practice 3
EDSE 554 Adaptive Methods in Education 3

EDSE 649 Clinical Psychoeducational Assessment in Special Education 3
EDSE 658 Cognitive Instruction and Learning Strategies or EDSE 665 Family Intervention Programs for Handicapped
EDCI 529 The Teaching and Learning of Social Studies and Humanities in the Middle Grades 3
EDCI 608 The Teaching and Learning of Science in the Middle Grades or EDCI 663 Teaching of Science in the Elementary School 3
EDSE 790 Internship in Special Education: LD 6

Additional course work for M.Ed. in special education 3-9
EDRS 590 Education Research 3
Comprehensive examinations 0
or EDUC 599 Master's Thesis 6

Course work for Initial Certification and an M.Ed. in Special Education—Learning Disabilities 51-57

Endorsement in Emotional Disturbances: To complete an endorsement in emotional disturbances in addition to the learning disabilities certification, students must complete the following courses:

PSYC 325 Abnormal Psychology 3
EDSE 620 Advanced Applied Behavioral Analysis and Social Learning Theory 3
EDSE 790 Internship in Special Education: LD 3

Severely and Profoundly Handicapped Certification Program
Certification courses in education 42

Foundations course work 18
EDUC 300 Introduction to Teaching 3
EDUC 301 Educationally Diverse Populations: Handicapped, Gifted, Multicultural 3
EDUC 302 Human Growth and Development 3
EDUC 552 Language Development and Disorders 3
EDSE 551 Classroom Management: Theory and Practice 3
EDSE 648 Introduction to Psychoeducational Assessment 3
A course in CPR (cardiopulmonary resuscitation)
Areas of Study

Specialization course work ................. 24
(graduate level only)

EDSE 663 Seminar in Special Education ................. 3
EDSE 620 Advanced Applied Behavioral Analysis ................. 3
EDSE 622 Augmentative Communication ................... 3
EDSE 661 Curriculum and Methods SPH ................... 3
EDSE 668 Vocational and Leisure Education ................. 3
EDSE 669 Transdisciplinary Approach to Special Education ................. 3
EDSE 790 Internship in Special Education: SPH ................. 6

Additional course work for M.Ed. in special education ................. 15-22

Advanced master's course work ................. 9-15
EDSE 647 Medical and Health Aspects of Handicapping Conditions ................. 3
EDRS 590 Education Research ................. 3
EDUC 599 Thesis (6) or EDSE 782 Comprehensive Topics in Special Education (3) and comprehensive examinations ................. 3-6
Electives ................. 6-7
Two courses from the following
(or others with permission of adviser):
EDUC 517 Computer Applications for Special Populations (4)
EDSE 665 Family Intervention Programs for Handicapped Children (3)
EDSE 662 Educational Consultation (3)

Initial certification ................. 42
Certification plus master's ................. 57-62

Center for Applied Research and Development in Education (CARD)
Programs are available within education (EDUC 600) throughout the year that enable students to focus on their own work place and to develop techniques of reflective practice that complement work done in the center.

Northern Virginia Writing Project Courses
This project, a cooperative effort between the Departments of English and Curriculum and Instruction, has developed the following courses for students to use as part of the requirement within the middle, reading, and secondary specializations:

EDUC 695 NVWP Inservice Program
EDUC 696 NVWP Research Seminar
EDUC 697 NVWP Writing Theory Seminar

Teachers who have completed the project's six-semester-hour summer institute may use that as part of their degree requirements. No more than 6 hours of NVWP courses may be applied to an M.Ed. in curriculum and instruction.

Programs for Certified Teachers
The curriculum and instruction major offers seven specializations:
1. Bilingual/Multicultural (K-12)
2. Early Childhood Education (NK-3)
3. Instructional Applications of Microcomputers (K-12)
4. Middle Education (4-8)
5. Reading (K-12)
6. Secondary Education (8-12)
7. Teaching English as a Second Language (K-12)

The special education major offers six specializations:
1. Bilingual/Multicultural Special Education (K-12)
2. Early Childhood Handicapped (ages 2-5)
3. Emotionally Disturbed (K-12)
4. Gifted and Talented Education (K-12)
5. Learning Disabled (K-12)
6. Severely and Profoundly Handicapped (K-12)

Curriculum and Instruction
M.Ed. in Curriculum and Instruction with Specialization in Bilingual/Multicultural Education

Prerequisite: Certification for classroom teaching.
(To specialize in bilingual/multicultural education, students may take this course work concurrently with courses for teacher certification.)

Foundations requirements ................. 6
EDUC 521 Advanced Foundations of Education ................. 3
EDRS 590 Education Research ................. 3

Specialization courses ................. 15
Required courses ................. 9
EDCI 517 Introduction to Bilingual Education ................. 3
EDCI 518 Introduction to Multicultural Education or
EDUC 529 Pluralism and Exceptionality in U.S. Education ................. 3

http://catalog.gmu.edu
EDCI 519 Methods of Teaching in Bilingual/ESL Settings .... 3
Specialization electives ............... 6
(choose at least 6 hours)
EDUC 506 Education and Culture (3)
EDUC 532 Bilingualism and Language Acquisition Research (3)
EDCI 520 Assessment in Bilingual/ESL Settings (3)
EDCI 521 Curriculum Development in Bilingual/ESL Settings (3)
EDRD 615 Teaching Reading in Multicultural/Multilingual Settings (3)
Open electives in education or a teaching discipline (in Arts and Sciences) .... 6
Exit requirement .................. 3
EDCI 781, 782, or 783 Advanced Seminar in Early Childhood, Middle, or Secondary Education
Total degree hours ............... 30

M.Ed. in Curriculum and Instruction with Specialization in Early Childhood Education
The early childhood education specialization prepares students who have completed beginning level study and practice for leadership roles in the profession. The program enables them either to increase their competence in current positions or to prepare for positions requiring a different level of performance and understanding. Students can pursue ongoing study through this specialization or prepare for career goals.

Admission Requirements
Students without certification preparing for the early childhood education specialization must:
1. Possess a baccalaureate degree;
2. Submit evidence of three years of acceptable teaching or administrative experience in a preschool or elementary school program;
3. Submit recommendations by three persons qualified to judge the candidate's professional competence.

Students with certification preparing for the early childhood specialization must:
1. Provide evidence of certification in early childhood or elementary education by the state of Virginia or another acceptable jurisdiction;
2. Submit recommendations by three persons qualified to judge the candidate's professional competence.

Foundations Requirements ............. 6
EDUC 521 Advanced Foundations of Education ............... 3
EDRS 590 Methods of Education Research ............... 3
Early Childhood Specialization Courses . 18
Required
EDUC 509 Advanced Human Development: Infancy-Middle Childhood .... 3
EDCI 513 Play in Applied Settings .... 3
EDCI 511 Developing Curriculum and Designing Instruction in Early Childhood Education .... 3
EDCI 601 Advanced Study of Young Children's Language or EDSE 552 Language Development and Disorders . 3
EDCI 505 Problem Solving in Early Childhood Mathematics and Science .... 3
EDCI 603 Trends, Issues, and Research in Early Childhood Education 3
Approved Elective ............. 3
Students select one elective from the following:
  EDCI 512 Parent/Teacher Communication (3)
  EDCI 514 Administering and Supervising Early Childhood Programs (3)
  EDCI 602 Integrating Microcomputers into the Early Childhood Curriculum (3)
  EDUC 506 Education and Culture (3)
  EDCI 620 Teaching Thinking Skills (3)
  EDCI 663 Teaching Science in the Elementary School (3)
Departmental exit requirement .... 3
EDCI 781 Advanced Seminar in Early Childhood Education
Total degree hours ............... 30

M.Ed. in Curriculum and Instruction with a Specialization in Instructional Applications of Microcomputers (IAM)
Students majoring in curriculum and instruction may complete a specialization in the instructional applications of microcomputers. This two-track specialization enables students to assume school-based leadership roles in incorporating microcomputers in the instructional programs of elementary and secondary schools (School Computer Coordinator track) and to prepare secondary education students to teach advanced placement computer science and APCS-related courses (Computer Science Education track).
Specialization Requirements

School Computer Coordinator (SCC) track. Students take 6 hours of foundations and research: EDUC 521 and EDRS 590; 6 hours of basic concentration courses: EDCI 705 and 782 or 783; and 18 hours of specialization courses: EDCI 530, 532, 630, 730, and two 3-hour approved electives.

Computer Science Education (CSE) track. Students take 6 hours of foundations and research: EDUC 521 and EDRS 590; 6 hours of basic concentration courses: EDCI 705 and 783; and 18 hours of specialization courses: CS 611, 583, 520, one 3-hour approved CS elective, EDCI 611, and one 3-hour approved Curriculum and Instruction elective.

Admission Requirements

1. Applicants must meet the general requirements for admission to the M.Ed. programs in Curriculum and Instruction. In addition, applicants must document (a) their ability to communicate effectively in writing, and (b) their understanding of the application of this specialization to their work situation.

2. In addition to the application for admission to the M.Ed. program in Curriculum and Instruction, applicants must complete an essay relating to one of the IAM tracks. For the SCC track, the essay should address the following issues: (a) the nature of computer literacy—present and defend a definition; (b) experiences relevant to the program; (c) the knowledge the applicant wants to gain from this program; and (d) how the applicant envisions using computers in the classroom. For the CSE track, the candidate should address (b) and (c) above, plus discuss how teaching high school computer science is consistent with the purposes of pre-college education. An interview with the IAM coordinator may also be required for both tracks; an interview with a Computer Science department faculty liaison is required for the CSE track.

3. Priority is given to classroom teachers, or those who have an impact on classrooms, at the elementary and secondary school levels.

4. Students who apply to transfer from a GMU M.Ed. program to the IAM program must meet the same requirements as new applicants.

M.Ed. in Curriculum and Instruction with a Specialization in Middle Education (4-8)

The middle education specialization is for teachers who have completed an initial certification program and want to improve their teaching and leadership skills in upper elementary, middle, junior high, and intermediate school settings.

Prerequisite: Certification for classroom teaching (4-8) or an approved equivalent.

Foundations requirements ............... 6
EDUC 521 Advanced Foundations of Education ............... 3
EDRS 590 Education Research ............... 3

Specialization courses ............... 21
Required ............... 9
EDCI 651 Curriculum Development in Middle Education ............... 3
EDCI 504 Introduction to Education Technology or appropriate substitute, e.g., EDUC 699 ............... 3
EDCI 510 Advanced Human Development: Adolescent through Adult ............... 3
Electives ............... 12
Teaching discipline courses—6 hours from Arts and Sciences
Open electives in education—6 hours from the following or other available courses:
EDCI 620 Teaching Thinking Skills (3)
EDCI 663 Teaching Science in the Elementary School (3)
EDUC 506 Education and Culture (3)

Exit requirement ............... 3
EDCI 782 Advanced Seminar in Middle Education

Total hours ............... 30

M.Ed. in Curriculum and Instruction with a Specialization in Reading

Admission Requirements

Applicants to the reading specialization must:

1. Provide evidence of certification at the collegiate professional level by the State of Virginia or another jurisdiction;

2. Have completed two years of successful teaching experience;

3. Be recommended by three professional educators in the position of principal, supervisor, or administrator, including at least one who has observed the applicant's teaching.

Foundation requirements ............... 6
EDUC 521 Foundations of Education ............... 3
EDRS 590 Education Research ............... 3

http://catalog.gmu.edu
Specialization courses .......................... 27

Common core of required courses .......................... 12
EDRD 611 Remedial Reading .......................... 3
EDRD 613 Diagnostic and Evaluative Techniques .......................... 3
EDRD 614 Teaching Reading in the Secondary Schools .......................... 3
EDSE 552 Language Development and Disorders .......................... 3

Specialization requirements .......................... 6
Reading teacher (two years of teaching experience):
EDRD 559 Teaching Reading in the Elementary School (3)
EDCI 657 Teaching Language Arts in the Elementary School (3) or
EDCI 569 Teaching English in the Secondary School (3)

Reading specialist (three or more years of teaching experience):
EDRD 559 Teaching Reading in the Elementary School (3)
EDRD 618 Organization and Administration of Reading Programs (3)

Specialization electives .......................... 6
Suggested but not required:
EDRD 615 Teaching Reading in Multicultural/Multilingual Settings (3)
EDRS 531 Educational and Psychological Measurement (3)
EDCI 661 Literature in the Elementary School (3)
EDUC 695 Northern Virginia Writing Project (3-6)
EDRC 616 Teaching Reading to Adults (3)
EDCI 517 Introduction to Bilingual Education (3)
EDCI 518 Introduction to Multicultural Education (3)
EDUC 509 Human Development:
Infancy to Middle Childhood (3) or
EDUC 510 Human Development:
Adolescence Through Adulthood (3) or
Special education courses and other approved electives (approval is granted by the program coordinator and/or Curriculum and Instruction Department chair. Program modifications must also be approved by the Graduate School dean).

Exit requirement .......................... 6
EDRD 790 Practicum in Reading

Total hours .......................... 36

M.Ed. in Curriculum and Instruction with a Specialization in Secondary Education

Prerequisite: Certification for classroom teaching (8-12)

Foundations requirements .......................... 6
EDUC 521 Advanced Foundations of Education .......................... 3
EDRS 590 Education Research .......................... 3

Specialization courses .......................... 21
Required .......................... 9
EDCI 652 Curriculum Development in the Secondary School .......................... 3

Curriculum and methods .......................... 3
Select one of the following:
EDCI 567 Teaching Social Studies in the Secondary School (3)
EDCI 569 Teaching English in the Secondary School (3)
EDCI 572 Teaching Mathematics in the Secondary School (3)
EDCI 573 Teaching Science in the Secondary School (3)
EDRD 614 Teaching Reading in the Secondary School (3)
EDRD 615 Teaching Reading in Multicultural/Multilingual Settings (3)
EDCI 504 Introduction to Educational Technology (3)
Select one of the following: .......................... 3
EDUC 510 Adolescent and Adult Development (3)
EDUC 539 Psychological Foundations of Adolescent Learning and Development (3)
EDUC 529 Pluralism and Exceptionality in U.S. Education (3)

Electives .......................... 12
Teaching discipline courses .......................... 9
selected from an Arts and Sciences department
Open elective in education .......................... 3
Electives may be selected from the following, or other appropriate courses: EDCI 620 Teaching Thinking Skills, EDUC 506 Education and Culture, a course in instructional applications of microcomputers, a course related to technology and society, a course taught by Northern Virginia Writing Project.
Exit requirement ................. 3
   EDCI 783 Advanced Seminar in
   Secondary Education

Total hours .................... 30

M.Ed. in Curriculum and Instruction
with Specialization in Teaching English
as a Second Language
See degree requirements listed earlier under
Teaching English as a Second Language Certification
Program. (Total degree hours: 30)

Special Education
The Master of Education degree with a major in
Special Education enables certified teachers to be-
come specialists in:
1. Bilingual/Multicultural Special Educa-
   tion (BMSE)
2. Early Childhood Handicapped (ECH)
3. Emotional Disturbance (ED)
4. Gifted and Talented Education (GTE)
5. Learning Disabilities (LD)
6. Severely and Profoundly Handicapped (SPH)

Admission Requirements
Applicants for the M.Ed. degree in Special Educa-
tion must:
1. Meet the general admissions requirements of
   the Graduate School;
2. Submit recommendations by three persons
   qualified to judge the applicant's professional
   competence;
3. Submit a written autobiographical narrative;
4. Be interviewed and recommended for accep-
tance.

Additional requirements vary according to the
area of specialization.

For ECH and SPH, applicants must:
1. Provide evidence of successful completion of
   baccalaureate degree in a human services area
   such as education, psychology, sociology, or al-
   lied health services;
2. Provide evidence of work-related experiences
   with severely handicapped individuals;
3. Complete or have completed prerequisite
   course work.

Completion of program course work in ECH and
SPH allows the student to meet endorsement
requirements. Initial state certification can be ob-
tained while seeking endorsement.

Degree Requirements
A total of 33-46 graduate credit hours are re-
quired depending upon previous course work.

Bilingual/Multicultural Special
Education (BMSE)
BMSE is taken in conjunction with four of the spe-
cialization areas. Specific requirements include
those of the chosen specialization (LD, ED, ECH,
SPH) and at least one additional course (including
EDUC 532 Bilingualism and Language Acquisi-
tion Research).

Early Childhood Handicapped (ECH)
Prior to state endorsement in preschool handi-
capped, graduates of the early childhood handicapped
program must possess collegiate
professional certification and have completed two
years of experience as an elementary or special edu-
cation teacher.

M.Ed. in Early Childhood Handicapped
(2-5 years)

Endorsement courses in education

Prerequisite course work
A course in CPR (cardiopulmonary
resuscitation) and a course in human
growth and development (3)

Specialization course work .............. 21
   EDUC 514 Administering and
   Supervising Pre-elementary Education . 3
   EDSE 552 Language Development
   and Disorders ....................... 3
   EDSE 622 Augmentative
   Communication .................... 3
   EDSE 647 Medical and Health
   Aspects of Handicapping Conditions . 3
   EDSE 648 Introduction to
   Psychoeducational Assessment .................... 3
   EDSE 665 Family Intervention
   Programs for Handicapped Children . 3
   EDSE 669 Transdisciplinary
   Approach to Rehabilitation .................... 3

Additional course work for endorsement
and/or M.Ed. degree ................. 15
   EDSE 551 Classroom Management:
   Theory and Practice ................ 3
   EDSE 649 Clinical Psychoeducational
   Assessment: Preschool Handicapped . 3
   EDSE 659 Curriculum and Methods:
   Preschool Handicapped ................ 3

http://catalog.gmu.edu
EDSE 790 Internship in Special Education: Preschool Handicapped 6

Total credits for endorsement 36

Additional course work for M.Ed. in special education 6-9
EDRS 590 Education Research 3
EDSE 782 Comprehensive Topics in Special Education (3) and Comprehensive examinations (0) or EDUC 599 Thesis (6) 3-6

Total course work for endorsement and an M.Ed. in special education—early childhood handicapped 42-45

Emotional Disturbance M.Ed. Program

Prerequisite foundations course work 12
EDUC 300 Introduction to Teaching or EDUC 521 Advanced Foundations of Education 3
EDUC 302 Human Growth and Development or EDUC 539 Psychological Foundations of Adolescent Learning and Development 3
EDUC 301 Educationally Diverse Populations: Handicapped, Gifted, Multicultural or EDUC 529 Pluralism and Exceptionality in U.S. Education 3
PSYC 325 Abnormal Psychology 3

Specialization course work 30 (graduate level only)
EDSE 644 Characteristics of Students with Emotional Disturbances and Learning Disabilities 3
EDSE 648 Introduction to Psychoeducational Assessment 3
EDSE 553 Teaching Mathematics to Special Needs Populations 3
EDSE 655 Curriculum and Methods—Emotional Disturbances/Learning Disabilities 3
EDSE 551 Classroom Management: Theory and Practice 3
EDSE 554 Adaptive Methods in Education 3
EDSE 620 Advanced Applied Behavior Analysis and Social Learning Theory 3
EDSE 658 Cognitive Instruction and Learning Strategies 3
EDSE 790 Internship in Special Education 6

Additional course work for M.Ed. Special Education—Emotional Disturbances

Professional strand 6-9
Curriculum and instruction strand
EDCI 529: The Teaching and Learning of Social Studies and Humanities in the Middle Grades 3
EDCI 608 The Teaching and Learning of Science in the Middle Grades or EDCI 663 The Teaching of Science in the Elementary School 3

Learning disabilities strand
EDSE 649 Clinical Psychoeducational Assessment in Special Education 3
EDSE 552 Language Development and Disorders 3
EDUC 790 Internship in Special Education—Learning Disabilities 3

Cognitive instructional strand
EDCI 620 Teaching Thinking Skills Across the Curriculum 3
EDCI 705 Instructional Design or
EDSE 662 Educational Consultation 3

Computer technology strand
EDSE 517 Computer Applications in Special Education 3
EDCI 530 Programming Microcomputers in BASIC for Instructional Applications or EDSE 532 Programming Microcomputers in LOGO for Instructional Applications or
EDUC 699 Seminar in Computer Applications in Education 3

Bilingual/Multicultural education strand
EDCI 519 Methods of Teaching in Bilingual/English-as-a-Second-Language Settings 3
EDCI 520 Assessment and Curriculum Development in Bilingual/English-as-a-Second Language Settings 3

Transition to work strand
EDSE 544 Post-secondary Transition 3
EDUC 682 Curriculum Development in Vocational Education 3

Independent option
Two elective courses with permission of adviser

Advanced master's course work 3-9
EDRS 590 Education Research 3
Comprehensive Examinations 0
or EDSE 599 Master's Thesis 6

Students may complete an M.Ed. in special education—emotional disturbance with 36 graduate credits, depending on previous course work.
Gifted and Talented M.Ed. Program
Students seeking an M.Ed. in gifted and talented education must be certified to teach.

Foundations course work .......... 11
EDCI 539 Psychological Foundations of Adolescent Learning and Development or EDCI 521 Advanced Foundations in Education .......... 3
EDSE 676 Educating the Special Needs Gifted Child .......... 2
Supporting course work in science, mathematics, humanities, or computer technology .......... 6

Specialization course work .......... 23-25
EDCI 620 Teaching Thinking Skills Across the Curriculum .......... 3
EDSE 670 Introduction to Gifted and Talented Education .......... 3
EDSE 671 Special Topics in Education of Exceptional Children 1-3 (Topics vary. No more than 3 credits may be applied toward the M.Ed. degree.)
EDSE 672 Models and Methods in Gifted and Talented Education .......... 3
EDSE 673 Curriculum Design and Research in Gifted and Talented Education .......... 3
EDSE 675 Evaluation and Identification of Gifted and Talented Students 2
EDSE 677 Counseling the Gifted 2
EDSE 790 Internship in Special Education: G/T 6

Additional M.Ed. course work .......... 6
EDRS 590 Education Research .......... 3
EDSE 674 Seminar in Gifted and Talented Education .......... 3

Learning Disabilities M.Ed. Program
Prerequisite foundations course work .... 12
EDUC 300 Introduction to Teaching or EDUC 521 Advanced Foundations in Education .......... 3
EDUC 302 Human Growth and Development or EDUC 539 Psychological Foundations of Adolescent Learning and Development .......... 3
EDUC 301 Educationally Diverse Populations: Handicapped, Gifted, Multicultural or EDUC 529 Pluralism and Exceptionality in U.S. Education 3
EDSE 552 Language Development and Disorders .......... 3

Specialization course work .......... 30 (graduate level only)
EDSE 644 Characteristics of Students with Emotional Disturbances and Learning Disabilities .......... 3
EDSE 648 Introduction to Psychoeducational Assessment .......... 3
EDSE 553 Teaching Mathematics to Special Needs Populations 3
EDSE 655 Curriculum and Methods—Emotional Disturbances and Learning Disabilities .......... 3
EDSE 551 Classroom Management: Theory and Practice .......... 3
EDSE 554 Adaptive Methods in Education .......... 3
EDSE 649 Clinical Psychoeducational Assessment in Special Education .......... 3
EDSE 658 Cognitive Instruction and Learning Strategies or EDSE 665 Family Intervention Programs for Handicapped Children .......... 3
EDSE 790 Internship in Special Education—Learning Disabilities 6

Additional course work for M.Ed. in special education

Professional strand .......... 6-9
Curriculum and instruction strand
EDCI 529 The Teaching and Learning of Social Studies and Humanities in the Middle Grades .......... 3
EDCI 608 The Teaching and Learning of Science in the Middle Grades or EDCI 663 Teaching of Science in the Elementary School 3

Emotional disturbances strand for dual endorsement
PSYC 325 Abnormal Psychology .......... 3
EDSE 790 Internship in Special Education: ED 6

Cognitive instructional strand
EDCI 620 Teaching Thinking Skills Across the Curriculum .......... 3
EDCI 705 Instructional Design or EDSE 662 Educational Consultation 3

Computer technology strand
EDSE 517 Computer Applications for Special Education .......... 4
EDCI 530 Programming Microcomputers in BASIC for Instructional Applications or EDCI 532 Programming Microcomputers in LOGO for
Instructional Applications or
EDUC 699 Seminar in Computer
Applications in Education ........ 3

Bilingual/Multicultural education strand
EDCI 519 Methods of Teaching in
Bilingual/English-as-a-Second-Language
Settings .................................. 3
EDCI 520 Assessment and Curriculum
Development in Bilingual/English-
as-a-Second-Language Settings .......... 3

Transition to work strand
EDSE 544 Post-secondary Transition . 3
EDUC 682 Curriculum Development
in Vocational Education .......... 3

Independent Option
Two elective courses with permission
of adviser

Advanced master's level course work 3-9
EDRS 590: Education Research .... 3
Comprehensive examinations .... 0
or EDUC 599 Master's Thesis ...... 6

Students may complete an M.Ed. degree in special
education—learning disabilities with 36 graduate
credits, depending on previous course work.

M.Ed. in Special Education—Severely
and Profoundly Handicapped

Prerequisite foundations course work 18
EDUC 300 Introduction to Teaching* .... 3
EDUC 301 Educationally Diverse
Populations: Handicapped, Gifted,
Multicultural* .......................... 3
EDUC 302 Human Growth and
Development* .......................... 3
EDSE 552 Language Development
and Disorders* .......................... 3
EDSE 551 Classroom Management:
Theory and Practice* ................. 3
EDSE 648 Introduction to Psycho-
educational Assessment* ............ 3
A course in CPR (cardiopulmonary
resuscitation)*

SPH Specialization course work 27
EDSE 663 Seminar in Special
Education* ............................ 3
EDSE 620 Advanced Applied
Behavioral Analysis* ................. 3
EDSE 622 Augmentative
Communication* ...................... 3
EDSE 647 Medical and Health
Aspects of Handicapping Conditions 3
EDSE 661 Curriculum and
Methods SPH* .......................... 3

EDSE 668 Vocational and Leisure
Education* ...................... 3
EDSE 669 Transdisciplinary Approach
to Special Education* .............. 3
EDSE 790 Internship in Special
Education: SPH* ...................... 6

*Required for state endorsement in severely and profoundly
handicapped.

Electives 6-7
Two courses from the following (others
may be taken with permission of adviser):
EDUC 517 Computer Applications for
Special Populations (4)
EDSE 665 Family Intervention Programs
for Handicapped Children (3)
EDSE 662 Educational Consultation (3)

Advanced master's course work 6-9
EDRS 590 Education Research .... 3
EDUC 599 Thesis (6) or EDSE 782
Comprehensive Topics in Special
Education (3) and comprehensive
examinations ......................... 3-6

Total credit hours:
Endorsement ......................... 42
Master's ............................. 38-41
Endorsement plus master's .......... 56-61

Programs for Non-Certified
Teachers

These programs are open to non-certified teach-
ers and do not lead toward certification:

1. M.Ed. in special education with a specialization
   in special education technology
2. M.Ed. in special education with a specialization
   in early childhood handicapped—infants and
toddlers
3. M.Ed. in curriculum and instruction with a spe-
cialization in teaching English as a second lan-
guage (ESL)
4. M.Ed. in curriculum and instruction with a spe-
cialization in early childhood education

Special Education Technology (SET)

Prerequisites: Students must have completed (a) a
survey of special education course or its equiva-
 lent, (b) a characteristics course in a specific spe-
cial education category, and (c) a curriculum and
methods course in the same category.
### Areas of Study

#### Technology specialization

- EDUC 517 Computer Applications for Special Populations ............ 4
- EDSE 622 Augmentative Communication ........................................ 3
- EDCI 730 Designing Learning Activities for Microcomputers .......... 3
- EDSE 790 Internship in Special Education Technology ................. 6
- EDCI 530 Programming Microcomputers in BASIC for Instructional Applications or .......................................................... 3
- EDCI 534 Introduction to Pascal Programming ............................. 3

**Technology electives** ......................................................... 6

Two courses from the following (others may be taken, including EDUC 600, with permission of adviser):

- EDUC 699 Computer Applications in Education (3)
- EDUC 752 Seminar in Instructional Applications of Computers (3)
- EDUC 754 Seminar in Computers for Educational Administration (3)
- EDCI 532 Programming Microcomputers in LOGO for Instructional Applications (3)
- EDCI 630 Supervising and Organizing Instructional Applications of Microcomputers (3)

#### Curriculum and instruction methods .................................. 6-9

Students must take three curriculum or methods courses offered by the Department of Curriculum and Instruction (for example, EDSE 553, 554, 655; EDCI 519, 572, 573; others with permission of adviser)

**Advanced master's course work** ........................................... 12-15

- EDRS 590 Education Research .................................................. 3
- EDCI 705 Instructional Design .................................................. 3
- EDSE 662 Educational Consultation ............................................ 3
- EDUC 599 Thesis (6) or EDSE 782 Comprehensive Topics in Special Education (3) and comprehensive examinations ................. 3-6

**Total** ...................................................................................... 42-48

**Specialization course work**

- EDUC 514 Administering and Supervising Pre-Elementary Education .... 3
- EDSE 552 Language Development and Disorders ............................ 3
- EDSE 622 Augmentative Communication ....................................... 3
- EDSE 647 Medical and Health Aspects of Handicapping Conditions .... 3
- EDSE 648 Introduction to Psychoeducational Assessment ............... 3
- EDSE 665 Family Intervention Programs for Handicapped Children .... 3
- EDSE 669 Transdisciplinary Approach to Rehabilitation ............... 3
- PSYC 513 Infant Development ................................................... 3
- EDSE 669 Clinical Psychoeducational Assessment: Infants/Toddlers ... 3
- EDSE 615 Early Intervention for At-Risk and Handicapped Infants/Toddlers ................................................................. 3
- SOCW 501/NURS 505 Case Management ....................................... 3
- EDSE 790 Internship in Special Education: Infants/Toddlers ........... 3

**Additional course work for Master of Education degree**

- EDRS 590 Education Research .................................................. 3
- EDSE 782 Comprehensive Topics in Special Education (3) and comprehensive examinations or EDUC 599 Master's Thesis (6) ......... 3-6

**Total course work for an M.Ed. degree in special education** ........ 42-45

#### Teaching English as a Second Language (ESL)

See degree requirements listed earlier in this section.

#### Early Childhood Education

See degree requirements listed earlier in this section.

#### Elementary/Secondary Education Courses (EDCI)

500. See EDUC 500.

504 Introduction to Educational Technology (3:3:0).

**Prerequisite:** Admission to Graduate School, or senior standing and permission of department. Examines uses of and issues in educational technology, explores LOGO as a problem-solving tool, and focuses on learning and using commercially available applications software. Both
507 Internship in Applied Linguistics (3:0:3). Prerequisite: Graduate standing in the Curriculum and Instruction or English Department and EDCI 519 or ENGL 521 (ESL methods course). Internship requires 100 hours completed over at least a five-week period for 3 hours of credit. Provides practical experience in the field of English as a Second Language and Applied Linguistics as, e.g., teacher, administrator, counselor, or researcher. For placement, consult instructor before semester starts.

511 Developing Curriculum and Designing Instruction in Early Childhood Education (3:3:0). Study of procedures, materials, and organization of environments for young children (infancy- kindergarten). Field experiences required for students without previous teaching or administrative experience at the pre-elementary levels.

512 Parent Teacher Communication (3:3:0). Examination of patterns and problems of family life for the purpose of improving communication between teachers and parents.

513 Play in Applied Settings (3:3:0). Focus on play as an approach to teaching and learning; examined as an intellectual, social, and emotional function in children's development.

514 Administering and Supervising Pre-Elementary Education (3:3:0). Examines programs and techniques relating to the administration and supervision of pre-elementary education programs. Emphasis on the director's role in staff recruitment, hiring, development, and evaluation. Leadership and management techniques.

515 Practicum in Secondary Education (12:0:12). Prerequisite: Admission to and completion of all additional course work in the secondary education certification program, admission to and good standing in the Teacher Education Program, and/or permission of instructor and advisor. Intensive, supervised clinical experience of a full semester in an approved Virginia school. Experience at the secondary level. Participation in scheduled group sessions required.

517 Introduction to Bilingual Education (3:3:0). Analysis of concepts, principles, and issues of bilingual education; its present status, and its future direction. Focus on current programs and their relationship with curricula in English as a second language.

518 Introduction to Multicultural Education (3:3:0). A survey of multicultural education that examines problems faced by an individual in an alien culture, theories of bilingual/multicultural education, relationships between nonverbal communication and language systems, and interpersonal skills needed for encouraging harmony between our dominant culture and minority ethnic communities.

519 Methods of Teaching in Bilingual/English-as-a-Second-Language Settings (3:3:0). Examination of past and current methods and techniques for teaching English as a Second Language (ESL) in bilingual/ESL classrooms. Students analyze all program models and methods of instruction for students of limited English proficiency; practice teaching strategies based on recent second language acquisition research; and examine materials, textbooks, and resources available in the field. This course includes a field experience component and meets Virginia certification requirements for ESL teachers.

520 Assessment in Bilingual/English-as-a-Second-Language Settings (3:3:0). Examination of issues in testing students of limited English proficiency for placement, diagnosis, exit, and evaluation; analysis of current assessment instruments; and practice in development of a language evaluation.


530 Programming Microcomputers in BASIC for Instructional Applications (3:3:0). Students will learn the fundamentals of operating a microcomputer. The major focus of the course will be learning to use the BASIC language to program microcomputers for instructional applications.

532 Programming Microcomputers in LOGO for Instructional Applications (3:3:0). Prerequisite: EDCI 530 or permission of instructor. Students learn to write and use programs in LOGO, an interactive programming language used in schools. They create microcomputer activities which develop problem-solving skills and programming skills.

550 (formerly EDUC 450) Teaching Foreign Languages in the Secondary School (3:3:0). Study of theories and methods of foreign language teaching, with practical application to the classroom. Field experience required for those seeking initial teacher certification. Fall semester only.

567 Teaching Social Studies in the Secondary School (3:3:0). Advanced course in methods, materials, content and organization of social studies programs in the secondary schools. Field experience required for those seeking initial teacher certification, Spring semester only.


600. See EDUC 600.

601 Applied Study of Young Children's Language Development (3:3:0). Prerequisite: Admission to Graduate School. Focus on analyzing the language development of preschool, kindergarten, and primary children and on designing individual and group language experi-

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ences. Language development is studied in relation to cognitive, social, and emotional development.

602 Integrating Microcomputers into the Early Childhood Curriculum (3:3:0). Prerequisite: Admission to Graduate School and permission of department. Examines criteria and methods for integrating microcomputers into all areas of the early childhood curriculum. Emphasizes the use of computer-assisted instruction to facilitate cognitive and social growth through the development of online and off-line computer activities.

603 Trends, Issues, and Research in Early Childhood Education (3:3:0). Prerequisite: Admission to Graduate School and EDRS 590. Examines current trends, present and recurring issues, research findings, and resulting program development in the field.


620 Teaching Thinking Skills Across the Curriculum (3:0:0). Through lecture, discussion and demonstration, students design, analyze, apply and evaluate a range of approaches to teaching thinking skills and strategies in grades K-12. Application to selected subject matter is stressed.

630 Supervising and Organizing Instructional Uses of Microcomputers (3:3:0). Prerequisite: EDCI 530 or permission of instructor. Teachers do some programming; develop criteria for selecting microcomputer hardware; learn to choose and evaluate available software; and study, analyze and develop procedures for organizing and managing the use of microcomputers in schools.

650 Curriculum Development in the Elementary School (3:3:0). Study of development of curriculum in the pre-elementary and elementary grades, historical backgrounds, present programs, development of new programs, methods of implementing new programs, and evaluative methods and procedures.

651 Curriculum and Instruction in the Middle School (3:3:0). Study of development of curriculum in the middle school grades, historical backgrounds, present programs, development and implementation of new programs, program evaluation, instructional and organizational implications.


657 Teaching Language Arts in the Elementary School (3:3:0). Study of methods, curricula, current issues, and research literature in English-language arts programs of the elementary school. Emphasis on recent innovations in methodology and traditional concerns of the communication arts.

658 Teaching Social Studies in the Elementary School (3:3:0). Prerequisite: Course in teaching social studies in the elementary school. Study of methods, material...
Reading Education Courses (EDRD)

500. See EDUC 500.

559 Teaching Developmental Reading in the Elementary School (3:3:0). Advanced course in the study of foundations of reading; principles, techniques and materials for developmental reading programs.

600. See EDUC 600.

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). Prerequisite: Admission to graduate program in reading, EDRD 611 or 612, and permission of adviser. Technical diagnosing of reading problems. Procedures in testing, scoring, and evaluating standardized and informal tests, individual and group tests, physical and psychological tests, and techniques of reporting test results.

614 Teaching Reading in the Secondary School (3:3:0). Emphasis on reading in content areas; reading problems: causes, diagnosis, remediation; skills and speed reading.

615 Teaching Reading in Multicultural/Multilingual Settings (3:3:0). Develops competencies in reading methods for students from multicultural or multilingual backgrounds. Emphasis on increasing the teacher's knowledge and understanding related to effective reading instruction. Particular emphasis on issues, methods, techniques, innovative designs for teaching, problem areas, linguistic differences, prereading skills, and the psychological development of the child.

616 Teaching Reading to Adults (3:3:0). Includes history of adult education, assessment techniques, and reading methods and materials that meet the special needs of adult students.

617 Teaching Reading to the Gifted (3:3:0). Prerequisite: EDRD 559 or 614. Study of higher levels of reading attainment: speed reading, critical reading, advanced study skills, intellectual needs of the gifted, and literature and materials for enrichment programs.

618 Organization and Administration of Reading Programs (3:3:0). Prerequisite: EDRD 559 or 614, EDRD 611, EDRD 613 or permission of instructor. Examines the roles of administrative staff and resource personnel in reading programs. Emphasis on 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). Prerequisite: Completion of the graduate program in reading except for practicum, or enrollment in the final semester of the program and permission of adviser. Supervised practice in the Educational Study Center working with individuals and small groups using a variety of reading procedures. Participation in scheduled group sessions required.

794 Internship in Reading (3:3:0). Prerequisite: Completion of graduate program in reading except for practicum, or enrollment in the final semester of the program and permission of adviser. Supervised teaching and participation as a reading specialist in a public school system. Participation in scheduled group sessions required.

Special Education Courses (EDSE)

500. See EDUC 500.

544 Post-secondary Transition (3:3:0). Exploration of factors for developing vocational independence in individuals with disabilities and/or limited English proficiency.

551 Classroom Management: Theory and Practice (3:3:0). Focus on identifying, recording, changing, and evaluating social and academic behaviors. Theories of classroom management are explored and various approaches to management are practiced. Development of individual education programs emphasized. Field experiences required.


554 Adaptive Methods in Education (3:3:0). Prerequisite: EDUC 523. Students apply theory to practice as they adapt different levels of general education curriculum to accommodate various learning styles and needs. Emphasis is placed on adaptation of materials, intervention methods, and the development of an ongoing system for evaluation of student progress.

600. See EDUC 600.

620 Advanced Applied Behavioral Analysis and Social Learning Theory (3:3:0). Prerequisite: Graduate standing and permission of adviser. Focus on recording and analyzing behaviors for application of theory to develop techniques that increase learning by handicapped students.

622 Augmentative Communication (3:3:0). Prerequisite: Graduate standing. EDSE 552 (can be taken concurrently), and permission of adviser. Focus on alternative language and communication techniques for children with severe language and speech impairments.

644 Characteristics of Students with Emotional Disturbances and Learning Disabilities (3:3:0). Study of manifestations of learning and behavioral differences and their impact on academic and social performance. Theories of deviance as they relate to emotional disturbances and learning disabilities are presented. Field experiences required.

647 Medical and Health Aspects of Handicapping Conditions (3:3:0). Prerequisite: EDUC 523 or permission of adviser. Nature and causes of disabling and/or special health conditions. Examines screening and evaluation techniques, treatment goals and intervention procedures. Field experiences required.
648 Introduction to Psychoeducational Assessment (3:3:0). Explored are concepts, purposes, terminology, and practices basic to standardized testing of school-aged youngsters. Emphasis is placed on examination of procedures and interpretation of group and individual screening and diagnostic instruments. Practice in scoring and interpreting tests is required.

649 Clinical Psychoeducational Assessment in Special Education (3:3:0). Administration, scoring and interpretation of education evaluation instruments with emphasis on the generated educational plan and written report. Supervised experiences required in the Educational Study Center on selected Saturdays.

655 Curriculum and Methods—Emotional Disturbances/Learning Disabilities (3:3:0). Application of 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. Focus on developing metacognitive and self-regulated learning techniques in students with limited academic motivation and/or achievement. Learning strategies for achievement across curriculum content are emphasized.

659 Curriculum and Methods—Early Childhood (3:3:0). Prerequisite: Permission of adviser. Emphasis on planning, organizing, implementing and evaluating programs for handicapped children ages two to eight.

661 Curriculum and Methods—Severely Profoundly Handicapped (3:3:0). Prerequisite: Permission of adviser. Formulation, implementation and evaluation of individualized educational programs for severely/profoundly handicapped individuals.

662 Educational Consultation (3:3:0). Prerequisite: Teaching certification 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.

665 Family Intervention Programs for Handicapped Children (3:3:0). Focus on strategies for developing and strengthening bonds between school and family for the benefit of the handicapped child. Home training approaches, programs, and materials are explored. Due process rights, legal roles of parents, and legislation governing substance and child abuse are emphasized.

668 Vocational and Leisure Education for Severely Handicapped (2:2:0). Prerequisite: Graduate standing. Focus on methods and techniques for vocational and leisure training of severely handicapped individuals in school and nonschool settings.

669 Transdisciplinary Approach to Rehabilitation (3:3:0). Prerequisite: Graduate standing and permission of adviser. Students are introduced to adaptive equipment and special techniques used by medical disciplines to enhance independence in the physically/multipie handicapped population. Incorporation of therapeutic modalities into other settings is explored via the educational/medical team approach.

670 Introduction to Gifted and Talented Education (3:3:0). Examination of personal values, academic strengths and leadership qualities of gifted and talented. Identification techniques, articulation of personal philosophy, and rationale for gifted and talented education are studied.

671 Special Topics in the Education of Exceptional Children (1:1:0). A variable topics course. No more than 3 credits may be applied to the M.Ed. degree.


672 Models and Methods of Teaching in Gifted and Talented Education (3:3:0). Study of theory and practice of gifted and talented education in elementary and secondary education. Theoretical principles are applied to classroom settings. Theories studied include models for teaching, methods, individualization, group procedures and aspects of creativity.

673 Curriculum Design and Research in Gifted and Talented Education (3:3:0). Curriculum design, program models, and program evaluation for gifted and talented individuals presented from a broad perspective including historical aspects and current practices.

674 Seminar in Gifted and Talented Education (3:3:0). Prerequisite: Completion of the graduate program except for internship and permission of adviser based on satisfactory academic standing. Focus on synthesis of preceding course work. Each student designs, implements, and presents a project designed to contribute to the improvement of gifted and talented education. Required seminars are scheduled throughout the year.

675 Evaluation and Identification of Gifted and Talented Students (2:2:0). Interpretation of formal and informal measuring devices used to identify gifted and talented students and study of screening models adapted to individual program needs.

676 Educating the Special Needs Gifted Child (3:0:0). Prerequisite: Admission to Graduate School. Focus on methods for identifying and fostering high levels of intellectual performance in youngsters who are handicapped and/or who represent diverse cultural populations. Emphasized are instructional adaptations for gifted/talented pupils who are visually impaired, blind, hearing impaired, deaf, severely physically handicapped, emotionally disturbed, and/or learning disabled.

677 Counseling the Gifted (2:2:0). Introduction to theory, principles, practices, and trends of guidance related to gifted and talented education.

782 Comprehensive Topics in Special Education: Trends and Issues (3:3:0). Prerequisite: Approval of adviser and permission of Special Education Committee. Synthesizes course work, theory, and practical application. Focus on current trends and issues, foundations and preparation for traditional area specialization comprehensives, which can be taken in the same or a separate semester. Offered only in the fall and spring.

790 Internship in Special Education (1-6:0:0). Prerequisite: Permission of the Special Education Committee. Supervised internships include the design and implementation of educational programming for young-
sters in campus-based program, public school, approved private school, hospital, institution, or clinic. Students enroll in two separate internships appropriate to the area of study for a total of 6 credits. Applications for field internships are due as follows: fall—April 15, spring—September 15, summer—February 15.

**Education Courses (EDUC)**

**500 In-Service Educational Development (1-6:0:0).** Prerequisite: Employment in professional capacity by sponsoring division or agency. Offered at request of school division or other educational agency. Content varies. May be repeated.

**502 History of Education in the U.S. (2:2:0).** Prerequisite: Admission to Graduate School or permission of instructor. A history of ideas about learning in the U.S. analyzed from the perspective of what can be accomplished for determining the future.

**503 Philosophy of Education (2:2:0).** Prerequisite: Admission to Graduate School or permission of instructor. A critical analysis and examination of ancient and contemporary educational philosophies and their impact upon educational thought and practice. The method of instruction is primarily lecture.

**504 Issues in Comparative Education (2:2:0).** An overview of national systems of education from the perspective of their similarities to and differences from education in the U.S., with special focus on the countries of recent immigrants to the Northern Virginia-D.C. metropolitan area.

**506 Education and Culture (3:3:0).** Prerequisite: Admission to Graduate School or permission of instructor. Examination and application of studies in educational anthropology, with focus on the process of cultural transmission in the U.S. through formal and informal institutions. Analysis of U.S. values, cultural discontinuity, hidden transmission of values in schools, U.S. schools’ response to cultural pluralism and cultural transmission in educational systems within other countries.

**508 Human Relations for Educators (3:3:0).** Helps students develop an awareness of self and self-concept, learn communication skills for improving interpersonal relations, and create a nondiscriminatory school environment.

**509 Advanced Human Development: Infancy to Middle Childhood (3:3:0).** Prerequisite: Admission to Graduate School or permission of instructor. 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.

**510 Advanced Human Development: Adolescence Through Adulthood (3:3:0).** Prerequisite: Admission to Graduate School or permission of instructor. Advanced course in the physical, psychosocial and cognitive development of the adolescent from pubescence to adulthood, as well as the study of adulthood from a developmental perspective. Emphasis is on the examination of the principal contemporary theories and conceptualizations of adolescence and adulthood and their application in contemporary educational settings. The relationship between development and learning is also be emphasized.

**515 (formerly 684) History and Philosophy of Vocational Education (3:3:0).** Prerequisite: Completion of undergraduate degree or appropriate educational requirement. Study of historical, philosophical and societal backgrounds of vocational education. Several specialty areas of vocational education and their relationship to general education. Students study current trends in their own areas of specialty with attention to the backgrounds of those trends.

**517 Computer Applications for Special Populations (4:3:1).** Prerequisite: Graduate standing or permission of instructor. A lecture/laboratory course for teachers of special populations (e.g., handicapped, bilingual) in applications of computer technology for instructional programs and career skills. Students learn to use computer technology designed specifically for special populations.

**521 Foundations of Education (3:3:0).** Prerequisite: Acceptance in a degree program in the Department of Curriculum and Education or permission of instructor. An overview of the various ways of educating and of the socialization processes operating within American educational institutions and other organizations. Current educational practices analyzed in terms of history, philosophy, psychology, sociocultural factors of formal and informal learning. Emphasis on trends, issues, alternative futures.

**522 Introduction to Secondary Education (3:3:0).** Prerequisite: Admission to Graduate School or permission of instructor. Analysis of the philosophical assumptions, curriculum issues, learning theories and history associated with current teaching styles. Emphasis on applications to all disciplines taught in secondary schools. Current educational trends and issues examined in relation to the sociology of secondary school settings.

**523 The Exceptional Child in American Education (2:2:0).** Prerequisite: Graduate standing in the department or permission of instructor. This course introduces the regular classroom teacher to the psychological, sociocultural, educational and physical aspects of the exceptional child. Emphasis on integration of the exceptional child into the regular classroom. Lectures, simulations, films and other modes of instruction are used.

**524 Learning Theory (2:2:0).** Prerequisite: Admission to Graduate School or permission of instructor. Examination of the relationships among learning theory, motivation, personality development, social and emotional behavior, and student attitudes. Emphasis on putting theory into practice.

**529 Pluralism and Exceptionality in U.S. Education (3:3:0).** Prerequisite: Admission to Graduate School or permission of instructor. Examination of 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 (2:2:0).** Prerequisite: Admission to Graduate School or permission of instructor. Examination of selected social issues in education. Uses concepts and information from

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social sciences to understand the social issues and suggest possible remedies through practice and policy.

532 Bilingualism and Language Acquisition Research (3:3:0). Examination of research in first and second language acquisition, including the interaction of a bilingual person's two languages, with implications for the classroom.


565 Production of Instructional Materials (3:3:0). Prerequisite: Course in instructional media. Prepares teachers with basic knowledge needed to produce inexpensive teaching materials. Emphasizes planning, production techniques, and evaluation standards. Students work on individual projects in their own subject field.

581 Cooperative Work Study Programs (Curriculum and Methods) (3:3:0). Prerequisite: Completion of proper undergraduate requirements in vocational education for industrial cooperative instructors. Prepares teachers to develop curriculum material for cooperative work study courses. Opportunity to gain proficiency in the techniques of planning and teaching generally related and directly related curriculum materials.

586 Competency-Based Instruction in Vocational Education (3:3:0). Introduction to practical and theoretical components of the competency-based programs in vocational education. Includes methods and strategies of implementation for specific areas of vocational education: industrial arts, trade and industrial education, home economics, business and office education, health occupations, and cooperative programs.

587 Administration and Coordination of Cooperative Work Programs (ICT) - (COE) (3:3:0). Prerequisite: Completion of undergraduate requirements in vocational education for industrial cooperative instructors. Prepares teachers to develop and select cooperative work stations. Teachers gain proficiency in planning and working with advisory groups. Included in the course are materials related to employment opportunities, rules and regulations of employment, and design and completion of necessary documentation. State certification for Cooperative ICT Instructors requires completion of this course. The course is the second in the required sequence for certification.

589 Materials and Processes Technology (Variable) (3-12). Advanced lab course focusing on the implementation of new technological methods of manufacturing and testing materials, energy utilization and products. Students build, research, and test individual products and ideas including the strategies required for classroom implementation.

593 (formerly 625). Utilization of Instructional Technology (3:3:0). Effective utilization of educational technology in the teaching-learning situation.

596 Project in Applied Education (2:2:0). The completion of a research and development project or paper as one of two culminating courses for the master's degree in education. The completed project or paper will contribute to the field of education within the student's specialization.

598 Directed Reading, Research, and Individual Projects (1-6:0:0). Prerequisite: Admission to a degree program and permission of department. 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. No more than 6 hours of EDUC 500 (may also be listed as EDAS, EDGC, EDRD or EDSE), 598 and/or 600 may be applied to degree credit.

599 Thesis (6:0:0). Prerequisite: EDUC 590 and 591. Study of 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). Full-time workshops and weekend seminars dealing with selected topics in education, education tour seminars. May be repeated.

680 Competency-Based Instruction in Vocational Education—Technical Area Specialty (3:3:0). Advanced course that provides an opportunity to research and implement competencies associated with a specific instructional area. Each student researches and identifies present occupationally related skills in the cognitive, psychomotor, and affective domains and incorporates these into a specific instructional program.

681 Organization and Administration of Vocational Education (3:3:0). Study of principles and practices of organizing and administering vocational educational programs in the public schools. Areas of concern are planning, policies, personnel professional development, program development, budgeting, public relations, teacher evaluation, program evaluation, and research.

682 Curriculum Development in Vocational Education (3:3:0). Curriculum development for teachers of vocational subjects. Program development, implementation, and evaluation are studied with emphasis on current trends in vocational education. The impact of the Virginia Vocational State Plan and competency-based instruction are stressed.

686 Teaching and Working with Adult Learners (3:3:0). Prerequisite: Completion of undergraduate degree or appropriate educational requirements. Provides adult instructors with the fundamental program skills required to organize and administer programs for teaching adults. Topies relate to vocational and avocational adult basic program goals including an overview of existing vocational and adult programs in the community.

687 Industrial Safety (3:3:0). Prerequisite: Completion of undergraduate degree or appropriate educational requirements. Introduces teachers, industrial managers, and others to the processes and procedures of establishing safety programs for industry and the public schools. Specific areas of concentration highlight OSHA requirements, safety evaluation systems, and safety awareness techniques. Includes review of the legal responsibilities related to various industrial and educational environments. Includes field visits.

688 Internship in Vocational Education (1-6:0:0). Prerequisite: Completion of undergraduate degree or appropriate educational requirements. Opportunity to complete a total of 6 hours placed in education, industry or business associated with the area of teaching responsibility. Stu-
dents research the various technical and professional skills required for successful employment and development recommendations for curriculum revisions. Projected program changes are presented to peer groups at regularly scheduled seminars.

695/ENGL 695 Northern Virginia Writing Project In-service Program (1-3:0:0). Prerequisite: Admission to the graduate program or permission of department. Offered at the request of a school division or other educational agency. Content varies. May be repeated with the permission of department, but no more than 6 semester hours of credit in ENGL 695, ENGL 695 and/or ENGL 699 may be applied toward a master's degree.

696/ENGL 696 Northern Virginia Writing Project/Research Seminar (3:0:0). Prerequisite: EDUC 695/ENGL 695 or NVWP Summer Institute. Acquaints 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 prior to enrolling will conduct the research during the course.

697/ENGL 697 Northern Virginia Writing Project/Theory of Composition (3). Prerequisite: ENGL/EDUC 695 or NVWP Summer Institute. Acquaints classroom teachers with current theory relating to writing and the teaching of composition. Focus is on making explicit participants' theories, on reading the works of leading theorists, and on developing a statement describing the implications of theoretical consistency in the teaching of writing.

699 Computer Applications in Education (3:1:2). Introduces graduate students to the instructional and databased management uses of microcomputers and mainframe computers in school settings. Emphasis is on study, analysis, and exploratory application in laboratory classes of selected concepts of computer usage to achieve objectives common to a variety of formal education settings.

752 Seminar in Instructional Application of Computers (3:3:0). Prerequisite: EDUC 699 or permission of instructor; mastery of BASIC. Concentrates on principles and techniques of implementation of instructional curricula using computers, especially microcomputers. Emphasizes computer-assisted, computer-managed, and computer-based instruction, advanced BASIC statements, the use of instructional programming and authoring languages (e.g., LOGO, PILOT), courseware authoring systems, and the evaluation and validation of educational software for instructional purposes.

754 Seminar in Computers for Educational Administration and Research (3:2:1). Prerequisite: EDUC 699 or its equivalent or permission of instructor. Mastery of BASIC. Emphasizes the principles and techniques of using microcomputers, minicomputers and large mainframe computers for purposes of record keeping, management information, instructional supervision and data analytic research in instructional settings in education and industry.

805 Doctoral Seminar in Education (2:2:0). Prerequisite: Admission to the D.A.Ed. program. In-depth study of selected topics in education. Students participate in an information exchange with other students, faculty members and other scholars about current research interests and ideas. Students also present their own research in a professional forum. A maximum of 8 credits in EDUC 805 may be credited toward minimum D.A.Ed. requirements.

840 Seminar in Adult Development and Learning (3:3:0). Prerequisite: Admission to the D.A.Ed. program or permission of instructor. 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 the development patterns in adult education activities, and learning theory implications for adult learners.

881 Seminar in Bilingual Education: Policy (3:3:0). Prerequisite: Admission to the D.A.Ed. program. Examines the historical development of bilingual education in the U.S., focusing on federal and state legislation and court decisions of the last two decades. Policy issues and programmatic models developed in response to legal mandates and legislative decisions affecting bilingual education are explored in depth from federal, state and local points of view.

882 Seminar in Bilingual Education: Theory and Research (3). Prerequisite: Admission to the D.A.Ed. program. Examines the theoretical foundations of bilingual education through focus on linguistic, anthropological, sociological, psychological, and educational research in the areas of first and second language acquisition, language use in a bilingual classroom, code-switching, bilingualism and intelligence, cognitive style, the teaching of reading, language dominance, proficiency assessment, achievement testing, special needs assessment, and research on the effectiveness of bilingual education.

Education: Doctor of Arts in Education

The College of Education and Human Services, in cooperation with the College of Arts and Sciences, offers a Doctor of Arts in Education degree as its major degree in education. The D.A.Ed. degree provides advanced liberal arts professional education for experienced educational practitioners pursuing or planning careers in nontraditional as well as traditional educational settings.

Program Requirements

The D.A.Ed. requires a minimum of 85 semester hours of study beyond the baccalaureate degree or a minimum of 55 semester hours beyond the master's degree. A limited number of graduate hours may be applied to the program. However, an individual's total program may require more semester hours than these minimum requirements depending on the individual's goals, program requirements, and previous preparation.
Program of Study

With the guidance of the graduate 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 interdisciplinary study in a professional education field in the liberal arts, sciences, and humanities in a subject area that supports his or her professional specialization.

Structure of Program

Students in the program participate in a common core of required courses and seminars. These include:

DAED 800, 801, 802;
EDRS 810, 811, 812; and
DAED 911, 994, 998, and 999.

A sequence of at least three courses (9 semester hours) must also be taken in a specific area of special scholarship that supports the student’s professional area of expertise (e.g., public affairs for an administrator, English for an English teacher). Students may choose to study in one of the following: anthropology, art, biology, chemistry, communication, economics, English literature, a foreign language, geography, geology, government, history, international relations, linguistics, mathematics, philosophy, physics, psychology, public administration, and sociology. Preparation of a research paper or papers demonstrating proficiency in the chosen subject culminates this study.

Additional internships, research seminars, specialized courses, or reading courses in special areas of education such as educational administration, educational uses of microcomputers, special education, curriculum and instruction, counseling and development, bilingual education, and so on are selected or required to complete the program. The specific nature of all courses is determined by the student in conjunction with his or her faculty doctoral advising committee during the first year of study.

General Program Goals

To complete the D.A.Ed. program each student must demonstrate competence in oral and written English; computer literacy; mastery of the knowledge and skills of an area of special scholarship and of an area of professional expertise; and the ability to apply general and specific knowledge and skills to significant educational problems. Students demonstrate these competencies by successful completion of courses and seminars, by passing a preliminary qualifying exam after 15 credits of study, by passing a special written comprehensive qualifying examination near the conclusion of program course work, and by preparing and orally defending a doctoral project.

Students have five years from the time they enroll in their first class to complete all course work through the comprehensive examination. Two additional years, starting with the date on which students complete the comprehensive examination, are allowed to complete the doctoral project.

Residency

The purposes of residency are achieved in the D.A.Ed. program through a combination of core courses and special seminars, and through continuous enrollment. These requirements include successful completion of the Leadership Seminar and of the Ways of Knowing seminar. Students must enroll in at least one approved course each semester they are in the program.

Internship

Candidates enroll in at least one and up to three internships designed to broaden their professional expertise. These 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 cases, the student works with university and on-site supervisors.

Admission Requirements

Candidates are admitted to study by the College of Education and Human Services and by a department offering study in a field of special scholarship chosen by the student. Admission is highly selective. Approximately 20 students are admitted to the program each year.

In addition to completing all the university Graduate School admission requirements, each applicant 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. Demonstration of high intellectual capability;
4. Minimum requirements established by the various areas of special scholarship;
5. Demonstrated leadership potential;
6. Three letters of recommendation;
7. Graduate Record Examination or Miller Analogies Test scores;
8. A written goals statement relating the study in the D.A.Ed. program to the applicant’s educational and career plans.
The D.A.Ed. program admits students twice each year. Upon faculty approval of a student's program of studies, applicants are admitted to full doctoral student status.

Information and Applications

For further information about admission and program requirements, contact the Graduate School, the Office of Admissions, or the Coordinator of the Doctor of Arts in Education program. Completed applications must be submitted to the university's Office of Admissions by February 1 for admission the following summer or fall, or by November 1 for admission the following January.

Doctor of Arts in Education

Interdisciplinary Courses

(DAED)

800 Ways of Knowing (3:3:0). Prerequisite: Admission to D.A.Ed. program. Provides an understanding of the methods of inquiry in various fields of study. Examines selected disciplines in terms of subject matter, scope, key concepts, principles, generalizations, and theories in each field. The characteristic way of knowing in each discipline is studied as a tool for the analysis and solution of educational issues and problems. Required during first semester of study in the program.

801 Seminar in Liberal Education (3:3:0). Prerequisite: Satisfactory completion of DAED 800 and 802, and all but one special scholarship course. Analysis of American education from a variety of discipline perspectives. Students apply concepts and methodologies studied to a study of education in America. Includes regular seminar papers and critiques.

802 Leadership Seminar (3:3:0). Prerequisite: Admission to the D.A.Ed. program. Intensive study of leadership emphasizing concepts of leadership, decision and change processes, and the assessment and development of leadership skills.

890 Doctoral Internship in Education (3:3:0) or (1:1:0 to 6:6:0). Prerequisite: Admission to the D.A.Ed. program. Requires 100 hours of on-site internship completed over at least a five-week period. Interns work with an appropriate staff member in a cooperating school, school system, or other educational institution, agency, or setting. Up to 6 hours of EDUC 890 may be applied toward D.A.Ed. degree requirements.

895 Seminar in Emerging Issues of Education (3:3:0). Prerequisite: Satisfactory completion of EDUC 800 and DAED 800. Focus 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. Up to 6 hours of EDUC 895 may be applied D.A.Ed. requirement.

896 Doctoral Seminar in Curriculum Areas (2:2:0). Prerequisite: Successful completion of DAED 800. Focus on research, theory and exemplary practice in specific subject areas of education. Students engage in research, study, discussion and writing in the designated subject area to analyze trends, assumptions, and important implications for the educational area today and in the future. Usually taken near the end of D.A.Ed. course work.

897 Independent Study for the Doctor of Arts in Education (varying credit). Prerequisite: Admission to the D.A.Ed. program and doctoral student status; permission of student's doctoral advising committee. A structured learning experience to extend and develop skills and knowledge relative to a field of professional expertise.

911 Doctoral Projects Seminar (2:2:0). Prerequisite: Admission to candidacy in the D.A.Ed. program, successful completion of the doctoral qualifying examination and EDRS 810, 811, and 812 or their equivalents. Development of proposals for individual projects in the D.A.Ed. program. May be repeated. No more than 8 hours of EDUC 911 and EDUC 998 may be applied toward the minimum D.A.Ed. degree requirements.

994 Advanced Internship in Education (3:3:0). Prerequisite: Admission to the D.A.Ed. program and permission of student's doctoral committee. Requires internship in a setting related but not identical to the student's major area of study. Requires 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, other educational institution or agency, or in a setting that may differ from regular employment.

998 Doctoral Project Research (3:0:3). Prerequisite: Admission to candidacy in the D.A.Ed. program, successful completion of the doctoral qualifying examination and EDUC 911. Continued faculty assistance on an individual basis in the completion of projects planned in EDUC 911 and the initiation of new projects. May be repeated. No more than 11 hours of EDUC 911 and EDUC 998 may be applied toward the minimum D.A.Ed. degree requirements.

999 Doctoral Research (1:0:1). Prerequisite: Enrollment in EDUC 998 for required credit, permission of D.A.Ed Coordinator. Students engaged in doctoral project research and writing must register in this course each semester following approval of their project unless registering for EDUC 998. Does not count toward the D.A.Ed. degree credit required. Open only to candidates for the D.A.Ed. degree in Education. For additional D.A.Ed. courses see DAED. May be repeated.

Other courses. For other D.A.Ed. courses see EDUC 699, 840, 881, 882; EDRS 810, 811, 812, 820; ED 701 and 705.

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Education: Educational Leadership and Human Development

Faculty
Benshoff, James M., Ph.D., The American University, 1988; Assistant Professor
Beyer, Barry K., Ph.D., University of Rochester, 1962; Professor
Bonfadini, John E., Ph.D., Virginia Polytechnic Institute and State University, 1976; Associate Professor
Carroll, Jack C., Ed.D., The American University, 1970; Associate Professor
Cates, Ward M., Ed.D., Duke University, 1979; Associate Professor
Chickering, Arthur W., Ph.D., Teachers College, Columbia University, 1958; Professor
Dobson, E. Clark, Ph.D., Florida State University, 1972; Associate Professor
Dunklee, Dennis R., Ph.D., Kansas State University, 1985; Associate Professor
Edgemon, Albert W., Ed.D., Teachers College, Columbia University, 1964; Professor
Jacob, Evelyn J., Ph.D., University of Pennsylvania, 1977; Associate Professor
Lepard, David, Ed.D., University of Massachusetts, 1971; Research Associate Professor
Levy, Jack, Ph.D., University of Southern California, 1973; Associate Professor
Schuchman, Betty J., Ed.D., Indiana University, 1967; Associate Professor
Seligman, Linda H., Ph.D., Teachers College, Columbia University, 1974; Professor
Sockett, Hugh T., Ph.D., King’s College, London, 1974; Professor
Thomas, Charles L., Ph.D., Johns Hopkins University, 1971; Associate Professor
Thomas, Wayne P., Ph.D., Virginia Polytechnic Institute and State University, 1980; Associate Professor

Master of Education Programs, M.Ed.
The Department of Educational Leadership and Human Development offers two degree programs: the M.Ed. in Leadership and Human Development and the M.Ed. in Counseling and Development. Nondegree status is available for students who are eligible to take courses toward certification, endorsement, or licensure.

Each program is approved by the State Department of Education and is accredited by the Southern Association of Colleges and Schools and by the National Council for the Accreditation of Teacher Education.

Program Requirements
Each student is responsible for knowing all requirements and for developing with the assigned adviser a program that will meet those requirements. Some programs require a practicum or internship. Applications for practica/internships must be filed one semester prior to enrollment, observing the following deadlines:

- March 15 for fall semester
- September 15 for spring semester
- February 15 for summer session

Application forms for practica/internships are available from the Office of Professional Education Services. Completed forms are submitted to advisers for approval and processing.

Leadership and Human Development
The M.Ed. in Leadership and Human Development permits study in the following areas:

1. Education Leadership and Supervision. Programs for persons interested in such positions as elementary school team leader, secondary school department chair, assistant principal, principal, and instruction coordinator/supervisor/director. Teachers who want preparation for school-based management may also participate in this program.

2. Instructional Leadership in Non-school Environments. Programs for persons responsible for instructional programs in private and governmental environments.

3. Human Resource Development. Programs that emphasize (a) training and development and (b) computer-based training.

Admission Requirements
Degree applicants must meet Graduate School requirements and have an undergraduate grade point average of at least 3.00 (4.00 scale).

Applicants in education leadership and supervision who are planning a public school career must be recommended by three professional educators, at least two of whom are in positions of education
administration/supervision and who can comment on the applicant's success as a teacher and potential for leadership/supervision positions.

Applicants for programs in human resource development must (1) present scores from either the GRE or GMAT and (2) be recommended by three professionals with expertise relevant to the applicant's proposed study.

**Degree Requirements**

The M.Ed. in leadership and human development requires a minimum of 30 semester hours. (Most programs require more than the minimum.) Students develop individualized programs in consultation with their advisers and subject to the approval of the department chair. Each program must include the following:

1. At least one course appropriate to the student's specialization in each of the following areas:

   - Foundations
   - Research methodology
   - Leadership
   - Human resource development

2. A series of courses (at least 12 semester hours) in a specialization. The series must include at least one sequence of courses that moves the student from an introductory to an advanced level of study within the specialization. Courses in Parts (1) and (3) may be included in satisfying this requirement.

3. A culminating and synthesizing experience, such as a practicum, internship, seminar, computerized unit, comprehensive paper, or comprehensive examination.

In addition, students must satisfy the requirements of their specializations. For example, candidates for Virginia endorsement in school administration or supervision must complete the program approved by the Virginia State Department of Education. Requirements for each program specialization are available in the department office or from program faculty.

**Counseling and Development**

The Master of Education program in Counseling and Development prepares students for careers as counselors and human development professionals in a variety of work settings, including elementary, middle, and secondary schools; colleges and universities; and community mental health agencies. The program develops students' competence in a broad range of counseling skills, including group and individual counseling, career counseling, and assessment. The program emphasizes the integration of theory and practice and prepares knowledgeable and capable helping professionals for a wide range of employment settings. The culmination of the students' program is an internship in an educational or mental health agency counseling setting similar to that in which they hope to be employed. This offers students the opportunity to test and refine their counseling skills while experiencing the counselor role.

**Admission Requirements**

**Degree Applicants**

Degree applicants must meet the requirements of the Graduate School and have an undergraduate grade point average of at least 3.0. In addition, the applicant must satisfy (1) or (2) below:

1. Students preparing for elementary, middle, or secondary school counseling positions and seeking the M.Ed. degree must:
   a. Provide evidence of teacher certification by the state of Virginia or another acceptable jurisdiction;
   b. Have successfully completed a minimum of 12 semester hours of undergraduate work in the behavioral sciences (courses taken to make up undergraduate deficiencies cannot be used to fulfill degree requirements);
   c. Have completed two years of successful work experience, one year of which must be in a school setting;
   d. Submit three letters of recommendation from supervisors or professors regarding the potential of the applicant for the field of counseling;
   e. Submit a statement of interests and objectives;
   f. Be interviewed and recommended for acceptance.

2. Students preparing for counseling and student development work in colleges and universities and for counseling in mental health agencies and seeking the M.Ed. degree must:
   a. Possess a baccalaureate degree;
   b. Have successfully completed a minimum of 12 semester hours of undergraduate work in the behavioral sciences (courses taken to make up undergraduate deficiencies cannot be used to fulfill degree requirements);
   c. Submit two letters of recommendation from supervisors or professors concerning the applicant's potential as a professional counselor or as a student professional;
   d. Submit a statement of interests and objectives;
   e. Be interviewed and recommended for acceptance.

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Nondegree Applicants

Students who wish to take courses in the counseling and development program but do not want a degree should apply to the program as nondegree students. These include:

1. Students with a master's degree in education or in a helping profession who plan to take a series of courses, typically including an internship, leading to endorsement as an elementary, middle, or secondary school counselor in Virginia.

2. Students with a master's degree in a helping profession who plan to take a series of courses, typically including an internship, to obtain the 60 credits of needed course work so they can apply for licensure as a professional counselor in Virginia.

Students applying under the nondegree applicant category must submit two letters of recommendation from supervisors or professors and a statement of interests and objectives. These students are generally required to take a minimum of 15 credits of course work.

Degree Requirements

The M.Ed. degree in counseling and development usually requires 40 semester hours. Students admitted to the degree program take the following courses:

**Department Foundation Courses—6 semester hours:**
- EDRS 590 Education Research (3)
- EDUC 509 or 510 Human Development (3)

**Core Courses—23 semester hours:**
- EDGC 604 Analysis of the Individual (3)
- EDGC 605 Introduction to Counseling Theory and Practice (3)
- EDGC 607 Advanced Counseling Theory and Practice (3)
- EDGC 608 Group Processes and Analyses (3)
- EDGC 610 Career and Educational Counseling (4)
- EDGC 754 Practicum in Counseling and Development (3)
- EDGC 790 Internship in Counseling and Development (6)

**Specialization courses (see below)—9 semester hours**

Upon completing the program, the student must pass a comprehensive examination, usually taken during the last semester of study. It is broadly conceived and structured to cover both knowledge and experience.

Areas of Specialization

**School Counseling and Development**

The school counseling specialization prepares students for careers as elementary, middle, or secondary school counselors. The admission requirements for this specialization were developed to ensure that graduates of the program possess the academic and experiential prerequisites for endorsement as a school counselor by the Virginia Department of Education. Along with the foundations and core courses common to all specializations, school counseling students also take two courses focusing on the school counselor's role and two other specialization courses. Students who wish to be endorsed at more than one level of school counseling (e.g., elementary and middle) can do so by completing an additional two-credit course and a practicum that is at least 120 hours long.

**Required Specialization Courses:**
- EDGC 620 Philosophy and Principles of School Counseling (1)
- EDGC 666 Counseling and Development for Special Populations (3)
- EDGC 668 Counseling and Development Programming (3)

**One of the following:**
- EDGC 624 Theories and Practices of Elementary School Counseling (2)
- EDGC 626 Theories and Practices of Middle School Counseling (2)
- EDGC 628 Theories and Practices of Secondary School Counseling (2)

**Higher Education Counseling and Development**

The higher education counseling specialization prepares counselors and other student development professionals who share with teaching faculty the responsibility for humanizing and personalizing each student's experience in higher education. Graduates of the program are employed in a variety of positions in postsecondary education: counseling centers, career planning and placement, residence halls, student activities, financial aid, academic advising, and special programs for foreign students, returning students, minority students, and others. The higher education counseling specialization focuses on the role of student development professionals, knowledge of special groups, and higher education settings in which student development professionals use their skills.

**Required Specialization Courses:**
- EDGC 644 College Student Development (3)
- EDGC 666 Counseling and Development for Special Populations (3)
EDGC 668 Counseling and Development Programming (3)

Community Agency Counseling and Development

The specialization in community agency counseling prepares counselors for employment in a wide range of settings, including community mental health centers, family counseling centers, agencies specializing in career counseling, businesses and industries, rehabilitation agencies, and counseling programs in federal, state, and local governments. Students complete foundations and core courses along with other students in the program. In addition, specialization courses familiarize students with the role and function of agency counselors and provide special skills they will need such as intake interviews, diagnosis and treatment planning, and couples and family counseling.

Required Specialization Courses:
- EDGC 654 Counseling in Community, Agency, and Business Settings (3)
- EDGC 656 Diagnosis and Treatment Planning for Mental Health Professionals (3)
- EDGC 658 Couples and Family Counseling (3)

School Psychology

Certification in School Psychology can be obtained by completing the M.A. in Psychology. This program, jointly administered by the Departments of Educational Leadership and Human Development and Psychology, is open to students with either an education or psychology background. The degree is offered by the Department of Psychology, while the Department of Educational Leadership and Human Development assumes responsibility for certification. Further information concerning this program can be found under the Psychology section of this catalog.

Leadership/Supervision Courses (EDAS)

500. See EDUC 500.
598. See EDUC 598
599. See EDUC 599
600. See EDUC 600.

611 School-Community Relations (3:3:0). Principles, philosophy, practices, and agencies involved in developing and maintaining desirable relationships between schools and communities.

612 School Law (3:3:0). Provides the background in school law needed by school administrators, supervisors, counselors and others.

621 School Administration (3:3:0). Prerequisite: Teaching experience. Basic principles and practices of school organization and administration. Emphasis on elementary, middle and high schools with reference to state and district structures.

626 Curriculum Development and Evaluation: Elementary School (3:3:0). Course examines leadership roles in elementary school curriculum design and evaluation. Emphasis on techniques used in program design and assessment. Includes current trends in curriculum development and the various disciplines.

627 Curriculum Development and Evaluation: Middle School (3:3:0). Course examines leadership roles in middle school curriculum design and evaluation. Emphasis on techniques used in program design and assessment. Includes current trends in curriculum development and the various disciplines.


631 Supervision and Evaluation of Instruction (3:3:0) (formerly Supervision of Instruction). Prerequisite: Teaching experience and EDAS 626, 627, or 628. Basic principles and practices of instructional supervision. Elementary, middle and high school specialization may be accomplished through options in reading and project assignments. Includes the theory and practices of both supervision and evaluation of instruction.

725 Educational Finance (3:3:0). Study of the economic interdependence of educational systems and society and economic concepts they relate to schooling. Focus on issues, solution sets and philosophies of educational funding.

740 Personnel Administration in Education (3:3:0). Prerequisite: EDAS 612, EDAS 621 or permission of instructor. Study of theory, research and practice relating to personnel administration in education.

789 Seminar in Education Leadership (3:3:0). Prerequisite: EDAS 631 and 621; admission to the degree program in education administration and supervision; or permission of department. Theory and practice of leadership behavior applied to educational environments.

791 Practicum in Education Leadership (3 or 6:0:0). Prerequisite: Permission of department. Students apply administrative and supervisory theory to practice and analysis of practice through approved field experiences. Primarily designed for persons holding administrative or supervisory positions. May be repeated for a total of 6 credits.

792 Internship in Education Leadership (3 or 6:0:0). Prerequisite: Permission of department. Students translate administrative and supervisory theory into practice through approved field experiences. Primarily designed for persons not holding administrative or supervisory positions. May be repeated for a total of 6 credits.

Counseling and Development Courses (EDGC)

500. See EDUC 500.
598. See EDUC 598.
Areas of Study

599. See EDUC 599.

600. See EDUC 600.

604 Analysis of the Individual (3:3:0). Development of a framework for understanding the individual in counseling, including methods of gathering and interpreting data; choosing, administering, and interpreting individual and group tests; the study of individual differences; use of case study technique.

605 Introduction to Counseling Theory and Practice (3:3:0). Introduction to counseling theories, principles, and practices. Students study, discuss, and analyze four of the basic therapeutic approaches to individual and group counseling with clients. Emphasis on learning basic counseling skills through supervised practice and critique sessions. Includes lab.

607 Advanced Counseling Theory and Practice (3:3:0). Prerequisite: EDUC 509/510 or equivalent and EDGC 605. Advanced course in M.Ed.—counseling and development program. In-depth study of selected counseling theories, principles, and topics. Intensive practice in advanced counseling techniques and approaches with emphasis on supervised practice sessions. Includes lab.

608 Group Processes and Analyses (3:3:0). Prerequisite: EDGC 605. Theories appropriate to various types of groups and descriptions of group practices, methods, dynamics, and facilitative skills. Attention to application of theory to practice.

610 Career and Educational Counseling (4:3:2). Prerequisite: EDGC 605 and 607. Study of vocational choice theory, sources of occupational and educational information, approaches to career decision-making processes, and career development exploration techniques. Attention to application of theory to practice. Includes lab.

620 Philosophy and Principles of School Counseling (1:1:0). Introduction to school counseling programs at the elementary, middle, and secondary levels. Philosophy and basic principles necessary for effective school counseling programs.

624 Theories and Practices of Elementary School Counseling (2:2:0). School counseling programs at the elementary school level. Emphasis on appropriate counseling practices in the elementary school setting. Developmental needs of students 5 to 10 years of age.

626 Theories and Practices of Middle School Counseling (2:2:0). School counseling programs at the middle school level. Emphasis on appropriate counseling practices in the middle school setting. Developmental needs of students 10 to 14 years of age.

628 (formerly EDGC 634) Theories and Practices of Secondary School Counseling (2:2:0). School counseling programs at the secondary school level. Emphasis on appropriate counseling practices in the secondary school setting. Developmental needs of students 14 to 18 years of age.

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.

654 Counseling in the Community, Agency, and Business Settings (3:3:0). Emphasis on the types of services and facilities provided, needs and problems of the client population served, role and function of the counselor in the agency setting, and personnel needs of the individual agency.

656 Diagnosis and Treatment Planning for Mental Health Professionals (3:3:0). Prerequisite: EDGC 605. By using actual and hypothetical cases, the course helps the student develop written plans and simulate implementation for overall diagnosis and treatment of clients and their families.

658 Couples and Family Counseling (3:3:0). Prerequisite: EDGC 605 and 607, taken previously or concurrently. Introduces major approaches to counseling couples and families. Case studies and simulations facilitate the transition from theory into practice.

666 Counseling and Development for Special Populations (3:3:0). Prerequisite: EDGC 605 or permission of instructor. Study of the nature, characteristics, and needs of special groups seeking counseling and development services. Analysis of content, techniques, and goals of programs developed to serve these groups.

668 Counseling and Development Programming (3:3:0). Prerequisite: EDGC 605 or permission of instructor. Needs assessment, planning, implementation of counseling and human development programs including the development of workshops, group and individual sessions. Attention is given to consultation and collaboration with other professionals in efforts to facilitate human development and self-direction.

754 Practicum in Counseling and Development (3:6:0). Prerequisite: 605, 607, and permission of adviser. Focus on basic counseling skills through simulated and actual counseling experiences. Students are required to volunteer in a counseling setting and spend time in class meeting for presentation, analysis, and practice of techniques. Those taking EDGC 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. Prerequisite: Completion of the graduate program except for internship; permission of adviser; overall GPA of 3.00 and no more than two grades of C in all graduate course work required by the program. Supervised practice of counseling in a setting similar to that in which the student plans to work. (School placements open to certified personnel only.)

Human Resource Development Courses (EDHR)

500. See EDUC 500.

598. See EDUC 598.

599. See EDUC 599.

600. See EDUC 600.

580 Introduction to Training and Development (3:3:0). Introduction to the field of training and development in industry, government, and other settings. Discussion topics include overviews/history of training, basic types of training programs, profiles of training professionals, general training techniques, needs assessment, evaluation, employment opportunities, and others.

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583 Introduction to Computer-Based Training (3:3:0). Prerequisite: Graduate standing or permission of instructor. Overview of the field of computer-based training (CBT) for those considering implementing CBT in an instructional setting. Topics include organizational and financial concerns, computer-oriented instructional design, authoring tools and systems, new issues and trends in CBT, and evaluation of courseware.

655 Designing Training Programs (3:3:0). Topics in the design of training programs in business, government, and educational settings. Included are analysis and practice in needs assessment, goal setting, content/activity selection and evaluation. Students also become familiar with a variety of existing training programs, and participate in presentations by practitioners.

565 Instructional Techniques in Training and Development (3:3:0). Prerequisite: EDHR 580, 655, or permission of instructor. Develops basic skills in instructional techniques used in training: climate setting, small group training, role playing, problems solving, case study, lecture, simulation, structured exercises, and team building. Techniques such as video and computer-based training are discussed. Experiential approaches emphasized.

Education Research Courses (EDRS) (Formerly EDUC)

531 Educational and Psychological Measurement (3:3:0). Emphasis on 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.

590 Education Research (3:3:0). Development of skills, insights and understandings basic to performing research, with emphasis on interpretation and application of research results. Critique of research and use of findings in educational settings.

591 Education Statistics (3:3:0). Introduction to practical and applied aspects of statistics in education. Includes selected descriptive and inferential statistics; also statistical data processing.

810 Problems and Methods in Education Research (2:2:0). Prerequisite: Admission to the D.A.Ed. program or permission of instructor. Advanced course in the interpretation and application of 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. Students study and apply qualitative data collection and analysis procedures used in educational research, including ethnographic and other field-based methods, historical materials and unobtrusive measures. Emphases 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 evaluation of public and private elementary and secondary schools, colleges and universities, and government and industrial education programs.

School Psychology Course (EDSP)

790 School Psychology Internship (3, 6, 9, 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 where 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 hours (thesis option) or 12 hours (nonthesis option) in increments of 3 hours according to placement. Students enrolled in PSYC 790 are not required to complete the practical research project.

Additional Courses. See listings in the Department of Curriculum and Instruction under the prefixes EDCI, EDRD, EDSE, and EDUC; and in Doctor of Arts in Education for courses with DAED prefix.

Electrical and Computer Engineering

Faculty

Auletta, Richard J., Ph.D., University of Virginia, 1987; Assistant Professor
Baraniecki, Anna Z., Ph.D., University of Windsor, 1980; Assistant Professor
Bass, Steven C., Ph.D., Purdue University, 1971; Professor
Beale, Guy O., Ph.D., University of Virginia, 1977; Associate Professor
Berry, Alok K., Ph.D., University of Missouri, 1985; Assistant Professor
Black, W. Murray, Ph.D., Pennsylvania State University, 1971; Associate Professor

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Bourbakis, Nikolaos G., Ph.D., University of Patras, 1982; Assistant Professor
Capetanakis, John, Ph.D., Massachusetts Institute of Technology, 1977; Associate Professor
Ceperley, Peter H., Ph.D., Stanford University, 1973; Associate Professor
Chang, Shih-Chun, Ph.D., University of Hawaii, 1977; Associate Professor
Cole, Eric, Chang, Shih-Chun, Ph.D., Massachusetts Institute of Technology, 1965; Professor
Cook, Gerald, Sc.D., Massachusetts Institute of Technology, 1951; Associate Professor
Copley, William C., Dr. Eng., Massachusetts Institute of Technology, 1951; Associate Professor
Earp, Samuel L., Ph.D., Duke University, 1985; Assistant Professor
Eldeb, Hany K., Ph.D., University of Virginia, 1986; Assistant Professor
Gertler, Janos, Sc.D., Hungarian Academy of Sciences, 1980; Professor
Hintz, Kenneth J., Ph.D., University of Virginia, 1981; Associate Professor
Jabbari, Bijan, Ph.D., Stanford University, 1981; Associate Professor
Manitius, Andrej Z., Ph.D., Polytechnical School of Warsaw, 1968; Professor
Mulpu, V. Rao, Ph.D., Oregon State University, 1985; Assistant Professor
Schaefer, David H., B.S., Tulane University, 1949; Associate Professor
Stephanou, Harry E., Ph.D., Purdue University, 1976; Associate Professor
Tabak, Daniel, Ph.D., University of Illinois, 1967; Professor
Van Trees, Harry L., Sc.D., Massachusetts Institute of Technology, 1961; Distinguished Professor

Computer and Electronics Engineering, M.S.

Graduate programs leading to the master of science and doctor of philosophy degrees prepare students for careers in industry, government, or academia. The M.S. degree is offered by the Department of Electrical and Computer Engineering. The Ph.D. degree is offered by the School of Information Technology and Engineering, which includes the Department of Electrical and Computer Engineering.

While firmly committed to high standards of teaching and research excellence in the traditional areas of communications and signal processing, control and robotics, computers, and electronics, the department also recognizes the need to augment and enhance these areas through the use of modern information technology. Graduate students are offered a progressive environment with ample opportunities for the type of multidisciplinary research that will be needed to confront the complex realities of the twenty-first century.

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 is available in various forms such as assistantships, research grants with a project conducted at the university, work-study, or co-op agreements with local industry.

Students may take courses through the Cooperative Graduate Engineering Program, in affiliation with the University of Virginia and Virginia Tech. Appropriate courses may be transferred, with advisor approval, into this GMU degree program. Refer to the section on Certificates, Programs, and Additional Graduate Courses in this catalog.

Admission Requirements

Admissions are strictly competitive. The department's policy is to admit only students who have demonstrated a potential for outstanding performance in their graduate work. To be considered for admission to the master's program, applicants 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 hours.
3. Three letters of recommendation, preferably from academic references, or from references in industry or government who are holders of advanced degrees and are familiar with the applicant's professional accomplishments.
4. A detailed statement of career goals and aspirations.
5. For students whose native language is not English, a score of 575 or higher on the Test of English as a Foreign Language. A minimum score of 600 is required for applicants who wish to be considered for graduate assistantships.
6. Although the Graduate Record Examination (GRE) is not formally required, it is strongly recommended, particularly for international students. Test results are used as an additional measurement of the applicant's qualifications.
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 capacity to pursue graduate work. To be advanced to degree status, provisional students must achieve a 3.0 grade point average after 12 semester hours, must remove all undergraduate deficiencies (by taking the corresponding courses with a B or better), and must receive a grade of B or better in each of the graduate core courses ECE 521, 528, 546, and 571. Nondegree students who wish to enter the degree program must formally apply for admission.

Non-ECE Students

Outstanding 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. As a general guideline, students who do not have adequate preparation in some of the ECE undergraduate core areas are required to complete the corresponding course(s) from the following list with a B average or better:

- Circuit Theory ECE 285, 286
- Digital Electronics ECE 331, 332
- Linear Electronics ECE 333, 334
- Signals and Systems ECE 360
- Matrix Algebra MATH 303
- Differential Equations MATH 304
- Probability MATH 351 or STAT 344
- Pascal and Data Structures CS 211

In addition to the above core areas, students must display some competence in two or more of the following areas: communications, controls, computers, and semiconductors, before being granted the master's degree. The following undergraduate courses correspond to these areas:

- Control Theory ECE 421
- Device Theory ECE 430
- Computer Architecture ECE 445
- Communications ECE 460

Transfer of Credit

Up to 12 hours, the maximum permitted by the Graduate School, may be transferred from the University of Virginia or Virginia Polytechnic Institute and State University as part of the Northern Virginia Cooperative Graduate Engineering Program.

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 (703) 323-2892. Each student is expected to select a major area of concentration from the department's four specialty areas: communications and signal processing, computer engineering, control and robotics, or electronics. The student then is assigned an academic adviser from that area. Before the end of the first semester, each student must submit a plan of study (approved by his or her academic adviser) to the graduate coordinator's office.

Degree Requirements

Course Work

Each student must complete a minimum of 30 semester hours of graduate-level courses beyond the bachelor's degree. A minimum grade-point average of 3.0 is required. Additional constraints include the following:

1. A minimum of two core courses (with B or better in each) from the following list:
   - ECE 521 Modern Systems Theory
   - ECE 528 Random Processes in ECE
   - ECE 546 Parallel Computer Architectures
   - ECE 571 Network Analysis
2. A minimum of two courses at the 600 or 700 level.
3. A minimum of three courses outside the student's major area.
4. A maximum of two non-ECE courses, subject to prior departmental approval. This constraint does not apply to INFT courses taught by ECE faculty.
5. A maximum of two courses with a C grade may be applied toward the degree. However, all graduate courses are counted in the computation of the student's grade-point average.

Seminar requirement

All degree candidates must attend a minimum of 10 department seminars.

Thesis requirement

Students may select one of the following options:

- Thesis option. Thesis students register for ECE 799 Master's Thesis (6 hours). This option involves a significant research effort, which is conducted under the guidance of a faculty adviser. 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 three full-time faculty members, including two from the student's major area and one from outside the area. A fourth member, possibly

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from outside the department or university, may be optionally added. Thesis students may not register for ECE 798 Research Project.

* Nonthesis option. Students who select this option must pass a written comprehensive examination in their major area. Each examination consists of six sections, corresponding to the following courses:

- Communications: ECE 528, 535, 542, 630, 631, 642
- Computers: ECE 445, 511, 516, 542, 546, 641
- Control and Robotics: ECE 512, 521, 528, 620, 624, 650
- Electronics: ECE 565, 571, 584, 586, 587, 689

The student may select any four sections from the examination in his or her major area. Registration for the comprehensive must be approved by the student’s academic advisor, and submitted to the graduate coordinator by the end of the fourth week of the semester during which the student plans to take the examination. Students who fail the comprehensive may repeat the entire examination once.

Nonthesis students may register for 3 hours of ECE 798 Research Project.

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**Electrical and Computer Engineering Courses (ECE)**

**500 Signals and Systems: Theory and Applications**

Prerequisite: MATH 213, MATH 303, MATH 351 — not open to Electrical and Computer Engineering students. Fundamental and advanced techniques for system analysis; review of Fourier series and integral; 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; analysis and design of digital filters.

**511 Microprocessors**

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, interface. Microcomputer development systems. Applications examples. Introduction to 16-bit microprocessors. The course includes a project involving hands-on experience with microcomputer systems.

**512 Real-Time Microprocessor Systems**

Prerequisite: ECE 421 and 511 or equivalent. A course on real-time microprocessor systems with emphasis on control, interfacing techniques, real-time operating systems, and related applications. Topics include basic input-output, interfacing the peripheral analog circuitry, operating systems, programming techniques, process control with microcomputers, and microcomputers for communications. The course includes a simulation and design project.

**513 Applied Electromagnetic Theory**

Prerequisite: ECE 305 and 360, or equivalent. Maxwell’s equations, electromagnetic wave propagation, wave guides, transmission lines, radiation and antennas.

**516 Advanced Microprocessors**

Prerequisite: ECE 511 or equivalent. 16-bit and 32-bit microprocessors. Detailed study of the Intel 8086 and Motorola 68000 families (up to 80386 and MC68020). Auxiliary chips of the above families, microcomputers and applications. Brief coverage of NS32000, Z8000, Z80000, AT&T WES32100, NEC V70, V71, DEC MicroVAX 78032. The course includes a laboratory project and demonstration involving the Intel 8086 and MC68000 systems.

**520 Electronic Systems Analysis**

Prerequisite: ECE 333. A study of electronic circuits from a systems viewpoint. Topics consist of the analog building block circuits used in system design including operational amplifiers, 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**


**528 Random Processes in Electrical and Computer Engineering**

Prerequisite: ECE 360, MATH 351, or equivalent. Topics include random signals and noise in communications, stationary and ergodic random processes, spectral analysis, Gaussian processes, Brownian motion, 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**

Prerequisite: ECE 360, 528, or permission of instructor. Representation, analysis, and design of digital signals and systems. Sampling and quantization. Z-transform and Discrete Fourier Transform. Digital filter realizations. Design techniques for recursive (IIR) and nonrecursive (FIR) filters. The Fast Fourier Transform algorithms. Spectrum analysis. Additional topics may include adaptive filtering, homomorphic digital signal processing, digital inter-polation and decimation, VLSI signal processors.

**542 Computer Network Architectures and Protocols**

Prerequisite: STAT 344 or MATH 351 or equivalent, and graduate standing in SITE. 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, various examples of computer networks.

**546 (formerly 446) Parallel Computer Architectures**

Prerequisite: ECE 445. Study of computer schemata, Petri nets, parallel floating, point operations, instruction handling techniques, pipeline systems, functional parallelism, memory organization, arbitration and
621 Estimation, Identification, and Adaptive Control (3:3:0). Prerequisite: ECE 521 or ECE 528 or permission of instructor. A detailed treatment of stochastic control theory and its applications. Topics include state space models with random inputs, optimum state estimation, Kalman filtering, Linear Quadratic Gaussian problem, computational issues, stochastic dynamic programming, applications in process control and in decision making under uncertainty.

622 High-Frequency Electromagnetics (3:3:0). Prerequisite: ECE 305, 433, 520, MATH 313, 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; the design of linear and power amplifiers using S-parameter techniques and computer simulation.

624 (522) Computer Control Systems (3:3:0). Prerequisite: 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. The 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.


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. Measure of information, efficient representation of message sources, communication channels and their capacity. 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. Linear block codes: generator and parity check matrices; error syndromes. Binary cyclic codes. Convolutional codes; implementation of encoders and decoders.

634 Detection and Estimation Theory (3:3:0). Prerequisite: ECE 630. 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 estimations, ML estimations of signal parameters in AWGN and ACGN, estimations of Gaussian waveforms in Gaussian noise, linear MSE estimations, Kalman and Wiener filters.

636 Secure Telecommunication Systems (3:3:0). Prerequisite: ECE 632 and ECE 633. Introduction to secure data and voice communications. Topics include theoretical basis of cryptography, random cipher systems, practical security schemes, linear and nonlinear shift registers and encryption algorithms, block encipher and NBS data encryption standard (DES), public key cryptography, RSA, knapsack algorithms, digital signatures and authentication, security of computer networks, cryptographic protocols, key management, speech security, voice scrambling.

637 Spread Spectrum Communications (3:3:0). Prerequisite: ECE 631. Introduction to spread spectrum communications. Topics include pseudonoise 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.

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, 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 schemata, types of intercommunication networks between processing elements, single instruction stream-multiple data stream computers, computers with “massive parallelism,” pyramid computing structures, multiple instruction stream-multiple data stream computers, and parallel processing of images.

641 Computer System Architecture (3:3:0). Prerequisite: ECE 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, current trends in computer architecture.

642 Design and Analysis of Computer Communication Networks (3:3:0). Prerequisite: ECE 542 and ECE 528 or equivalent. Introduction to queuing theory. Other topics include concentrator design, multiplexing, capacity assignments, random access schemes, polling and probing techniques, topology design, flow control and routing, packet radio, protocol specification, and validation.

644 Architectures and Algorithms for Image Processing (3:3:0). Prerequisite: ECE 511 or equivalent. Architectures and algorithms for the analysis and processing of pictorial information. Topics include systems and techniques for the digital representation of images; image scanning methods and their applications; picture processing languages; image data structures; feature detection, extraction, and reconstruction; detection of symmetries; systems and methods for regular decompositions, image desegmentation, object thinning, real-time orthogonal transformations, and applications. The 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 Robotics II (3:3:0). Prerequisite: ECE 650 or permission of instructor. In-depth study of the theoretical aspects of robotics. Emphasis on the integration of topics from control theory and machine intelligence. Topics include manipulator dynamics; optimal, self-organizing, and distributed control of manipulators; stability of legged locomotion; mathematical modeling of uncertain knowledge; knowledge-based control of robot systems.

662 (563) Microwave Engineering (3:3:0). Prerequisite: ECE 513 or permission of instructor. Study of the generation, control, and propagation of microwave signals. Topics include transmission lines, waveguides, resonators, scattering parameters, Smith charts, measurement techniques, instrumentation, and microwave devices.

663 Antennas and Propagation (3:3:0). Prerequisite: ECE 513 or permission of instructor. Study of the electromagnetic antennas and the waves which radiate from them. Topics include types of antennas and their characterization, radiative E-M fields, transmission loss, propagation near and around obstacles, and phased arrays.

685 Optical Signal Processing (3:3:0). Prerequisite: ECE 565. Study of optical systems for processing temporal signals as well as images. Topics include use of coherent optical systems for image processing and pattern recognition, principles of holography, acousto-optic systems for radar-signal-processing optical computers.

680 VLSI Circuit Analysis and Design (3:3:0). Prerequisite: ECE 584 and 586 or permission of instructor. Physics and modeling of various semiconductor devices and fundamental building block circuits that are extensively used in VLSI design. Topics include review of MOSFETs and BJTs, SPICE device modeling, inverter and logic circuits, logic minimization, PLA implementation, static and dynamic RAM and problems in VLSI.

684 Advanced Solid-State Device Theory (3:3:0). Prerequisite: ECE 584 or permission of instructor. Study of the theory of special microwave and optoelectronic semiconductor devices based on solid-state physics. Topics include tunnel devices, IMPATT diodes, transferred-electron devices, LED and semiconductor lasers, photodetectors, and solar cells.

689 Semiconducting Materials (3:3:0). Prerequisite: ECE 584 or permission of instructor. Course on semiconducting materials that are of interest for present and future applications. Topics include crystal and electronic structure, elemental semiconductors, group III-V and group II-VI compound semiconductors, various material growth techniques, ion implantation, mate-
rial characterization techniques, and novel device structures.

744 Computer Vision and Expert Systems (3:3:0). Prerequisite: 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; applications to text processing/analysis (as expert systems). Design project will be conceived, simulated, and tested by the students.

798 Research Project (3:0:0). Prerequisite: 9 hours of graduate-level course work. Research project to be chosen and completed under the guidance of a graduate faculty member, and which results in an acceptable technical report.

799 Master’s Thesis (3-6:0:0). Prerequisite: 9 hours of graduate-level course work and permission of instructor. Research project chosen and completed under the guidance of a graduate faculty member, and which results in a technical report acceptable to a three-faculty-member committee and an oral defense.

For more advanced doctoral-level courses in electrical and computer engineering, see course descriptions under Information Technology.

English

Faculty
Albanese, Denise, Ph.D., Stanford University, 1986; Assistant Professor
Bausch, Richard C., M.F.A., University of Iowa, 1975; Professor
Baxter, Ralph, Ph.D., Wayne State University, 1964; Professor
Bergmann, Johannes D., Ph.D., University of Connecticut, 1969; Associate Professor
Brady, Laura A., Ph.D., University of Minnesota, 1988; Assistant Professor
Brogan, Kathleen, Ph.D., Yale University, 1989; Assistant Professor
Brown, Lorraine A., Ph.D., University of Maryland, 1968; Professor
Brown, Stephen J., Ph.D., Yale University, 1959; Professor
Brunelle, Peter C., Ph.D., University of Wisconsin, 1975; Professor
Cheuse, Alan, Ph.D., Rutgers University, 1974; Associate Professor
Comito, Terry A., Ph.D., Harvard University, 1968; Professor

D’Andrea, Paul, Ph.D., Harvard University, 1966; Robinson Professor
Derrick, Scott, Ph.D., University of Pennsylvania, 1987; Assistant Professor
Forche, Carolyn, M.F.A., Bowling Green State University, 1975; Associate Professor
Foreman, Joel E., Ph.D., The George Washington University, 1975; Associate Professor
Foster, John B., Ph.D., Yale University, 1974; Associate Professor
Fuchs, Cynthia, Ph.D., University of Pennsylvania, 1989; Assistant Professor
Gallehr, Donald R., Ph.D., The Catholic University of America, 1974; Associate Professor
Garson, Helen S., Ph.D., University of Maryland, 1967; Professor
Goodwin, Stephen H., M.A., University of Virginia, 1969; Associate Professor
Gras, Vernon W., Ph.D., University of Chicago, 1967; Professor
Grewal, Inderpal, Ph.D., University of California, Berkeley, 1987; Assistant Professor
Hammond, Jeffrey A., Ph.D., Kent State University, 1979; Associate Professor
Holisky, Dee A., Ph.D., University of New York, Buffalo, 1979; Associate Professor
Irvine, Lorna M., Ph.D., The American University, 1977; Associate Professor
Jann, Rosemary, Ph.D., Northwestern University, 1975; Associate Professor
Jones, Charles, Ph.D., University of Massachusetts, 1985; Assistant Professor
Kaplan, Deborah, Ph.D., Brandeis University, 1979; Associate Professor
Karlon, Robert Emil, Ph.D., The George Washington University, 1970; Associate Professor
Kaufmann, David, Ph.D., Yale University, 1989; Assistant Professor
Keaney, Winifred G., Ph.D., University of Maryland, 1975; Associate Professor
Kelley, Michael R., Ph.D., The Catholic University of America, 1970; Professor
Klappert, Peter, M.F.A., University of Iowa, 1968; Associate Professor
Kuebrich, David L., Ph.D., University of Chicago, 1973; Associate Professor

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Areas of Study

Lathbury, Roger D., A.M., Indiana University, 1968; Associate Professor
Leith, Wilkie, M.A., George Mason University, 1983; Director, The Writing Center
Melosh, Barbara, Ph.D., Brown University, 1979; Associate Professor
Mobley, Marilyn B., Ph.D., Case Western Reserve University, 1987; Assistant Professor
Nadeau, Robert L., Ph.D., University of Florida, 1970; Associate Professor
O’Connor, John S., Ph.D., University of Virginia, 1974; Associate Professor
Owens, Collin D., Ph.D., Kent State University, 1975; Associate Professor
Palmieri, Anthony F., Ph.D., University of Maryland, 1974; Associate Professor
Radn er, John B., Ph.D., Harvard University, 1966; Associate Professor
Rutledge, Amelia A., Ph.D., Yale University, 1974; Associate Professor
Shreve, Susan R., M.A. University of Virginia, 1969; Professor
Story, Patrick L., Ph.D., Northwestern University, 1968; Associate Professor
Sypher, Eileen B., Ph.D., University of Connecticut, 1976; Associate Professor
Thaiss, Christopher J., Ph.D., Northwestern University, 1975; Associate Professor
Tichy, Susan, M.A., University of Colorado, 1979; Assistant Professor
Tsukui, Nobuko, Ph.D., University of Nebraska, 1967; Associate Professor
Weinberger, Steven H., Ph.D., University of Washington, 1988; Assistant Professor
Williams, C. K., B.A., University of Pennsylvania, 1959; Professor
Yocom, Margaret, Ph.D., University of Massachusetts, 1980; Associate Professor

M.A. with a concentration in linguistics, a certificate in the teaching of English as a second language (TESL, 15 semester hours), and courses as part of the Doctor of Arts in Education degree.

English, M.A.

Admission Requirements

In addition to fulfilling Graduate School admission requirements, applicants must submit one copy of a 1,000-word writing sample and two letters of recommendation. The writing sample may be a paper written for an undergraduate class or any other material that gives evidence of writing skills. In addition to the writing sample requirement, applicants for the concentration in professional writing and editing must submit a statement of purpose (no more than 750 words) and 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 for the concentration in the writing of fiction or poetry must submit, in addition to the 1,000-word writing sample, two copies of a portfolio consisting of up to 10 pages of poetry or 20 pages of fiction. 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 semester hours of credit in graduate English courses. With the approval of the department, up to 6 hours of graduate credit in courses in related disciplines may be substituted for 6 hours in English.

General Requirements for All Concentrations

1. ENGL 701 (normally in the first semester of study).
2. Nine hours in literature courses, including at least 3 hours of Master’s Seminar (either ENGL 790 Topics in Literary History or ENGL 791 Themes, Modes and Genres). For the concentration in the teaching of writing and literature only, ENGL 610 may be used to fulfill 3 hours of the literature requirement.
3. Students who have not completed 12 hours of undergraduate credit or its equivalent in a foreign language must either do so or demonstrate...
equivalent proficiency by passing a translation test administered by the English Department.

**Concentration Requirements**

(one concentration must be completed)

1. **Concentration in Literature**
   a. General requirements (above).
   b. Three hours in critical theory at the 600-700 level.
   c. Three hours of Master's Seminar in addition to those used to satisfy the general requirements. Students in this concentration should complete both ENGL 790 (Topics in Literary History) and ENGL 791 (Themes, Modes, and Genres).
   d. Nine hours in a core program organized by period, genre, theme, or some other principle approved by the student's adviser and the director of graduate studies in English. These hours will customarily 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 Department of English.
   e. Three hours of electives.
   f. Optional: 6 hours of thesis may be substituted for the core program.

2. **Concentration in Professional Writing and Editing**
   a. General requirements (above).
   b. Three hours in nonfiction writing.
   c. Nine hours in professional courses: e.g., editing, technical writing, scientific writing, internship in writing or editing, or Northern Virginia Writing Project.
   d. Three hours of electives in writing or literature.
   e. Three hours of thesis.

3. **Concentration in the Writing of Fiction or Poetry**
   a. General requirements (above).
   b. Three hours in Form of Fiction or Form of Poetry.
   c. Six hours of workshop in this genre.
   d. Three hours of thesis in this genre.
   e. Six hours of electives in writing or literature.

4. **Concentration in the Teaching of Writing and Literature**
   a. General requirements
   b. Six hours in writing courses.
   c. Three hours in linguistics.
   d. Three hours in the teaching of writing and three hours in the teaching of literature.
   e. Three to six hours of electives from literature or writing; alternatively, a thesis may be arranged through the student's adviser and the Director of Graduate Studies in English.

**English: Linguistics, M.A.**

The M.A. degree in English: Linguistics is an interdisciplinary program that 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.

**Admission Requirements**

The admission requirements are the same as those for the other concentrations in the Master of Arts in English. Students with undergraduate majors in any field are encouraged to apply. There are no specific prerequisites.

**Degree Requirements**

Students must successfully complete 30 semester hours of graduate credit distributed as follows:

1. Fifteen hours in the following core courses: ENGL 520, 690, 691, 785, 786. Candidates in the TESL program may substitute ENGL 522 for ENGL 786.

2. Fifteen hours of graduate electives, chosen in consultation with an adviser, which reflect one or more areas of language study. The electives can be in such areas as linguistics, the teaching of reading or writing, literary criticism, bilingual education, or a foreign language, and may include six hours of thesis.

Students who have not already completed 12 hours of undergraduate credit (or its equivalent) in a foreign language must either do so or demonstrate equivalent proficiency by passing a translation test administered by the English Department. See the section on Certificates, Programs, and Additional Graduate Courses for additional information on the TESL program.

**Creative Writing, M.F.A.**

**Admission Requirements**

In addition to fulfilling Graduate School admission requirements, applicants must submit two letters of recommendation, one copy of a 1,000-word nonfiction writing sample, and two copies of a portfolio of fiction and/or poetry. The nonfiction writing sample may be a paper written for an undergraduate class or any other work that gives evidence of basic writing skills. The additional
portfolio should contain up to 20 pages of poetry or 50 pages of fiction.

**Degree Requirements**

Students must successfully complete 48 semester hours of graduate credit, including:

1. Three hours in ENGL 701;  
2. Twelve hours in literature, including at least 3 hours of Master's Seminar (ENGL 790, Topics in Literary History, or ENGL 791, Themes, Modes, and Genres);  
3. Twelve to 18 hours of writing seminars in one genre, including either Form of Poetry or Form of Fiction and at least 3 hours of Advanced Workshop (ENGL 750 or 751);  
4. Three to 9 hours in other genres;  
5. Three to 6 hours in nonliterary art;  
6. One to 3 hours in internship (optional);  
7. Six hours in thesis. Students must give a public reading of their work at the end of the semester in which their thesis is approved.

Up to 9 hours of electives may be chosen in consultation with the writing program staff.

Students must pass an 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 hours of course work and before the completion of 32 hours. The exam must be completed at least one semester before the thesis is submitted.

Students who have not completed 12 hours of undergraduate credit (or its equivalent) in a foreign language must either do so or demonstrate equivalent proficiency by passing a translation test administered by the English Department.

**Basic Discipline in English as Part of Doctor of Arts in Education**

**Admission Requirements**

In addition to material requested by the Graduate School and the College of Education and Human Services, applicants planning a basic discipline in English must present:

1. Scores from the aptitude section of the GRE;  
2. A writing sample of approximately 1,000 words;  
3. A letter of recommendation from a person with specific knowledge of the applicant's work in English.

While a B.A. or an M.A. in English is desirable, an applicant must have earned the following minimum requirements:

1. Fifteen hours of graduate or upper-division undergraduate work in English or American literature;  
2. Three hours in graduate or upper-division undergraduate work in Linguistics or History of the Language;  
3. Three hours of graduate work in Bibliography and Research and 3 hours of graduate work in Critical Theory.

Applicants with a particular interest in a concentration in writing are also required to present evidence of advanced work in the field. Especially qualified students who lack certain requirements listed above may be admitted and allowed to enroll in the appropriate English courses on the graduate level. These courses will not be counted toward the D.A.Ed.

**Degree Requirements**

1. A minimum of 6 hours of ENGL 800, studying material relevant to the student's individual goals;  
2. Three hours of independent research, directed by the student's D.A.Ed. adviser;  
3. A substantial research paper (3 hours), written under the direction of the D.A.Ed. adviser and shared and discussed with other students in the D.A.Ed. program.

**Nondegree Status**

Persons who are not yet certain about their plans for graduate study may apply for nondegree status. Only an undergraduate transcript is required for this application.

**English Courses (ENGL)**

**503 Theory and Practice of Editing (3:3:0).** Prerequisite: 6 hours of English courses numbered above 300, including one advanced writing course—309, 310, 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.

**507 (EDCI 507) Internship in Applied Linguistics (3:0:0).** Prerequisite: ENGL 521 or EDCI 519 and ENGL 582. Contact the English Department one semester prior to enrollment. Internships provide experience working in.
a language-teaching program or an educational research organization.

511 Styles and Modes in Literary History (3:3:0). A historical consideration (not a survey) of some of the principal styles, in prose and poetry, of English and American Literature.

512 (PHIL 530) Issues in Literature and Philosophy (4:3:1). Prerequisite: Graduate or senior standing. 6 hours of upper-level English, 6 hours of philosophy, and permission of instructor. An interdisciplinary seminar that offers students an opportunity to arrive at a personal synthesis of work previously done in philosophy and literature. The topic will change yearly but will focus on themes or methodologies common to both disciplines.

513 Advanced Special Topics in English (3:3:0). Prerequisite: 15 hours of advanced undergraduate English courses and permission of department, or a baccalaureate degree. An intensive study of selected topics in English and American literature. May be repeated for credit with permission of department.

514 (CL 514) Theories of Comparative Literature (3:3:0). Prerequisite: ENGL 300 and senior standing, or permission of instructor. An 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 competence; other texts are studied in translation.

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: ENGL 481 or 520. Theories and basic principles of the acquisition 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: ENGL 481 or 520. 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.

551 Literary Criticism (3:3:0). Studies of major critical theories and techniques with emphasis on the twentieth century.

556 Literary Style (3:3:0). Theory and practical analysis of English literary style. Several methodologies, including impressionistic, rhetorical, and linguistic, are examined and applied to the language of various literary texts, including essays, poems, and novels.

557 Old English (3:3:0). Study of Old English language, including its phonology, morphology, syntax and lexis, aimed at preparing students to read Anglo-Saxon literature in its original form. Accompanied by reading from Anglo-Saxon prose and poetry of the seventh through the eleventh centuries. Selections from The Anglo-Saxon Chronicle, Aelfric’s Homilies, The Legend of St. Andrew, and other prose works, as well as such verse as The Dream of the Road, The Seafarer, and Judith, are read and translated.

564 Form of Poetry (3:3:0). Prerequisite: ENGL 464 or equivalent and permission of instructor. Students must submit a typed manuscript of original poetry at least one week before they intend to register. For specific guidelines, consult the department’s course description booklets, the instructor, or the department secretaries. 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.

566 Form of Fiction (3:3:0). Prerequisite: ENGL 465 or equivalent and permission of instructor. Students must submit a typed manuscript of original fiction at least one week before they intend to register. For specific guidelines, consult the department’s course description booklet, the instructor, or the department secretaries. 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/PSYC 581 Psycholinguistics (3:3:0). Prerequisite: ENGL 481, 520, 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 Applied Linguistics (3:3:0). Prerequisite: ENGL 481, 520, or permission of instructor. Study of applications of linguistic science to the teaching of the English language. Attention is given to linguistic foundations of teaching English as a second language, findings of linguistics with regard to composition instruction, and ways in which linguistics can support the teaching of literature in and literary style.

592 History of the English Language (3:3:0). Introduction to the history and development of the English Language, including study of Indo-European language family and various stages of the English language from Old and Middle English to Early and Recent Modern English and American English; emphasis on historical principles and theory of language change as it affects phonology, morphology, syntax, and semantics.

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.)

613 Technical and Scientific Writing (3:3:0). Prerequisite: ENGL 616 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 (1:0:0). Prerequisite: Open to graduate students currently enrolled in ENGL 615-A. Subject to approval of the CTC director or the Writing Place director. Qualified students serve as
tutors for three hours a week in the university's Composition Tutorial Center under the guidance of the CTC director or in the English Department Writing Place under the guidance of the Writing Place director. A journal on the experience is kept and a paper submitted at the end of the semester synthesizing what students have learned and describing their progress as teachers. 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 lab method of instruction.

616 The Writing of Nonfiction (3:3:0). Prerequisite: Permission of instructor. Students must submit a typed manuscript at least one week before they intend to register. For specific guidelines, consult the department's course description booklet, the instructor, or the department secretaries. Writing of original essays, biographies, documentaries, reports, and other forms of nonfiction.

617 Poetry Writing Workshop (3:3:0). Prerequisite: ENGL 564 or equivalent and permission of instructor. Students must submit a typed manuscript at least one week prior to registration. For specific guidelines, consult the department's course description booklet, the instructor, or the department secretaries. 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 (3:3:0). Prerequisite: ENGL 566 (565) or equivalent and permission of instructor. Students must submit a typed manuscript at least one week prior to registration. For specific guidelines, consult the department's course description booklet, the instructor, or the department secretaries. 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. Students must submit a typed manuscript at least one week prior to registration. For specific guidelines, consult the department's course description booklet, the instructor, or the department secretaries. A 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 (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 for credit with permission of department.

622 The Structure of Contemporary American English (3:3:0). Introductory survey of the phonology, morphology, and syntax of contemporary American English, with discussion of language attitudes and dialect variation due to region, social class and sex. This course is intended primarily for nonlinguistics majors; it cannot be taken for credit by students who have taken both ENGL 520 (620) and ENGL 522.

625 Studies in English Medieval Literature (3:3:0). Selected literary authors, works or movements, generally excluding Chaucer, from between 1300 and 1500, studied in Middle English. Content varies. May be repeated for credit with permission of department.

630 Studies in English Renaissance Literature (3:3:0). Selected literary authors, works, or movements, generally excluding Shakespeare and Milton, of the English Renaissance. Content varies. Recent offerings include Women in Shakespeare; The Golden Age and Earthly Paradise; and The Pastoral Tradition. May be repeated for credit with permission of the department.

631 Seminar in Shakespeare (3:3:0). Intensive study of the achievement of Shakespeare and major critical approaches to his work. Usually comedies and histories are taught one year, and tragedies and romances the next. May be repeated for credit with permission of the department.

635 Studies in Eighteenth-Century English Literature (3:3:0). Selected English literary authors, works or movements of the eighteenth century. Content varies. Recent offerings include Johnson and his Circle; Sympathy, Selfishness, and Self-Realization; and Sexual Motifs in Eighteenth-Century Poetry, Prose, and Drama. May be repeated for credit with permission of department.

640 Studies in Nineteenth-Century English Literature (3:3:0). Selected English literary authors, works or movements of the nineteenth century. Content varies. Recent offerings include Romantic Visionary Poets; Youth and identity; and Jane Austen, Charlotte Bronte, George Eliot. May be repeated for credit with permission of department.

645 Studies in Twentieth-Century English Literature (3:3:0). Selected English literary authors, works or movements of the twentieth century. Content varies. Recent offerings include developments since WW II; Contemporary British Drama; British Novel to WW II. May be repeated for credit with permission of department.

650 Studies in Seventeenth- and Eighteenth-Century American Literature (3:3:0). Selected literary authors, works, or movements of colonial and early federalist America. Content varies. May be repeated for credit with permission of department.

655 Studies in Nineteenth-Century American Literature (3:3:0). Selected American literary authors, works or movements of the nineteenth century. Content varies. Recent offerings include The American Renaissance and The Novel and American Society. May be repeated for credit with permission of department.

660 Studies in Twentieth-Century American Literature (3:3:0). Selected American literary authors, works, or movements of the twentieth century. Content varies. Recent offerings include The Federal Theatre Project; Gothicism in Southern Literature; Physics and Metaphysics in the Modern Novel; and The Wasteland Theme. May be repeated for credit with permission of department.

666 Seminar in Major Figures of English Literature before 1800 (3:3:0). Intensive study of the work of one or two major figures of English literature before 1800.
Content varies. Recent offerings include Chaucer; Milton; Blake; Fielding and Sterne. May be repeated for credit with permission of department.

667 Seminar in Major Figures of English Literature after 1800 (3:3:0). Intensive study of the work of one or two major figures of English literature after 1800. Content varies. Recent offerings include Yeats; V. Woolf; Dickens and Gissing; Joyce; Elizabeth Gaskell and C. Bronte. May be repeated for credit with permission of department.

668 Seminar in Major Figures of American Literature (3:3:0). Intensive study of the work of one or two major figures of American literature. Content varies. Recent offerings include Stevens; Hemingway; Eliot and Pound; Melville; Whitman; Bellow and Singer. May be repeated for credit with permission of department.

670 Film History and Theory (3:3:0). Prerequisite: Introductory film course or permission of instructor. Advanced study of the history of film art and major theories concerning the nature of film. Specific topic varies. May be repeated for credit with permission of department.

675 Feminist Criticism and Theory (3:3:0). Seminar designed for students who desire an introduction to criticism and theory which studies the role of gender in literature and in the practice of interpretation.

685 Selected Topics, Movements or Genres of Literature in English (3:3:0). Content varies. May be repeated for credit with permission of department.

690 Generative Phonology (3:3:0). Prerequisite: ENGL 520 or permission of instructor. 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: ENGL 520 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.

695/EDUC 695 Northern Virginia Writing Project In-service 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. Content varies. May be repeated for credit with permission of department, but no more than six semester hours of credit 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 theory relating to writing and the teaching of composition. Focus is on making explicit the theories of the participants, on analyzing 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 (1-3:3:0). Prerequisite: Admission to the graduate program or permission of department. Concentrated workshops, educational tours, 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 semester hours of credit in ENGL 699 may be applied toward a master's degree in English.

701 Literary Scholarship (3:3:0). Methods and purposes of literary research, including study of library methodology, use of critical bibliographies, techniques of textual criticism, and evaluation of various approaches to literary history.

705 Literary Theory and Criticism (3:3:0). Major theories of literature and methods of analyzing and evaluating literary works. Content varies. Recent offerings include Recent Trends in Critical Theory. May be repeated for credit with permission of the department.

750 Advanced Workshop in Poetry Writing (3:3:0). Prerequisite: ENGL 564 and ENGL 617 and permission of instructor. Students must submit a typed manuscript at least one week prior to registration. For specific guidelines, consult the department's course description booklet, the instructor, or the department secretaries. 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 (3:3:0). Prerequisite: ENGL 566 and ENGL 618 and permission of instructor. Students must submit a typed manuscript at least one week prior to registration. For specific guidelines, consult the department's course description booklet, the instructor, or the department secretaries. Intensive practice in the craft of fiction for experienced writers. May be repeated for credit with permission.

785 Semantics and Pragmatics (3:3:0). Prerequisite: ENGL 520 or permission of instructor. Developments in theoretical linguistics which 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 (3:3:0). Prerequisite: ENGL 520 or permission of instructor. The nature and form of a syntactic theory, and an examination and analysis of the properties of several major natural language syntactic structures within a contemporary theoretical framework.

790 Master's Seminar: Topics in Literary History (3:3:0). Prerequisite: 9 hours of graduate English courses including 701 or permission of department. Historical approaches to an understanding of literature and its relation to other elements of culture. Specific topics vary from term to term. May be repeated for credit with permission of department.
Foreign Languages and Literatures

Faculty

Aguera, Victorio G., Ph.D., The Catholic University of America, 1971; Professor
Berroa, Rei, Ph.D., University of Pittsburgh, 1983; Assistant Professor
Buffill, Jose A., Ph.D., George Washington University, 1986; Assistant Professor
Chamberlain, Jeffrey T., Ph.D., University of Illinois, 1982; Assistant Professor
Cordero, Anne D., Ph.D., The George Washington University, 1968; Associate Professor
Elstun, Esther N., Ph.D., Rice University, 1969; Professor
Francescato, Martha P., Ph.D., University of Illinois, 1970; Professor
Goldin, Mark G., Ph.D., Georgetown University, 1968; Associate Professor
Hazera, Lydia D., Ph.D., The George Washington University, 1971; Associate Professor
LePage, Raymond G., Ph.D., The George Washington University, 1972; Associate Professor
Lewis, Paula G., Ph.D., Columbia University, 1973; Professor
Meyer, Henry P., Ph.D., University of Maryland, 1970; Associate Professor
Ricouart, Janine, Ph.D., University of California at Davis, 1986; Assistant Professor
Wagner, Irmgard, Ph.D., Harvard University, 1970; Associate Professor
Warner, Keith Q., Doctorat de l'Universite (Caen), 1969; Professor of French; Department Chair
Wekerle, Inge B., Ph.D., The George Washington University, 1975; Assistant Professor

Foreign Languages and Literatures, 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 foreign languages at other institutions. The program offers three concentrations: (1) concentration in one language — French, German, or Spanish; (2) concentration in two of those languages; and (3) concentration in Spanish/Bilingual-Multicultural Education.

Admission Requirements

In addition to satisfying the general admission requirements of the Graduate School, applicants seeking degree status must hold a baccalaureate degree with a major in French, German, or Spanish; have at least a 3.0 grade point average (on a 4.0 scale) in the major; 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 semester hours of study. Those who concentrate in two languages must complete a program of 42 semester hours. The concentration in Spanish/Bilingual-Multicultural Education requires 36 semester hours. In all three concentrations, 6 of the total hours 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 a written comprehensive examination.

Concentration in One Language

Thirty-six semester hours, of which at least 18 must be earned in courses listed under a single rubric (FREN, GERM, or SPAN), to include the following distribution: at least 6 hours in literature courses covering two different periods and at least 6 hours in language/linguistics courses. The remaining 12 hours are electives, of which up to 6 may be used for directed reading (798) and thesis (799).

Concentration in Two Languages

Forty-two semester hours, of which 18 must be earned in each of two languages, in courses listed under a single rubric (FREN, GERM, or SPAN), to include the following distribution: at least 6 hours in literature courses covering two different periods; and at least 6 hours in language/linguistics courses. The remaining 6 hours are electives, which may be used for directed reading (798) and thesis (799).

Concentration in Spanish/Bilingual-Multicultural Education

Thirty-six semester hours, of which 18 must be earned in courses listed under the SPAN rubric, to include the following distribution: at least 6 hours in literature courses covering two different periods and at least 6 hours in language/linguistics courses; 6 hours of bilingual education seminars, selected from among EDUC 517, 518, 519. The remaining 12 hours are electives, of which up to 6 may be used for directed reading (SPAN 798) and thesis (SPAN 799).

Foreign Languages and Literatures Courses (FRLN)

510 Bibliography and Research Problems in Foreign Languages and Literatures (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.

565 Theory of Translation (3:3:0). Lectures on the nature and function of the translating process. Evaluation of theories of translation with respect to text-typology. Critiques of selected translations from the target languages to English and vice versa.

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 upon availability of positions.

600 Workshop in Foreign Languages (1-6:0:0). Prerequisite: Graduate standing or permission of instructor. 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 foreign languages.

620 Literary Theory and Criticism (3:3:0). Study of the nature of the literary work; 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 anyone who has previously taken and satisfactorily 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 anyone who has previously taken and satisfactorily completed FRLN 570.

French (FREN)

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 Eighteenth-Century Literature (3:3:0). Selected writers, works, themes, or trends of
French literature in the eighteenth century. Content varies. Course work in French. May be repeated for credit with permission of department.

519 Studies in Nineteenth-Century Literature (3:3:0). Selected works, themes, genres, and authors of nineteenth-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. A maximum of 6 hours of credit 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.


561 Old French (3:3:0). Study of Old French phonology, morphology, syntax, and lexicon, aimed at preparing students to read medieval French literature in original versions. Linguistic study complemented by reading of Old French verse and prose texts from the ninth through the thirteenth centuries.


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 humanities, the social and political sciences. Comparative terminology, sight translation, and precise writing. The importance, function, and techniques of documentation in translation. 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 credit hours. Reading and research on a specific project, under the direction of a department member. Oral or written report required.

799 Thesis (3-6:0:0). Students who take GERM 798 and then elect the thesis option receive 3 credits for GERM 799 upon completion of the thesis. Students who do not take GERM 798 receive 6 credits for GERM 799 upon completion of the thesis.

800 Studies for the Doctor of Arts in Education (varied credit). Prerequisite: D.A.Ed. admission to study in German. Program of studies designed by student's discipline director and approved by student's doctoral committee which prepares the student to do research and writing in the current area of interest of the discipline director. The student presents a research paper in a subsequent D.A.Ed. summer seminar. May be repeated. Also see FRLN course listings.

German (GERM)

518 Studies in Eighteenth- and Early Nineteenth-Century German Literature (3:3:0). Major authors, movements, and themes in eighteenth- and early nineteenth-century German literature. Literary theory and practice, historical background and critical reception. May be repeated for credit with department's permission.

525 Studies in Modern German Literature (3:3:0). Writers, themes, or genres of modern German literature. May be repeated for credit with department's permission.

550 Special Topics (3). Study of a special topic in 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.

798 Directed Reading and Research (3:0:0). Prerequisite: Open only to degree students who have completed at least 18 credit hours. Reading and research on a specific project, under the direction of a department member. Oral or written report required.

799 Thesis (3-6:0:0). Students who take GERM 798 and then elect the thesis option receive 3 credits for GERM 799 upon completion of the thesis. Students who do not take GERM 798 receive 6 credits for GERM 799 upon completion of the thesis.

800 Studies for the Doctor of Arts in Education (varied credit). Prerequisite: D.A.Ed. admission to study in German. Program of studies designed by student's discipline director and approved by student's doctoral committee which prepares the student to do research and writing in the current area of interest of the discipline director. The student presents a research paper in a subsequent D.A.Ed. summer seminar. May be repeated. Also see FRLN course listings.

Spanish (SPAN)

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.

505 Applied Spanish Stylistics (3:3:0). Creative writing, its form and expression, through text analysis from selected genres: novel, essay, drama, short story, and po-
etly. Practice in creative writing through exercises, composition, and workshops.

520 Studies in Medieval Spanish Literature (3:3:0). Intensive 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 Nineteenth-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). In-depth study of twentieth-century cultural, social, and political institutions in Spain and Spain America with emphasis on language and terminology used to describe their functions, regulations, and conditions.

635 Seminar in Don Quixote (3:3:0). Intensive study of Don Quixote and the major critical approaches to the work.

650 Seminar in Twentieth-Century Drama (3:3:0). Study of major dramatists in the Generation of 1898 and in the contemporary theater.

655 Seminar in Twentieth-Century Prose (3:3:0). Intensive 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). Intensive 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 (3:3:0). Prerequisite: Open only to degree students who have completed at least 18 credit hours. Reading and research on a specific project, under the direction of a department member. Oral or written report required.

799 Thesis (3:6:0:0), (3:0:0). Students who take SPAN 798 and then elect the thesis option receive 3 credits for SPAN 799 upon completion of the thesis. Students who do not take SPAN 798 receive 6 credits for SPAN 799 upon completion of the thesis.

800 Studies for the D.A.Ed. (variable credit). Prerequisite: D.A.Ed. admission to study in Spanish. Studies designed by student's discipline director and approved by student's doctoral committee which prepare the student to do research and writing in the current area of interest of the discipline director. The student presents a research paper in a subsequent D.A.Ed. summer seminar. Enrollments may be repeated.

Also see FRLN listing.

Geographic and Cartographic Sciences

Faculty

Andrews, Alice C., Ed.D., George Washington University, 1975; Associate Professor

Fonseca, James W., Ph.D., Clark University, 1974; Associate Professor

Haack, Barry N., Ph.D., University of Michigan, 1977; Associate Professor

Lindberg, Mark B., Ph.D., University of Kansas, 1987; Assistant Professor

Rundstrom, Robert A., Ph.D., University of Kansas, 1987; Assistant Professor

Wood, Joseph S., Ph.D., Pennsylvania State University, 1978; Associate Professor

Geographic and Cartographic Sciences, M.S.

The Master of Science in Geographic and Cartographic Sciences is offered by the Department of Public Affairs. The program provides training for students with different professional goals. 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 Graduate School requirements for admission, 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 and cartography.

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 adviser. The required core courses are:

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

In addition to these core courses, students select from a number of GECA electives to complete their programs. With departmental approval, up to 6 hours of course work from closely related disciplines may also be applied to the degree.

A thesis is optional and students may complete a 33-hour program that includes 6 hours of thesis, or they may complete a 36-hour program without a thesis. If the nonthesis option is selected, students are required to submit two papers as evidence of research proficiency at the graduate level. These papers are included in the student's permanent file.

Geographic and Cartographic Sciences Courses (GECA)

503 Problems in Environmental Management (3:3:0). Prerequisite: 6 hours of geography, including GEOG 102. Case studies of the impacts of human activities on atmospheric, hydrologic, geographic, and biotic processes.

505 Transportation Geography (3:3:0). Prerequisite: 6 hours 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 instructor. Emphasis on problems and techniques in teaching geography and current developments in research, methodology, and philosophy in the discipline.

540 Medical Geography (3:3:0). Prerequisite: Graduate standing or permission of department and a course in statistics. Spatial approaches to the study of health and disease. Topics covered include disease ecology, disease diffusion, and geographic perspectives on improved health care delivery.

551 Thematic Cartography (3:3:0). Prerequisite: Graduate standing or permission of instructor. Analysis of the conceptual and perceptual properties of thematic maps. Emphasis on discussion of these properties in relation to problems in data manipulation, design, and map comparisons.

553 Geographic Information Systems (3:3:0). Prerequisite: Course in computer science and graduate standing, 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 or permission of department. History of cartographic portrayal of the earth from ancient times through the nineteenth century, with emphasis on the interrelation of human culture, technological development, and geographical knowledge as reflected in maps.

562 Analytic Photogrammetry (3:3:0). Prerequisite: GEOG 414, a course in metric algebra and graduate standing, or permission of department. Analytic treatment of photogrammetric problems, including least squares adjustments, image coordination refinements, collinearity equation, resection, relative orientation, and analytic area-triangulation.

579 Remote Sensing (3:3:0). Prerequisite: Course in physical geography or geology and course in aerial photo interpretation, or permission of instructor. Analysis of the nature of electromagnetic radiation, principles and operations of sensors, techniques and systems of correction, enhancement, and production of imagery. Interpretation and applications in geomorphic, atmospheric, hydrologic, vegetation, land use and regional analysis.

580 Digital Remote Sensing (3:3:0). Prerequisite: GEOG 416 or GECA 579 or permission of instructor. Examination of the theory and techniques of using digital remotely sensed data for obtaining geographic information of the earth's surface. This includes 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 or permission of instructor. 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.

583 Spatial Dynamics of Political Systems (3:3:0). Prerequisite: Graduate standing or permission of instructor. Topics include territoriality, reapportionment, spatial allocation of public facilities, perception of boundaries. Emphasis on the spatial impact of political process upon land use.

585 Quantitative Methods (3:3:0). Prerequisite: Course in statistics or permission of department. Survey of quanti-
Graduate standing is prerequisite to all 600-level courses.

621 Human Ecology and the City (Same as SOCI 621) (3:3:0). Prerequisite: Graduate standing. 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.

650 Mapping Foundations (3:3:0). Prerequisite: GEOG 310 or equivalent or permission of instructor. Discussion of the philosophical, perceptual, and technical foundations of cartography.

652 Computer Applications (3:3:0). Prerequisite: GEOG 310 or equivalent and course in computer programming or permission of instructor. Examination of computer applications for display and analysis of geographical data.

655 Map Design (3:3:0). Prerequisite: GEOG 310 or equivalent or permission of instructor. Advanced examination of principles of map design, including discussions of map design research.

660 Geodetic Cartography (3:3:0). Prerequisite: GEOG 310 or 413 or equivalent and course in calculus, or permission of instructor. Introduction to science of earth measurement, methods of establishing geodetic control for mapping and geodetic basis of map projections and coordinate systems.

661 Map Projections and Coordinate Systems (3:3:0). Prerequisite: GEOG 310 or equivalent and course in calculus or permission of instructor. Development of various map projections and coordinate systems; analysis of their properties, distortions, and applications.

670 Applied Climatology (3:3:0). Prerequisite: Course in weather and climate or permission of instructor. Application of climatic concepts to natural and man-modified environments. Analysis of climatic change.

671 Applied Geomorphology (3:3:0). Prerequisite: Course in climatology, geomorphology, or structural geology. In-depth examination of interaction among land forming processes, settlement and land-use patterns. Emphasis on planning and problem solving.


698 Directed Readings and Research (1-3:0:0). Prerequisite: Permission of program director and instructor. 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.

785 Geographic Fieldwork (3:3:0). Prerequisite: Acceptance to degree status or permission of department. Introduction to the nature, scope, and objectives of geographic field methods and techniques, including the use of base maps, acquisition of data, and field research design. The course is taught, as much as possible, in field situations with the 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 (3-6:0:0). Prerequisite: Degree candidacy and departmental approval of thesis proposal.

Health Education

Faculty
Bever, David L., Ph.D., Purdue University, 1978; Associate Professor

Health Education, M.Ed.
The program leading to a Master of Education degree in Health Education is offered through the Department of Health, Sport, and Leisure Studies and serves teachers, community health agency personnel, and health promotion workers in business and industry.

Admission Requirements
In addition to fulfilling the Graduate School admission requirements, the applicant must hold a bachelor's degree in health education or a related field, must submit three letters of recommendation and transcripts of all college course work, and must have completed courses in biology, human anatomy, and physiology. Applicants who do not meet these requirements may be offered provisional or nondegree status in accordance with general regulations of the Graduate School.
Degree Requirements
In addition to fulfilling the Graduate School degree requirements, the candidate must complete the following program:

Core Courses:
- HEAL 500 Workshop Courses (3-6)
- HEAL 511 History and Philosophy of Health Education (3)
- HEAL 513 Current Issues in Health Education (3)
- HEAL 516 Program Development and Resources in Health Education (3)
- HEAL 517 Health Education Process: School and Community (3)
- HEAL 612 Scientific Foundations of Health and Fitness (3)
- PHED 630 Exercise, Health and Fitness Program Development (3)
- EDUC 590 Education Research (3) or EDUC 591 Education Research (3)
- HEAL 798 Special Project (3) or HEAL 799 Thesis (6)

Electives: 3

Successful completion of written comprehensive examination. Students must complete all course work, excluding the project or thesis, in the semester prior to taking the comprehensive examination.

Total: 30

Graduate Assistantships
Administrative, research, and teaching-related graduate assistantships are available in the Department of Health, Sport, and Leisure Studies. To be eligible for an assistantship, a student must be admitted to degree status and take a minimum of 6 semester hours of graduate credit each semester. Interested students should contact the Department of Health, Sport, and Leisure Studies for applications.

Health Education Courses (HEAL)
500 Workshop in Health Education (1,2,3:0:0). Analysis of selected health problems and issues involving readings, research, and group attention. Six semester hours of HEAL 500 may be applied to degree.

511 History and Philosophy of Health Education (3:3:0). Focus on evaluation of significant historical events that affected and contributed to health education development. Emphasis on personalities, institutions, and philosophical ideas of each era.

513 Current Issues in Health Education (3:3:0). Analysis of topical and often controversial health issues with emphasis on selected problems of concern to society.

516 Program Development and Resources in Health Education (3:3:0). Prerequisite: Baccalaureate degree in health education or related field or permission of instructor. Procedures used in planning, development, and organization of health education programs in school and health agency settings.

517 Health Education Process: School and Community (3:3:0). Prerequisite: Baccalaureate degree in health education or related field or permission of instructor. Examination of the health education process in a variety of public health, disease prevention, and rehabilitative settings.

599 Independent Study in Health Education (1-3:0:0). Prerequisite: Permission of department. Study of a problem area in health education research, theory or practice under direction of faculty. May be repeated, but no more than 3 hours total credit may be earned.

612 Scientific Foundations of Health and Fitness (3:3:0). An integrated study of human anatomy, physiology, chemistry, and microbiology, presenting a complete picture of how the body functions and the diseases and disorders that cause the body to malfunction.

798 Project (3:0:0). An individualized project applying appropriate methodology to a health problem or issue. Under supervision of graduate faculty member(s).

799 Thesis (3-6:0:0). Exploration of a health problem using appropriate research methodology under supervision of graduate faculty member(s). Proposal must be approved prior to enrollment for thesis credit.

History

Faculty
Bakhash, Shaul, Ph.D., Oxford University, 1972; Robinson Professor
Cassara, Ernest, Ph.D., Boston University, 1957; Professor
Censer, Jack R., Ph.D., Johns Hopkins University, 1973; Associate Professor
Censer, Jane T., Ph.D., Johns Hopkins University, 1980; Assistant Professor
Cohen, Martin B., Ph.D., The George Washington University, 1975; Assistant Professor
Copelman, Dina M., Ph.D., Princeton University, 1985; Assistant Professor
Deshmukh, Marion F., Ph.D., Columbia University, 1975; Associate Professor and Chair
Dinan, Desmond, Ph.D., National University of Ireland, 1985; Visiting Assistant Professor
Diner, Steven J., Ph.D., University of Chicago, 1972; Professor
Duara, Prasenjit, Ph.D., Harvard University, 1983; Assistant Professor

http://catalog.gmu.edu
History, M.A.

The Department of History provides graduate training in historical methods and analysis for students with widely varying goals. The four M.A. tracks outlined below are designed to meet those goals.

Admission Requirements

Applicants to the Master of Arts in History program must fulfill the requirements of the Graduate School and the Department of History. These include (1) satisfactory scores on the GRE, including the subject examination in history, 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.

For those with little formal training in history, the history exam is used to evaluate deficiencies. 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

Requirements for All Tracks

1. A minimum of 30 semester hours (36 hours in Track IV) of graduate-level work with a GPA of not less than 3.0;
2. Three semester hours of HIST 610 (The Study and Writing of History), taken within the first 9 hours of course work;
3. Except in Track IV, a specialized 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 hours of foundation courses (HIST 550, 601-606, Themes in U.S., Latin American, and Modern European History) may be required. This requirement applies particularly to students who did not major in history as undergraduates.

Predoctoral Track I

This track is for students planning to continue into doctoral studies. In addition to the general degree requirements, it requires:

1. Twelve hours in a major field of concentration (U.S., Latin American, or Modern European History), including a research seminar and a specialized readings course;
2. Nine hours in a second field of history (U.S., Latin American, Modern European, or World Regions in the Modern Period);
3. Six semester hours in thesis work;
4. Reading proficiency in a modern foreign language, as demonstrated by course work or an examination.

Applied History Track II

This track 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 the general degree requirements, this track requires:
1. Fifteen hours in a major field of concentration (U.S., Latin American, or Modern European History), including a research seminar and a specialized readings course;

2. Six hours of applied history courses (historic preservation, museum studies, archives, or historical editing);

3. Six hours of internship;

4. Proficiency in a relevant research tool (computers, statistics, or a modern foreign language) as demonstrated by course work or an examination.

Enrichment Track III

This track 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 the general degree requirements, this track requires:

1. Fifteen hours in a major field of concentration (U.S., Latin American, or Modern European History), including a research seminar and a specialized readings course;

2. Twelve hours of electives.

Six semester hours of thesis work is optional. If a thesis is elected, 3 hours in the major and 3 hours in electives are assigned to it.

Teaching Track IV

This track (formerly the M.A. in Teaching History) is for students interested in elementary and secondary teaching or administration and includes course work in history and education. Unlike the other three tracks, it requires a minimum of 36 hours of course work and does not include the specialized readings course. Students intending to teach at the secondary level must also qualify for the Virginia Collegiate Professional Certificate (or its equivalent) in history. In addition to the general degree requirements, this track requires:

1. Twenty-four hours in history, including the 3 credits in HIST 610 The Study and Writing of History. No specific distribution of courses is required, but students are encouraged to take courses in a wide range of areas.

2. Twelve credits in graduate education courses, including EDCI 567.

History Courses (HIST)

520 Social Revolution in Latin America (3:3:0).

Analysis of revolutionary forces that are challenging traditional institutions and transforming all aspects of society in contemporary Latin America. Selected countries are studied in depth.

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. Maximum of six hours may be earned.

528 Latin American Cultural and Intellectual History, Nineteenth Century (3:3:0). Iberian background and other foreign influences; ideas of independence leaders; midcentury Romanticism, Liberalism, and Traditionalism; secular and religious Positivism; and Marxian socialism. Intellectual developments traced in major Latin American thinkers, writers, and artists.

550 Interpretations of History (3:3:0). Study of development of historical writings in the West from ancient to modern times. Introduction to historical methodology.

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. Maximum of 6 hours may be earned.


583 The Cultural History of the Islamic World (3:3:0). Government, science, philosophy, religion, literature, arts and architecture of the Arabs of the Umayyad and Abbasid period, Persians of the Safavid period, Gazzavids of Afghanistan, grand Mughals of India and Pakistan, Timurids of Central Asia, Fatamids of Egypt, Moors of Spain, and the Turks. Important political and cultural movements in different parts of Islamic World are discussed.

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 once when content differs.

601 Themes in United States 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 United States History II (3:3:0). Survey of U.S. history since 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.

603 Themes in Latin American History I (3:3:0). Survey of Latin American history from the pre-Columbian era through the wars for independence. 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.

604 Themes in Latin American History II (3:3:0). Survey of Latin American history since the conclusion of the wars for independence in the early 1820s. Designed for individuals entering the graduate program who need to strengthen their preparation in this area and for those seeking to enhance their knowledge of the latest interpre-
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, synthesis of material.


614 The Enlightenment in America (3:3:0). Study of Enlightenment as it was reflected in various aspects of American life in the eighteenth and early nineteenth centuries. Impact of the Enlightenment on development of new American nation.

615 Problems in American History (3:3:0). Readings and discussion of bibliographies, interpretations and research trends in topics selected by instructor. Maximum of 9 hours may be earned.

616 Attempts to Control the U.S. Westward Movement (3:3:0). Study of attempts by the East to control the West, how and by whom control was attempted, to what extent it was effective, to what extent the need for such control existed, and in what manner the West resisted Eastern domination.

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, 1828-1848 (3:3:0). Inquiries, interpretations, and discussions of those elusive qualities of Jacksonian democracy which made the 1820s, 1830s, and 1840s a separate and distinguishable part of the American past. This course, conducted as a seminar, includes readings, discussions, oral reports, and a term paper based upon the issues of that transitional period.

619 The Constitution, Civil Liberties, and the Supreme Court (3:3:0). This course investigates 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.

623 Topics in 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. Conducted as a seminar.

624 Interpretations in U.S. Diplomatic History (3:3:0). Study of American foreign policy and its analysis by both popular and scholarly interpreters. Conducted as a seminar, with selected issues chosen for special study.


626 Seminar in State and Local History (3:3:0). Prerequisite: HIST 610 or permission of instructor. Exposition of principles and techniques of local history followed by intensive investigation of selected aspects of the region, using area manuscript collections.

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 will become familiar with major issues and bibliography of American urban history.

635 Problems in European History (3:3:0). Investigation of selected problems in the history of Europe. Readings, discussions, development of bibliographies. Where possible, primary sources are used. Maximum of 6 hours may be earned.

636 Political Culture in Twentieth-Century Germany and Austria: Continuities and Discontinuities (3:3:0). Recent interpretations of key political events of the twentieth century. Focus will be on the question: Despite radical political changes, were there fundamental continuities in the structure of German and Austrian society that can be observed throughout the period under review?


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.

645 The Russian Revolution and the Origins of the Soviet State (3:3:0). The period between 1890 and 1924 with concentration of 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.

679 Seminar on Inter-American Diplomacy (3:3:0). Prerequisite: HIST 610 or permission of department. Seminar on geographic, political, economic, military, and other forces that have influenced inter-American relations. Study of the special relationship between U.S. and Latin America. May be applied toward the major or minor concentration in either U.S. or Latin American history.

690 The Administration of Archives and Manuscripts (3:3:0). Prerequisite: 6 hours of U.S. History or permission of department. Introduction to the principles and practices in the management of records and the administration of archival and manuscript collections, pub-
lic 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: 6 hours 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. Course 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: 6 hours 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. Course 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 United States History (3:3:0). Prerequisite: HIST 610 or permission of department. Research in specialized topics using primary sources. Maximum of 6 hours may be earned.

731 Research Seminar in European History (3:3:0). Prerequisite: HIST 610 or permission of department. Research in specialized topics using primary sources. Maximum of 6 hours may be earned.

771 Research Seminar in Latin American History (3:3:0). Prerequisite: HIST 610 or permission of department. Research in specialized topics using primary sources. Maximum of 6 hours may be earned.

790 Specialized Readings in United States History (3:3:0). To be taken in the final semester of the program. Designed to integrate the students' past work in the major field and to fill gaps in this area prior to comprehensive exam. After review of graduate experience, student and instructor design a reading list to round out preparation for the exam.

791 Specialized Readings in Latin American History (3:3:0). To be taken in the final semester of the program. Designed to integrate the students' past work in the major field and to fill gaps in this area prior to comprehensive exam. After review of graduate experience, student and instructor design a reading list to round out preparation for the exam.

792 Specialized Readings in European History Since 1500 (3:3:0). To be taken in the final semester of the program. Designed to integrate the students' past work in the major field and to fill gaps in this area prior to 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). Prerequisite: 3 hours of applied history in appropriate area and 12 hours 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. An introduction to applied history through work and study at a historical museum, site, library archive, editing project, or other approved agency.

796 Directed Readings (3-6:0:0). Independent reading on a topic agreed to by student and faculty member. Maximum of 6 hours may be earned.

799 Thesis (6:0:0).

800 Studies for the Doctor of Arts in Education (various credits). Prerequisite: D.A. Ed. admission to study in 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. Paper is presented in a subsequent D.A. Ed. summer seminar. Enrollments may be repeated.

Information Systems and Systems Engineering

Faculty

Adelman, Leonard, Ph.D., University of Colorado, 1976; Associate Professor

Andriole, Stephen, Ph.D., University of Maryland, 1974; George Mason Institute Professor of Information Technology

Aseltine, John, Ph.D., University of California, Los Angeles, 1952; Visiting Professor

Baum, Richard, Ph.D., University of Michigan, 1969; Associate Professor

Davis, Allan, Ph.D., University of Illinois, 1975; Visiting Professor

Donnell, Michael, Ph.D., University of Michigan, 1977; Visiting Associate Professor

Fairley, Richard, Ph.D., University of California, Los Angeles, 1971; Professor

Goicoechea, Ambrose, Ph.D., University of Arizona, 1977; Associate Professor

Gomaa, Hassan, Ph.D., Imperial College, 1976; Professor

Hopple, Gerald, Ph.D., University of Maryland, 1975; Associate Professor

Jajodia, Sushil, Ph.D., University of Oregon, 1977, Associate Professor

Kerschberg, Larry, Ph.D., Case Western Reserve University, 1969; Professor and Chair

Kogan, Boris, Ph.D., Princeton University, 1988; Assistant Professor

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Information Systems and Systems Engineering

Information Systems, M.S.
The Master of Science in Information Systems program (MSIS) provides graduate-level instruction in the design, development, and use of computer systems for information management organizations. Managerial, user interface, and technical aspects of information systems are considered, within application environments, in both private and public sector organizations. A graduate of the MSIS program will be able to pursue a career in information systems analysis and design, and in managing the development of computer-based management information systems. Through elective courses, the MSIS student may acquire skills in special technical areas, such as management science, information retrieval, decision support systems, software systems engineering, computer languages, artificial intelligence, graphics, robotics, human factors, and simulation. The program is offered by the faculty of the Department of Information Systems and Systems Engineering. Many classes are offered in the late afternoon and evening to accommodate the professionally employed student.

Foundation Requirements
The MSIS program provides strong technical training and basic analysis tools coupled with practical management-oriented applications. To ensure that students have adequate grounding in management disciplines, mathematical methods, and the basic preparation in computer technology, five foundation courses are required. A student who needs to take any of these courses may apply for admission. Upon acceptance, the student is advised of the necessary foundation courses to be satisfactorily completed, as articulated courses, to meet this requirement. Foundation courses do not earn credit toward the MSIS degree.

These foundation courses are exemplified by the following three George Mason University courses, or equivalent, which are required:

- INFSCI 610 Computer Systems for Management
- ECON 602 Economic Analysis
- FNAN 610 Financial Management
- MKTG 610 Marketing Concepts and Practices
- MGMT 610 Legal Concepts and Trends Affecting Business

In addition, students must have knowledge equivalent to two of the following courses:

- ECON 602 Economic Analysis
- FNAN 610 Financial Management
- MKTG 610 Marketing Concepts and Practices
- BULE 610 Legal Concepts and Trends Affecting Business
- MGMT 610 Management Theory and Practice

Students may take courses through the Cooperative Graduate Engineering Program in affiliation with the University of Virginia and Virginia Tech. Appropriate courses may be transferred, with advisor approval, into this GMU degree program. Refer to the section on Certificates, Programs, and Additional Graduate Courses in this catalog.

Admission Requirements
Applicants for the MSIS program should meet the following minimum entrance requirements:

1. Hold a baccalaureate degree from an accredited institution.
2. Have earned a grade-point average of 3.0 or better in the last 60 hours.
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. The GRE/GMAT requirement is waived if the applicant already has a master's degree.
4. Submit the appropriate application form with three letters of recommendation from persons directly knowledgeable of the applicant's professional and academic competence. Note that the MSIS self-evaluation form is essential to evaluation of foundation requirements by the department faculty.

Lehner, Paul, Ph.D., University of Michigan, 1981; Associate Professor
Palmer, James D., Ph.D., University of Oklahoma, 1963; BDM International Professor of Information Technology, Associate Dean
Randall, L. Scott, Ph.D., University of Michigan, 1971; Visiting Associate Professor
Sage, Andrew, Ph.D., Purdue University, 1960; D.Engr., University of Waterloo, 1987; First American Bank Professor, Dean of School of Information Technology and Engineering
Sanden, Bo, Ph.D., Royal Institute of Technology, Stockholm, 1978; Visiting Associate Professor
Sibley, Edgar, Sc.D., Massachusetts Institute of Technology, 1967; University Professor
Siff, Frederick, Ph.D., New York University, 1974; Associate Professor
Van Trees, Harry, Ph.D., S.D.E.E., Massachusetts Institute of Technology, 1965; Distinguished Professor
White, E. Bernard, Ph.D., University of Virginia, 1984; Associate Professor
Advising

Each student admitted to the program is assigned a faculty adviser with whom the student confers on matters related to degree requirements. A plan of study for the MSIS degree should be completed and submitted by the student soon after admission to the program.

Degree Requirements

Completion of the MSIS program requires a minimum of 30 approved graduate semester hours (10 courses). This requirement is satisfied by the following:

Required Courses

To provide a common background in the fundamentals of information systems, the following courses are required of all students:

1. ORAS 540 Management Science
2. INFS 690 Program Design and Data Structures
3. INFS 790 Information Systems Policy and Administration
4. INFS 710 Computer Architecture and Operating Systems
5. INFS 712 Data Communications and Distributed Processing
6. INFS 714 Database Management Systems
7. INFS 722 Information Systems Analysis and Design

Electives

To allow for individual variations in interest, students may elect three courses in consultation with their adviser. A thesis option is available; students may elect to complete a thesis for 6 hours of elective credit.

The following courses are acceptable electives for the degree without prior adviser approval:

INFS 711, 720, 723, 780, 791, 792, 796
CS 540, 580, 612
DESC 535
IRM 760

To complete a master of science degree, students complete an approved plan of study. The plan, which serves as a learning contract between the student and the university, must contain a minimum of 30 semester hours of graduate-level course work.

Software Systems Engineering, M.S.

The program of study for the degree of Master of Science in Software Systems Engineering (MS-SWSE) is concerned with engineering technology for development and modification of software components in systems that incorporate digital computers. Software systems engineering is a young and emerging discipline based on computer analysis, design, 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.

Certificate in Software Systems Engineering

A certificate program in software systems engineering is available to students who hold master's degrees in scientific or engineering disciplines, or who are currently in graduate status in scientific or engineering degree programs. For more information, see the section on Certificates, Programs, and additional Graduate Courses in this catalog.

Foundation Requirements

Students entering the MS-SWSE 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; the assembly language and machine structure of a modern digital computer; 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. 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.

Admission Requirements

In addition to the general admission requirements of the university, applicants to the MS-SWSE program must meet the following minimum entrance requirements:

1. Hold a baccalaureate degree in an appropriate discipline from an accredited institution;
2. Have an acceptably high GPA that indicates a successful prognosis for graduate 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 systems engineering.
4. Submit a self-assessment form that provides summary information concerning background and preparation for the program;
5. Submit satisfactory GRE scores.

Acceptance into the MS-SWSE program is based on overall assessment of the applicant's potential ability to complete the program of study in a satisfactory manner. Well-qualified students with minor deficiencies may be admitted to the program in provisional status, with certain conditions (e.g., specified course work) to be completed within a specified time. Applicants with more serious deficiencies may be placed in deferred status and reconsidered when those deficiencies are corrected.

Advising
Each student admitted to the MS-SWSE program is assigned a faculty adviser. Soon after admission, the student, in consultation with the adviser, must complete an approved plan of study, which forms a learning strategy between the student and the university. Because a student's plans may change, the plan of study can be modified with the approval of the faculty adviser; however, each student must have on file an approved plan of study at all times.

Degree Requirements
The Master of Science in Software Systems Engineering requires a minimum of 30 semester hours of graduate-level courses. Required courses constitute 18 semester hours (Option 1) or 21 semester hours (Option 2) as follows:

Option 1 (18 semester hours)
Intended for students who are pursuing a terminal master's degree in software systems engineering.
- SWSE 520 Introduction to Software Systems Engineering
- SWSE 623 Formal Methods and Models in Software Systems Engineering
- SWSE 624 Analysis, Design, and Prototyping of Software Systems
- SWSE 625 Software Project Management
- SWSE 626 Software Project Laboratory (two semesters required)

Option 2 (21 semester hours)
Intended for students who plan to pursue a Ph.D. degree in information technology with emphasis on software systems engineering. Option 2 is identical to Option 1, except that only one semester of SWSE 626 is required and 6 semester hours of SWSE 799 Master's Thesis Research are required.

Electives
The remaining course work (12 semester hours for Option 1, 9 semester hours for Option 2) is chosen by the student with consent of the faculty adviser. Elective courses can be chosen from offerings within the School of Information Technology and Engineering deemed appropriate by the faculty adviser. 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.

Systems Engineering, M.S.
The graduate program leading to a Master of Science in Systems Engineering prepares students for research and professional practice associated with problem formulation, issue analysis, and evaluation of the consequences of alternative courses of action as they pertain to the design and development of systems of all kinds. The program emphasizes the analytical and behavioral aspects of engineering complex systems of large scale and scope. Students are expected to become proficient in operations research and applied statistics, which supplies an important quantitative basis for systems analysis. Cognitive aspects of systems engineering, systems design methodology, and systems management are also essential studies.

To achieve this objective, the program includes four core courses, electives selected by the student with the aid of a faculty adviser, and a thesis or systems engineering project. To earn the master of science degree, students must complete an approved plan of study. The plan, which serves as a learning strategy between the student and the university, must contain at least 30 semester hours of graduate-level course work. Either a thesis or a research project is required for the degree. Articulation requirements for candidates needing additional work in mathematics or engineering will also be included in the plan of study.

Students may take courses through the Cooperative Graduate Engineering Program in affiliation with the University of Virginia and Virginia Tech. Appropriate courses may be transferred, with adviser approval, into this GMU degree program. Refer to the section on Certificates, Programs, and Additional Graduate Courses in this catalog.
Admission Requirements

In addition to the general admission requirements, the academic background requirements for entrance into the program include an undergraduate degree in engineering, mathematics, physical sciences, economics, psychology, or a related field in which the applicant has successfully completed foundation courses in calculus through differential equations, applied probability and statistics, and a scientific programming language. Satisfactory GRE scores are required.

Acceptance to the degree program is based on an assessment of the applicant's capacity to successfully pursue the graduate program, and on factors such as the undergraduate record (a grade-point average of at least 2.9 is required) and professional work experience. Well-qualified students who present minor admissions deficiencies may be admitted subject to completing an articulation program. To this end, students applying to the program are asked to complete a self-assessment form. The primary purpose of this is to ascertain prior background in quantitative methods for engineering systems analysis and design, related engineering problem-solving approaches, and fluency in computer usage. The articulation program, when required, will consist of up to three graduate courses that provide preparation for further graduate study through intensive study in these areas.

Degree Requirements

To obtain a Master of Science degree in Systems Engineering, students must complete an approved plan of study with a minimum of 30 semester hours of graduate-level courses and research. Required courses, constituting 18 credits, are as follows:

1. Two courses in systems engineering concepts and methods (6 semester hours)
2. Two courses in operations research and applied statistics (6 semester hours)
3. Project or thesis:
   - Option A - SYST 798, Master's Systems Engineering Project (6 hours), plus four elective graduate-level courses (12 hours)
   - Option B - SYST 799, Master's independent research (6 hours), plus four elective graduate-level courses (12 hours)
   - Option C - SYST 798, Individual Project (3 hours), plus five elective graduate level courses (15 hours)

Option A, the master's systems engineering project, permits the student to carry out systems engineering analysis and design, usually within a multidisciplinary group, under the guidance of faculty members. The emphasis is on bringing a range of skills to bear on a complex, realistic system problem. The final product of the work is a professionally accomplished technical report dealing with a predefined portion of the project activity, and is submitted to the project adviser. During the first semester, the student operates in a supporting role on a phase of the project, and in the following semester assumes primary responsibility for a segment of the project. Although more than 6 semester hours registration in SYST 798 is possible, only 6 credits of this registration may be applied toward the degree.

Option B requires a master's thesis and involves a significant independent research effort. The work is conducted under the guidance of a faculty adviser, and the final written thesis and oral defense are approved by a three-member faculty committee and submitted through the School of Information Technology and Engineering to the dean of the Graduate School. The thesis work is expected to be completed while taking 6 semester hours of SYST 799, Master's Thesis Research. Although more than 6 semester hours registration in SYST 799 is possible, only 6 credits of this registration may be applied toward the degree.

Option C is intended for students who are employed in systems engineering work and consequently would benefit less from the group-intensive experience that is the objective of Option A. A project objective may be selected with the approval of the faculty adviser, usually directed toward analysis of system requirements, development of a prospective system architecture, or use and evaluation of systems engineering methodologies. A project report is submitted at the end of the semester while registered for SYST 798, and must be approved by the department faculty prior to award of the master's degree.

Curriculum

Systems Engineering Core Courses (6 credits):
- SYST 660 Systems Engineering I (Methodology, Analysis and Design)
- SYST 661 Systems Engineering II (Economic Systems Analysis)

Operations Research and Applied Statistics (6 credits):
- STAT 610 Statistical Foundation for Decision Making (or approved alternative for advanced students)
- OR 541 Operations Research I (or approved alternative, for advanced students)

Electives (12-15 credits):
The student should select electives based on personal objectives, developed with the aid and ap-
praval of the faculty adviser. It is suggested that no more than two areas of elective study be divided between the 12 semester hours, so that some depth of study in an area may be achieved.

Although many students choose electives from within the SITE departments, selected courses offered by other academic units at GMU are also appropriate.

Appropriate areas of specialization include, but are not limited to the following:

- Command and Control Systems Design
- Expert Systems and Decision Support Systems
- Software Systems Engineering
- System Level Architecture
- Systems Design and Systems Management
- Management
- Urban Systems Engineering

Of particular interest to students planning a Ph.D. program in information technology is the set of electives that compose the doctoral core study.

Students may wish to include some of these courses in their systems engineering master’s plan of study.

### Information Systems Courses (INFS)

**610 Computer Systems and Software (3:3:0).** Prerequisite: Graduate standing. Examination of information systems. Lecture and computing lab, including programming in a structured language, such as C or Pascal. Fall, spring, summer.

**690 Program Design and Data Structures (3:3:0).** Prerequisite: Acceptance into MSIS program and INFS 610 (formerly BUAD 680). Study of the fundamentals of data structures and algorithms applied in programming solutions to application problems. Structures stressed in modern high-language languages. Laboratory required. This is the first course in the MSIS program and a prerequisite for all other courses.

**699 Advanced Topics in Information Systems (3:3:0).** Prerequisite: Permission of instructor. Special topics not occurring in the regular INFS sequence will be presented. May be repeated for credit where distinct offerings of the course differ in subject.

**710 Computer Architecture and Operating Systems (3:3:0).** Prerequisite: INFS 690. Fundamentals of technology evaluation for the hardware and software architecture of information management systems. Focuses on modern microprocessor design, assembly language, operating system concepts and their interrelationships. Computing lab.

**711 Comparative Programming Languages (3:3:0).** Prerequisite: INFS 710. Investigation of the variety of environments for computer applications. Selection of the appropriate computing language for a specific application is demonstrated through case studies. Examples of languages are C, Assembler, PASCAL, COBOL, PL/I, FORTRAN, ADA, LISP, Prolog. Computing lab.

**712 Data Communications and Distributed Processing (3:3:0).** Prerequisite: INFS 710, DESC 611. Concepts and applications of telecommunication technologies, networks and distributed information systems. Includes regulatory issues, network pricing and management.

**714 Database Management (3:3:0).** Prerequisite: INFS 710. Generalized database management systems: their internal and external structure, development, implementation, management and use. Covers logical and physical database design and access methods. Several commercial systems are examined. Computing lab.

**720 Systems and Information Analysis in Organizations (3:3:0).** Prerequisite: INFS 690. Analysis of information flow in organizations and the operating context of the various computer-based subsystems of an organizational information system. Fundamental concepts of systems and information are integrated with those of organizational structure and management.

**722 Information Systems Analysis and Design (3:3:0).** Prerequisite: INFS 714, with INFS 712 also recommended. 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 computing lab.

**723 Information Retrieval (3).** Prerequisite: INFS 714. This course examines models and theories used for the design of information systems for textual and less well structured data bases; covering hardware, software and the design, implementation and evaluation of such systems. Laboratory (computer programming).

**780 Technical and Administrative Issues in Office Automation (3:3:0).** Prerequisite: INFS 690 (may be taken concurrently). Examines office automation as an issue in applying the concepts of MIS in an organization. Focuses on technical issues of hardware and software selection as well as administrative problems associated with successful integration of the appropriate technologies. Lecture and major class project.

**790 Information Systems Policy and Administration (3:3:0).** Prerequisite: Completion of all course work for the M.S. in Information Systems. Capstone course, integrates the technical and executive policy issues of information systems. Critical executive issues are examined through case studies and comprehensive individual project. Computing lab.

**791 Special Topics in Group Project Design (3).** Prerequisite: INFS 690 and INFS 710 (may be taken concurrently). Study of techniques for managing a software engineering or information systems design project. The student selects a project and prepares a detailed project plan with professional guidance. The plan developed in this course will be used in practice in the follow-on course, INFS 792.

**792 Special Topics in Group Project Implementation (3).** Prerequisite: INFS 690, INFS 710, INFS 791. Study of the various techniques for managing a computer-based information system design project. Using the project plan developed in INFS 791, students implement the project with undergraduate students enrolled in INFS 492 as group members.
796 Directed Readings. Prerequisite: Graduate degree students in information systems with at least 12 prior credit hours in INF5 and CS courses. Research and analysis of a contemporary problem in information system development. Prior approval required by a faculty sponsor who supervises the student's work. Written report or thesis proposal to be prepared.

799 Thesis. Prerequisite: 18 hours of credit applicable toward M.S. in CS. Original or compilaory work evaluated by a committee of three faculty members.

Software Systems Engineering Courses (SWSE)

520/CS 520 Introduction to Software Engineering (3:3:0). Prerequisite: Undergraduate courses or equivalent knowledge in structured programming, data structures, discrete mathematics, and assembly language programming. Software product lifecycle; process models and metrics; modern language concepts to support software systems engineering, including information hiding, inheritance, message passing, exception handling, and concurrency mechanisms; design, implementation, and validation of software systems using modern programming languages.


624/CS 624 Software Requirements, Prototyping, and Design Methods (3:3:0). Prerequisite: SWSE 520 or permission of instructor. In-depth study of methods, notations, and validation techniques for the analysis and design phases of software systems engineering. Topics include needs analysis, requirements specification, prototyping techniques, and design methods. Preparation and validation of requirements specifications, design documentation, test plans, and system test acceptance criteria are presented.

625/CS 625 Software Project Management (3:3:0). Prerequisite: SWSE 520 or permission of instructor. Lifecycle and process models; process metrics; planning for a software project; mechanisms for monitoring and controlling schedule, budget, quality, and productivity; and leadership, motivation, and team building.

626/CS 626 Software Project Laboratory (3:0:6). Corequisite: SYST 624 and 625. This course involves students in analysis, design, implementation, and management of a software system project. 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 520. Covers quantitative models of the software lifecycle; cost-effectiveness analysis in software engineering; multiple-goal decision analysis; uncertainty and risk analysis; software cost estimation; software engineering metrics; and quantitative lifecycle management techniques.

635 Software Testing and Quality Assurance (3:3:0). Prerequisite: SWSE 520. Software testing at the module, subsystem, and system levels; quality assurance techniques, including inspections, version control, and configuration management. The role of standards, policies, and procedures. Organizational concerns.

799 Thesis (3-6:0:0). Prerequisite: Permission of adviser. A research project completed under the supervision of a graduate faculty member, which results in a technical report accepted by a three-member faculty committee. The report must be defended in an oral presentation.

Systems Engineering Courses (SYST)


570 Quality Control (3:3:0). Prerequisite: Course in statistics. Statistical and managerial techniques applied to quality control and assurance in both manufacturing and nonmanufacturing applications. Topics include quality considerations in design, process vs. design tolerances, acceptance sampling, control chart methodology, and applications.

624 (522) Computer Control Systems (3:3:0). Prerequisite: 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. The course may include a simulation and design project.

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.

660 Systems Engineering—Methods and Design (3:3:0). Prerequisite: ENGR 390, MATH 351, or permission of instructor. Introduction to analysis, design, test, implementation, and management of systems. System life cycle, cost/benefit and analysis, comparison of alternatives, and human/social implications are examined.

661 Systems Engineering—Economic Analysis (3:3:0). Prerequisite: MATH 351, MATH 304. Introduction to the construction of differential and difference equation models occurring in systems engineering and their solution by transform methods. Elements of system control life cycle and cost/benefit analysis are discussed.

671 Judgment and Choice Processing and Decision Making (3:3:0). 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 informa-
tion processing abilities. The use of decision-analytic techniques to improve decision making.

675 Reliability Analysis (3:3:0). Prerequisite: STAT 654 or equivalent. Introduction to the concept of system reliability and its relationship to product quality, maintenance costs, and safety engineering. A series of topics are developed that incorporate the statistical and mathematical point of view in reliability as a means of helping students develop the capability to design, model, and make inferences on complex systems.

760 Command Control and Communications Systems Engineering (3:3:0). Prerequisite: SYST 661 and undergraduate or graduate course in communications engineering or permission of instructor. Hardware, software, and human elements of C-cubed systems. Systems structures and connectivity. Analysis and modeling. Typical large military, civil, and commercial systems.

761 Special Topics in Command Control and Communications Systems Engineering (3:3:0). Prerequisite: 760 or permission of instructor. Individual topics selected by the student with professor's approval are studied and discussed. A formal midterm progress report, including bibliography, is submitted with a final report at the end of the semester.

798 Research Project (3:0:0). Prerequisite: 9 hours of graduate level course work. Research project is chosen and completed under the guidance of a graduate faculty member, resulting in an acceptable technical report.

799 Master's Thesis (3-6:0:0). Prerequisite: 9 hours of graduate level course work and permission of instructor. Research project is 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.

Information Technology

The general doctoral requirements of George Mason University apply to this program.

When the term Information Technology and Engineering is used at George Mason University to describe our school and its activities, it is intended to mean information technology and information engineering. These aspects of technology are emphasized in this geographic region and we will develop excellence in precisely these areas. Our focus is on the information and systems approaches to technology, which complement and enhance the more traditional approaches.

Information technology and engineering at GMU involves an external design function and an internal design function. Electrical and computer engineering and computer science involve the hardware and software aspects of the internal design function. The human element and the external design functions are also important for successful system design and operation. Our efforts in information systems and systems engineering primarily concern working with people to assist them in knowledge organization. These efforts involve systems, including information systems, and the entire life cycle of systems from initial conceptualization and specification of information and architectural requirements through system evaluation and redesign. They include the analysis capability that is needed to quantitatively determine operational characteristics of existing and future systems and processes. Our activities in operations research and applied statistics are focused on these important endeavors.

Our tasks in information technology and engineering vary from requirements definition and specification to conceptual and functional design and development of systems. They concern such topics as architectural definition and evaluation. These occur at considerably different points in the system life cycle and are needed for functional integration, maintainability, reliability, and the appropriate interfaces that ensure system design for human interaction. This human interaction with systems and processes, and the associated information processing activities, may take any of several diverse forms. It may involve human supervisory control of physical processes, such as the robots that are used in automated manufacturing. It may involve typically cognitive tasks at the operational levels of fault diagnosis, detection and correction, or at the level of strategic planning.

A large number of new mathematical discoveries of the last three decades—especially in applied mathematics, statistics, and the mathematics of operations research—also have much to offer. The challenge is to exploit this knowledge by developing new computer simulation models that humans can use to increase their intelligence through an increase in the perspectives through which they approach a given problem.

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 is required for admission to the program. Students without an appropriate master's degree who otherwise satisfy admission requirements will usually be encouraged to first seek such a degree in one of the five master's programs offered through this school. Application packets are available from the Office of Admissions and from the Office of the Dean of SITE.

http://catalog.gmu.edu
An undergraduate grade average of B and Graduate Record Examination aggregate scores of 1200 on the aptitude tests are minimum requirements for applicants to the program. The admissions 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 detailed statement of career goals and aspirations, and a self-assessment of past background. All of an applicant’s background is examined prior to making an admissions decision.

Among appropriate fields of study that provide an immediate basis for doctoral study in information technology are engineering, computer science, operations research, statistics, mathematics, the physical sciences, economics, and psychology.

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. Since 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. program in information technology is made up of a core curriculum and in-depth study and research in the student’s field of concentration, followed by preparation of a dissertation. Generally, a student will have obtained a master’s degree in a field appropriate to information technology. This master’s program often contains many of the doctoral core courses.

Under the guidance of the doctoral supervisory committee, the student prepares a plan of study. This lists the intended courses and their expected timing in both the breadth and advanced specialty parts of doctoral study. The plan should also contain the intended date of the comprehensive examinations and the tentative subject of the dissertation research.

An evaluation of previous efforts is given to students with an explanation of how these satisfy both the fundamental entrance requirements and the breadth requirements for the Ph.D. degree.

Completion of the broad scope and in-depth advanced doctoral studies is followed by a comprehensive examination on the advanced work. In addition, preparation and oral presentation of a dissertation proposal is required. The doctoral program is completed with successful presentation and defense of a doctoral dissertation representing an important contribution to fundamental or applied knowledge in information technology.

**Core Curriculum**

Students must satisfy the breadth requirement in six subject areas. At least one area must be selected from each of the four departments within the School of Information Technology and Engineering. Each department offers up to five core or breadth subject areas.

Courses taken elsewhere in institutions of recognized standing may be used to satisfy portions of the breadth requirement when the course is equivalent to a GMU breadth course, the grade received in the course was an A or B, and the course was taken within five years of admission to GMU or the student has retained knowledge of the course material through professional experience.

The student grade-point average for courses taken at GMU to meet the breadth requirement must be at least 3.5. Students have the option of taking the final examination in a breadth course at GMU without taking the course itself, but may use this option only once for a given breadth course.

**Doctoral Supervisory Committee**

Upon admission to the program, a student is assigned a temporary adviser. The student is responsible for working with the temporary adviser so an advisory committee may be appointed soon after the student’s admission to the program. This is especially important for students who have completed a considerable amount of graduate work elsewhere.

The doctoral supervisory committee includes a faculty member from the student’s intended major area, who is selected by the student to become chair of the doctoral supervisory committee. Other committee members are selected to form a committee of at least four people. At least two of the departments of the School of Information Technology and Engineering must be represented on this committee. Industrial representatives and faculty members from departments outside of the school are highly desirable but are not required on the committee. The doctoral supervisory com-
mittee administers the comprehensive examination, the dissertation proposal presentation, and the dissertation defense.

Advanced Specialty Area Requirement
Students must include in the plan of study a well-defined advanced specialty area. Successful completion of this requirement should enable the student to do basic or applied research in a significant contemporary area in information technology.

The doctoral plan of study generally includes at least 48 semester hours of graduate-level coursework beyond the master's degree, and at least 18 of these must be information technology courses in the advanced specialty area of study.

Comprehensive Examination
The comprehensive examination is taken after the student has satisfactorily completed all of the course work requirements in the approved Plan of Study filed by the student. Having met all the criteria, the student meets with the committee chair and/or the entire committee to prepare a memorandum to be forwarded to the Office of the Dean requesting the comprehensive examination. 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. This is generally structured by four central areas to be covered on the examination and is reasonably explicit about the scope of the examination. The memo describes an advanced specialty area(s) and briefly comments upon the courses that the student has taken in the area and upon the independent study taken under the direction of a faculty member. This memo also defines the coverage for the comprehensive examination. 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 specialization.

After satisfactorily completing the written portions of the comprehensive examinations, the student arranges the oral portion. The entire advisory committee meets with the student and asks him or her questions concerning basic and advanced areas of study.

Dissertation Proposal Presentation
Near the end of the course work each doctoral student prepares a written dissertation proposal, which is presented in an oral public presentation to the doctoral supervisory committee. The student may enroll in INFT 999, 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 completing this portion of the doctoral effort, the student is formally admitted as a "candidate" for the Ph.D. degree. The application for candidacy is 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. 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, the final oral presentation of the dissertation research may be scheduled. A candidate submits the dissertation to the doctoral supervisory committee one month before the scheduled date of the dissertation defense. The dissertation is then presented to the committee in a public oral presentation.

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 Graduate School's Guide for Preparing Graduate Theses, Dissertations and Projects.

If the candidate successfully defends the dissertation, the dissertation defense committee recommends completion of the final form of the dissertation, and that the faculty of the School of Information Technology and Engineering and the graduate faculty of George Mason University confer on the candidate the degree of doctor of philosophy.
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 "reside" at George Mason University and associate with the GMU faculty for at least two full academic years. The advisory committee determines the equivalent of two academic years of effort at GMU. The basis for residency, as here defined, is effort in the intellectual community at GMU to complete the basic or core study area requirements of the comprehensive examinations, completion of the advanced specialty areas of study and the associated advanced specialty portions of the comprehensive examinations, and preparation of 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 in this area. Area professionals with outstanding credentials and interests in information technology are solicited as Visiting Industrial Professors at GMU. They may serve on doctoral advisory committees and, where permitted by available time and interests, direct doctoral dissertations.

Approved Core Curriculum Courses

Computer Science:
- CS 521 Software Design and Development
- CS 540 Language Processors
- CS 571 Operating Systems
- CS 580 Introduction to Artificial Intelligence
- CS 583 Data Structures and Analysis of Algorithms

Electrical and Computer Engineering:
- ECE 500 Signals and Systems: Theory and Applications
- ECE 511 Microprocessors, Microcomputers and Applications I
- ECE 521 Modern Systems and Control Theory
- ECE 528 Random Processes in Electrical and Computer Engineering
- ECE 542 Computer Network Architecture and Protocols

Information Systems and Systems Engineering:
- SYST 660 Elements of Systems Engineering
- SYST 661 Economic System Analysis

INFS 712 Data Communications
INFS 714 Database Management Systems

Operations Research and Applied Statistics:
- OR 541 Operations Research I
- OR 542 Operations Research II
- STAT 644 Applied Probability
- STAT 654 Applied Statistics

Information Technology Courses (INFT)

Graduate courses listed under the departments of Computer Science, Electrical and Computer Engineering, Information Systems and Systems Engineering, and Operations Research and Applied Statistics are appropriately considered as courses forming an inherent part of this program.

500 Quantitative Foundations for Information Systems Analysis (3:3:0). Prerequisite: MATH 106 or an equivalent one-semester undergraduate introductory calculus course covering both differential and integral calculus. Course 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.

796, 797 Directed Reading and Research (1-3). Reading and research on a specific topic in information technology under the direction of a faculty member. May be repeated as needed.

800, 801 Doctoral Seminar in Information Technology (1). A weekly seminar in information technology with interactive participation by students, faculty, and invited specialists.

803, 804 Doctoral Tutorial in Information Technology (3). Individualized intensive study of particular aspects of information technology. May be repeated as needed.

811 Machine Learning (3:3:0). Prerequisite: CS 580, CS 681, or permission of instructor. Introduction to machine learning. Topics cover past and current developments in machine learning.

812 Advanced Topics in Natural Language Processing (3:3:0). Prerequisite: CS 680 or permission of instructor. Advanced treatment of topics in syntax, semantics and generation of linguistic output. Implementation and applications are also discussed.

815 Parallel Computation (3:3:0). Prerequisite: CS 635 or permission of instructor. Topics illustrate some of the contemporary thinking on the relationships between the architectural, algorithmic, and language requirements for parallel computers.

816 Parallel Architectures, Algorithms, and Applications (3:3:0). Prerequisite: CS 583 and Computer Architecture course or permission of instructor. 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 stud-
ied, and applications to artificial intelligence, image processing, and database machines are explored.

817 Neural Networks (3:3:0). Discussion of the development of basic principles for neural networks. Certain analytical models, such as Hopfield, Anderson, Kohonen, Grossberg, etc., are discussed along with their advantages and disadvantages. Applications of neural networks are covered concerning problems in computer vision, memory organization, knowledge-based systems, and adaptive systems. Hardware for parallel and distributed systems are also discussed.

821 Software Engineering Seminar (3:3:0). Prerequisite: CS 621 or permission of instructor. This seminar studies the application of software engineering principles, design methods, and support tools through real-life problems extracted from faculty/industry projects.

830 (formerly ECE 634) Detection and Estimation Theory (3:3:0). Prerequisite: ECE 528. 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 estimation of signal parameters in AWGN and ACGN, estimation of Gaussian waveforms in Gaussian noise, linear MSE estimation, Kalman and Wiener filters.

832 Speech and Image Coding (3:3:0). Prerequisite: ECE 535, ECE 632. Study of waveform coding concepts and algorithms and their applications to the analysis and design of data compression systems. Specific schemes involving speech and image coding are discussed. Topics include statistical properties of speech and image signals, rate distortion theory, predictive and adaptive coding techniques, optimum quantization and bit assignment algorithms.

833 (formerly ECE 639) Satellite Communication (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 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, optical satellite communications.

835 Architectures for Knowledge-Based Vision Systems (3:3:0). Prerequisite: ECE 644 or equivalent. Introduction to knowledge-based vision systems. Topics include image analysis, vision system architectures (human visual system, homogeneous, heterogeneous, autonomous), vision system operations (focus and zooming), picture recognition languages, introduction to knowledge-based and expert systems, learning algorithmic schemes, applications. Course includes a design project.

840 (formerly ECE 651) Advanced Robotics (3:3:0). Prerequisite: ECE 650 or permission of instructor. Review of state-of-the-art in theoretical and software aspects of robotics. Topics include compliance, flexible manipulators, intelligent task planning, collision avoidance, grasping and pushing, dexterous manipulation with multifingered hands, coordination of multiple manipulators, legged locomotion, autonomous navigation, robot languages, intelligent control, integration of sensory information, visual servoing, robot learning.

841 State Estimation and Stochastic Control (3:3:0). Prerequisite: ECE 521 and 528 or permission of instructor. Detailed treatment of stochastic control theory and its applications. Topics include state space models with random inputs, optimum state estimation, Kalman filtering. Linear Quadratic Gaussian problem, minimum variance control, computational issues, and various applications.

842 Computer-Aided Control System Design (3:3:0). Prerequisite: ECE 620 or 624. Introduction to computer-aided control system design and current research topics in the integration of artificial intelligence techniques to computer-aided control system design. Course prepares doctoral students for conducting research. Topics include control system design using existing CAD methods, representation of design knowledge, integration of algorithmic and heuristic approaches to system design, intelligent user interfaces for computer-aided design, and intelligent design tutors.

843 Computer-Aided Control System Design (3:3:0). Prerequisite: ECE 620 or 624. Investigation of available computer-aided design (CAD) methods and current research in application of artificial intelligence to the computer-aided design of dynamic systems. Applications in computer-aided control system design. Topics include control system design using existing CAD methods, representation of design knowledge, integration of algorithmic and heuristic approaches to system design, intelligent user interfaces for computer-aided design, and intelligent design tutors.

844 Pattern Recognition (3:3:0). Prerequisite: ECE 521 and ECE 528 or equivalent or permission of instructor. Study of mathematical methods in pattern recognition. Topics include perceptions, categorization, induction, entropy minimization, covariance diagonalization, statistical decision making, discrimination, feature selection, learning, fuzzy objective function clustering, string and high dimensional pattern grammars, stochastic languages, error-correcting automata, grammatical inference.

845 High Frequency Electronics (3:3:0). Prerequisite: ECE 520 or permission of instructor. Study of devices and circuits used in high-speed communication systems. Topics include microwave bipolar transistors, GaAs MOSFETs, and high-speed integrated circuits; the design of linear and power amplifiers using S-parameter techniques and computer simulation.

846 Optical Signal Processing (3:3:0). Prerequisite: ECE 565. Study of optical systems for processing temporal signals and images. Topics include use of coherent optical systems for image processing and pattern recognition, principles of holography, acousto-optic systems for radar signal processing, and optical computers.

857 Automated Planning and Problem Solving (3:3:0). Prerequisite: CS 580 or permission of instructor. 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 or permission of instructor. Examines the relevance of logic theory to artificial intelligence. Familiarizes 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, non-monotonic 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: SYST 624/CS 624 or permission of instructor. Provides 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 potential impact of emerging technologies in this field. A term project in the design and analysis of a complex real-time software system is undertaken.

878 Statistical Analysis of Signals (3:3:0). Prerequisite: STAT 644 and 658 or equivalent. Advanced course in the analysis of discrete- and continuous-time signals using methods of stochastic differential equations and time series. Familiarity with the methods of harmonic analysis and times series modeling is presumed. Topics include state-space modeling and eigen-value processing, nonlinear modeling of signals, non-Gaussian stochastic process structure, detection and estimation of vector-valued signals, robust signal detection, array processing and target tracking. Relevant computational architectures such as systolic arrays are also discussed.

880 Queuing Modeling of Computer-Communication Networks (3:3:0). Prerequisite: Doctoral standing or permission of instructor. 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.

881 Numerical Methods for Mathematical Optimization (3:3:0). Prerequisite: OR 641, 642, 643, or 644 and knowledge of a scientific programming language (preferably FORTRAN). Study of computational issues related to the solution of linear, integer, and nonlinear programming problems. Topics include the use of list processing, AI, parallel processing, efficient inversion techniques, and numerical analysis procedures. Complexity analysis and the structure of algorithms. Recent results relating to the worst case and average case performance of algorithms. Survey of the leading software. Students use, alter, and develop software throughout the course.

882 Advanced Topics in Combinatorial Optimizations (3:3:0). Prerequisite: OR 641, 642, and admission to Ph.D. Program or permission of instructor. Study of recent advances in the solution of large integer programming problems using the polyhedral structure of the problem. Topics include the facial structure of a variety of real-world problems, methodology for developing cutting planes based on this polyhedral structure, reformulation procedures, group theoretic results, solving equations in integers, and the use of subadditive duality. Topics stress the most recent developments in the field.

883 Advanced Topics in Nonlinear Programming (3:3:0). Prerequisite: OR 644 and admission to SITE doctoral program or permission of instructor. Study of algorithms for solving nonlinear constrained and unconstrained problems. Study of current literature on methods for globally solving nonconvex problem and factorable programming techniques. Other possible topics are quasi-convexity, recent duality results, complementary pivot theory, quadratic and stochastic programming, max-min problems and some problems in optimal control.

910 Advanced Topics in Artificial Intelligence (3:3:0). Prerequisite: CS 680, 681, or 682. Special topics in artificial intelligence not occurring in the regular computer science sequence. Seminar format requires substantial student participation. Subject matter may include continuation of existing 600- or 700-level courses in artificial intelligence and/or other topics such as machine learning, intelligent tutoring systems, and mechanical theorem-proving. Course may be repeated for credit when subject matter differs.

915 Advanced Topics in Parallel Computation (3:3:0). Prerequisite: INFT 815. Seminar discusses 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).

921 Advanced Software Engineering Seminar (3:3:0). Prerequisite: INFT 721 and CS 580. Advanced software engineering topics currently in research laboratories, or which have received only empirical treatment. Topics may include special application areas (as opposed to nontraditional applications), such as artificial intelligence, as well as important industry-related software issues which have far-reaching consequences, like software configuration management.

930 Multichannel Statistical Signal Processing (3:3:0). Prerequisite: INFT 830. Study of topics in multichannel estimation and detection theory, with emphasis on the multivariate gaussian noise model. Multivariate distribution theory, including the Wishart, matrix-t, and multivariate-beta distributions, including radar and sonar signal processing applications. The general linear model and its application in adaptive and signal processing. Other topics include spectral analysis via principal components, tests for the dependence of several stochastic inputs, and analysis of covariance structures.

931 (formerly ECE 636) Secure Telecommunication Systems (3:3:0). Prerequisite: ECE 632 and 633. Introduction to secure data and voice communications. Topics include theoretic basis of cryptography, random cipher systems, practical security schemes, linear and nonlinear shift registers and encryption algorithms, block encipher and NBS data encryption standard (DES), public key cryptography, RSA, knapsack algorithms, digital signatures and authentication, security of computer networks,
932 (formerly ECE 637) Spread Spectrum Communications (3:3:0). Prerequisite: ECE 631. Fundamentals of spread spectrum communications. Major topics include pseudo-noise spread spectrum systems, acquisition, synchronization, time-hopping, frequency hopping, and multiple-access communication.

933 Modeling and Analysis of Integrated Services Digital Networks (3:3:0). Prerequisite: ECE 631 and 642. Study of integrated services digital networks. Topics include queueing, modeling, and analysis of digital circuit-switching systems; integrated data and voice multiple access schemes; ISDN layered architectures; ISDN protocols; transmission technologies and system implementations.

935 Knowledge-Based Systems for Text Translation (3:3:0). Prerequisite: INFT 835 or equivalent. Current topics for text processing, analysis and translation. Topics include automatic text reading and reconstruction systems; computational linguistics; syntax analysis; semantic analysis and interpretation; discourse analysis and information structuring; text generation; text abstractions; strategies in machine translation and R & D; sublanguages for automatic translation, knowledge-based machine translation; basic theory and methodologies in EUROTIRA and GMTP projects; machine translation as an expert task; human-machine interaction in translation; reflections on knowledge needed to process formed languages.

936 Advanced Computer Architecture Seminar (3:3:0). Prerequisite: ECE 641 or equivalent. Current topics of advanced research in computer architecture. Topics include data flow architecture; high-level language (HLL) architectures; multiprocessors: structure, algorithms, operating systems, RISC vs. CISC Architecture, distributed systems. Discussion of commercial advanced architecture systems.

940 Advanced Topics in Control Robotics (3:3:0). Prerequisite: Permission of instructor. Advanced and newly developed topics in control and robotics. Content varies depending on current faculty interest and student demand. Topics such as knowledge-based control, intelligent control, hierarchical and distributed control, robust control, and reasoning under uncertainty.

941 System Identification and Adaptive Control (3:3:0). Prerequisite: ECE 528, ECE 624. Advanced treatment of identification and adaptive control. Topics include identification algorithms, their convergence and accuracy, computational aspects. Model reference and self-tuning adaptive control, transients, stability and robustness. Intelligent schemes to improve robustness. Students are also required to study the literature individually and to complete a computer project.

943 Models of Approximate Reasoning (3:3:0). Prerequisite: CS 580, STAT 644, or permission of instructor. Survey of mathematical tools and algorithms for the modeling and utilization of certain knowledge in approximate reasoning. Topics include Bayesian theory, fuzzy logic, the Dempster-Shafer theory, evidential reasoning, probabilistic logic, multiattribute utility theory, confirmation theory, theory of endorsements, nonmonotonic reasoning, default reasoning, measures of information, knowledge fusion, propagation of beliefs in networks, and applications to knowledge support systems.

945 Advanced Topics in Microelectronics (3:3:0). Prerequisite: ECE 671, ECE 684, and INFT 845. Current topics of advanced research in microelectronics. Topics include Very High Speed Integrated Circuits (VHSICs), Monolithic Microwave Integrated Circuits (MMICs), Optoelectronic Integrated Circuits (OICs), novel device structures and advances in semiconductor device technology.

950 Design and Management Aspects of Information Systems (3:3:0). Prerequisite: Admission to Ph.D. program in INFT, SYST 661, CS 521, GMGT 610, and ECON 642 or permission of instructor. Impact of organizations and management of information systems (IS) and vice versa. Problems of introducing IS; 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; economic analysis.

951 Software Productivity (3:3:0). Prerequisite: CS 580, SYS 660 or permission of instructor. 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. Macro-enhancement approaches to increasing the effectiveness and efficiency of software development with particular emphasis on requirements specifications.

952 Knowledge-Based Systems Applications (3:3:0). Prerequisite: SYS 660, CS 580, or permission of instructor. Analysis of the framework of applications of knowledge-based systems within information technology. Study of impact of KBS on systems such as computer integrated manufacturing, planning support systems, and distributed information systems. Comparison of procedural and non-procedural computer languages in support of decision processes in large scale systems.

958 Basic and Applied Decision Support Systems Technology (3:3:0). Prerequisite: Systems Engineering 660 or 661. Analysis of tools, techniques, and methods that contribute to the design, development, application, and evaluation of interactive computer-based decision support systems. Analysis of the 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.

960 Expert Database Systems (3:3:0). Prerequisite: CS 580, INF5 714, or permission of instructor. 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.

972 Mathematical Statistics (3:3:0). Prerequisite: STAT 652 or equivalent. Sampling distributions, point and interval estimation (Cramer-Rao theorem), testing of hypotheses (Neuman-Pearson tests, uniformly most powerful tests, sequential tests), linear models, distribution free methods.

976 Statistical Inference for Stochastic Processes (3:3:0). Prerequisite: STAT 646 or permission of instructor.
The Master of Arts in Interdisciplinary Studies (M.A.I.S.) is for students who seek master's degrees that integrate knowledge from several disciplines. The M.A.I.S. is nontraditional in that students design, with the help of faculty advisers, individualized programs of study that include courses from several academic departments. Therefore, students' programs are individualized, interdisciplinary, and unique. The M.A.I.S. degree program is divided into two tracks: Individualized Studies and Liberal Studies.

Individualized Studies

The Individualized Studies (IS) track is for students who have specific professional or career interests in interdisciplinary areas not served by traditional graduate programs. Students in this track combine courses from various disciplines appropriate to their particular career needs. Since the IS track is for professionally oriented students, applicants should demonstrate their career interests by prior work or educational experience in their proposed areas of concentration. Under the guidance of faculty advisers, students entering the program develop an area of concentration tailored to their particular interests. Students in the IS track may earn a maximum of 6 hours' credit for prior experiential learning related to their field of concentration.

Admission Requirements

Applicants to the IS track must first obtain counseling through the IS office. Application is completed after a student has applied to the Graduate School, submitted all undergraduate and graduate transcripts, submitted three letters of reference, and completed the application to the IS program.

Degree Requirements

The IS track requires that students complete at least 36 hours of course work. Up to 12 hours of transfer credit may be accepted, provided that
each course has a minimum grade of B and that the course work relates to the proposed area of concentration. In all cases, a minimum of 18 hours of classroom course work at George Mason University must be completed with a minimum grade of B (excluding credit for experiential learning and IS project or thesis credits). No more than 12 hours of course work within a single discipline taken at George Mason University may be offered toward the M.A.I.S. degree in the IS track. The extent to which transfer credit and credit earned at George Mason University in the same discipline may be offered toward the degree is determined on an individual basis.

The proposed course of study must be designed in collaboration with and approved by a full-time member of the George Mason University faculty. A 3-credit IS project integrating knowledge from the student’s area of concentration is required. With the approval of the faculty adviser, the chair of the adviser’s department, and the assistant dean for Individualized Study Programs, a 6-credit IS thesis may be substituted for the project.

Within the IS track, students may apply to one of two special concentrations: Telecommunications and International Transactions.

**Telecommunications Program**

This program is for telecommunications professionals, individuals who want to change careers into the telecommunications area, and others who want to broaden their knowledge and earn a master's degree in telecommunications. The curriculum integrates courses from business, communication, computer science, economics, engineering, English, information systems, and law into a 12-hour core curriculum and a 15-hour specialization in one of four telecommunications areas. Students must also complete an internship, directed readings/research, and a coordinating seminar. The State Council of Higher Education for Virginia has authorized a Master of Arts in Telecommunications to begin in fall 1990.

For more information, contact Michael R. Kelley, professor, Department of Telecommunications (323-3585), or James F. Sanford, assistant dean for Individualized Study Programs (323-2342).

**International Transactions Program**

This program is primarily for business and government professionals who seek an academic program linked to their professional needs and experiences in international business and culture, international science and technology exchange, international economics and trade, international politics, law and national security, and cross-cultural communications. The program is offered on the Arlington Campus and is closely affiliated with the Institute for International Transactions (ITT). The ITT provides a wide range of professional services and seminar courses (credit and non-credit) in international transactions.

The curriculum consists of 42 semester hours including one 3-hour foundation course, one 3-hour course in cross-cultural understanding, seven required core courses (21 hours), and five electives (15 hours). The core courses are innovative and interdisciplinary. Each is taught by an academically credentialed practitioner with hands-on expertise in one of the core areas of the program. The elective courses come from existing courses offered by other disciplines. The program approaches international transactions from a functional as opposed to a geographical perspective.

For additional information, contact James F. Sanford, assistant dean for Individualized Study Programs (323-2342).

**Liberal Studies**

The Liberal Studies (LS) track offers a broad course of study for those who wish to explore the fundamental ideas of Western culture within the context of contemporary society. In addition to appealing to students who wish to broaden the humanistic dimension of their knowledge, this track is also valuable to business and professional people who need liberal studies to cope with the complex issues posed by modern society. Teachers, librarians, and other professionals often find that this program offers an alternative to graduate work in a single discipline. For the student with comprehensive goals, the program may be more satisfying than participating in a series of unrelated courses. A student in the LS track chooses one broad area of concentration from four interdisciplinary topics: (1) technology and culture; (2) the secular and the sacred; (3) the arts and society; and (4) personal, social, and political values. Within the student's area of concentration, he or she pursues individually designed courses of study.

**Admission Requirements**

In addition to fulfilling the admission requirements of the Graduate School, an applicant to the LS track is expected to provide three letters of recommendation and a written statement of 750 to 1,000 words detailing the reasons for choosing this degree program rather than a more traditional one. Care should be given to the preparation of the statement. The applicant should cover the following issues in the statement: (1) In terms of your goals and objectives, why is the LS track of the M.A.I.S. more appropriate than a traditional master's program? (2) In view of the four
concentrations listed above, what interests do you wish to pursue within this degree? (3) How do you see this degree relating to your previous education and life experience?

Degree Requirements

The program is designed to provide students with a common framework for examining and understanding the origins, historical development, and contemporary impact of ideas and values characteristic of Western culture and to provide an opportunity for students to take individually designed courses of study leading to in-depth analysis of particular issues or problems of Western culture in contemporary society. The key factors in this design are core seminars, an interdisciplinary concentration in an approved topical area, supporting course work, and a master's thesis. Credit hours required for graduation total 36, including 6 hours in core seminars and at least 30 hours in course work at the 500-level or above, including the master's thesis. A student must complete all requirements for the degree within six years of matriculation.

Core Seminars

Seminar I. An entering student is required to take an introductory 3-hour graduate seminar during the first 9 hours of the program. This seminar introduces the student to the study of human culture, as well as to the unique features of Western culture—its origins and continuing historical development.

Seminar II. This seminar is designed to be the last course that the student takes before commencing work on a thesis. Through a problem or theme chosen by the professor, the student again turns to the question of culture. In this case, however, the student applies the knowledge gained from the introductory seminar, as well as from courses completed, particularly those in the area of concentration.

Interdisciplinary Concentration

With the assistance of an adviser, a student chooses an interdisciplinary project and area of study from among the following general topics:

- Technology and culture
- The secular and the sacred
- The arts and society
- Personal, social, and political values

Since each of these topics can be studied successfully from the perspective of several of the traditional academic disciplines (humanities, social sciences, etc.), students are expected to choose courses from supporting departments to complete their fields of study.

Course Work and Master's Thesis

Courses relating to the student's area of study may be selected, with approval of the student's adviser, from among the graduate offerings of the departments in the College of Arts and Sciences. Courses from other areas may also be selected if they contribute to an understanding of the student's project. At least six of the courses presented for the degree must be in the student's area of concentration.

The thesis is planned as the last major activity in the student's course of study in the chosen area of concentration. The thesis is an interdisciplinary study of a significant problem identified by the student, and approved by the adviser, arising out of the student's course work and research within the chosen area of concentration.

Interdisciplinary Studies Courses (MAIS)

510 Liberal Studies: The Phenomenon of Culture (3:3:0). Prerequisites: Graduate standing and/or permission of the instructor. Examination of various concepts of culture (e.g., anthropological, sociological, philosophical), with a view toward arriving at a concept of culture that allows us to account for the difference between cultures as well as the diversity that occurs within a culture. Using this understanding, we explore the unique features of Western culture, paying particular attention to a single idea, e.g., the idea of evolution, and the ways in which it reflects and has influenced the values and ideals of the West.

798 Individualized Studies Project (3:3:0). Prerequisites: Degree candidacy in Individualized Studies Track M.A.I.S., completion of 27 semester hours of graduate course work, approval of faculty adviser, and approval of assistant dean for Individualized Study Programs. Research project related to the student's individualized concentration taken under supervision of the faculty adviser.

799 Individualized Studies Thesis (6:0:0). Prerequisites: Degree candidacy in the Individualized Studies Track M.A.I.S., and acceptance by the Graduate School of a thesis proposal. An original research endeavor related to the student's M.A.I.S. program concentration. Research must result in a document meeting the Graduate School's standards listed in the Guide for Preparing Graduate Theses, Dissertations, and Projects.
Mathematics

Faculty
Alligood, Kathleen T., Ph.D., University of Maryland, 1979; Associate Professor
Cabell, Mary Kay, Ph.D., University of Virginia, 1960; Associate Professor
Colonna, Flavia, Ph.D., University of Maryland, 1985; Assistant Professor
Epstein, Bernard, Ph.D., Brown University, 1947; Visiting Professor
Fischer, Klaus G., Ph.D., Northwestern University, 1973; Associate Professor
Gabel, Michael R., Ph.D., Brandeis University, 1972; Associate Professor
Glaz, Sarah, Ph.D., Rutgers University, 1977; Associate Professor
Kiley, W. Thomas, Ph.D., Brown University, 1969; Associate Professor
Kulesza, John S., Ph.D., State University of New York, Binghamton, 1987; Assistant Professor
Lawrence, James F., Ph.D., University of Washington, 1975; Associate Professor
Lawrence, L Brian, Ph.D., State University of New York, Binghamton, 1984, Assistant Professor
Levy, Ronald F., Ph.D., Washington University, 1974; Professor
Lim, Teck-Cheong, Ph.D., Dalhousie University, 1974; Associate Professor
Lin, Jeng-Eng, Ph.D., Brown University, 1976; Associate Professor
Loustauau, Philippe, Ph.D., University of Wisconsin, Milwaukee, 1988; Assistant Professor
McDaniel, Andrew L., Ph.D., Brandeis University, 1985; Assistant Professor
Morris, Walter D., Jr., Ph.D., Cornell University, 1986; Assistant Professor
Saperstone, Stephen H., Ph.D., University of Maryland, 1970; Professor, Department Chair
Sauer, Timothy D., Ph.D., University of California, Berkeley, 1982; Assistant Professor
Shapiro, Jay A., Ph.D., Rutgers University, 1975; Associate Professor
Singman, David H., Ph.D., McGill University, 1980, Assistant Professor
Smith, John M., Ph.D., University of Maryland, 1970; Professor
Struppa, Daniele C., Ph.D., University of Maryland, 1981; Professor
Thomas, Romeo F., Ph.D., University of Warwick, 1979; Assistant Professor
Zoltek, Stanley M., Ph.D., State University of New York, Stony Brook, 1976; Associate Professor

Mathematics, M.S.

The Department of Mathematical Sciences offers courses in pure and applied mathematics leading to the M.S. in mathematics. The program trains students in areas relevant to the needs of business, industry, government, and the teaching profession and provides the necessary background for advanced graduate work. Two specializations within the program allow the students, if they wish, to concentrate their studies in either operations research or statistics. Limited financial aid is available in the form of a research or teaching assistantship.

Admission Requirements
In addition to fulfilling the Graduate School admission requirements, applicants must have three letters of recommendation and extensive undergraduate training in mathematics that includes courses similar to MATH 315 and 316 Advanced Calculus, and MATH 322 Linear Algebra. MATH 611 and 612 Intermediate Analysis and Algebra present some of the highlights of these prerequisite courses and sharpen the skills necessary to enable a student to enter the degree program. GRE exams are recommended but not required.

Degree Requirements
In addition to fulfilling the Graduate School degree requirements, the candidate must:
1. Complete at least 30 semester hours of graduate work. Some of these hours may be from courses in related disciplines. See the graduate coordinator for the current list of approved courses.
2. Complete Algebra I (MATH 621) and Linear Analysis I (MATH 675).
3. Complete a research component of the degree: Thesis 799/Seminar 795/796. This component must be at least 3 hours and may not exceed 9 hours. No more than 6 hours of either thesis or seminar may be applied toward the 30-hour minimum requirement for the degree.
4. Pass the departmental examination. This oral exam is to be taken near the completion of the degree and tests the cumulative skills acquired by the student. The student is examined on
material from the two required courses and from one advanced topic beyond the basic courses. This advanced topic is chosen by the student in consultation with the graduate coordinator.

**Course Work**
The department offers courses in pure and applied mathematics, including Real and Complex Analysis, Algebra, Topology, Geometry, and Differential Equations. These include all courses prefixed by MATH. A complete list appears below. Courses prefixed by OR and STAT are offered by and listed with the Department of Information Systems and Systems Engineering.

**Options in Operations Research and Statistics**
Students may specialize in operations research or statistics instead of the standard mathematics curriculum.

**Operations Research**
This specialization allows students to concentrate their studies on mathematical models and methods that are used to analyze complex real-world decision problems in both the private and public sectors.

The following requirements apply to this specialization:

1. In addition to satisfying the general degree requirements of the department, students must complete a minimum of four courses prefixed by OR. Three of these must be at the 600 level or higher. Students must complete OR 541 and 542 Operations Research I and II.
2. The departmental examination must consist of the basic unit in operations research and the advanced unit in any area.

**Statistics**
This specialization allows students to concentrate their studies in the theory and practice of the methods and techniques of statistical analysis. The following requirements apply to this specialization:

1. In addition to satisfying the general degree requirements of the department, the student must complete the following:
   - MATH 651 Probability
   - STAT 652 Statistical Inference or MATH 752 Mathematical Statistics
2. The student must complete three of the following courses:
   - STAT 653 Survey Sampling
   - STAT 654 Applied Statistics
   - STAT 655 Analysis of Variance
   - STAT 656 Regression Analysis
   - STAT 657 Nonparametric Statistics
   - STAT 659 Topics in Statistics

3. The department examination must consist of the basic unit in the area of statistics and an advanced unit in any area.

**Mathematical Sciences Courses (MATH)**
A double number separated by a comma (MATH 771, 772) 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 chair. See also STAT and OR courses.

601 Principles of Analysis I (2:2:0). Prerequisite: The calculus sequence and permission of instructor. A fast-paced development of calculus including differentiation, integration, numerical methods, Fourier series, vector analysis, multivariate calculus. Prior exposure to some of the topics is assumed. Although open to all graduate students, the course is intended for those entering the graduate programs in the School of Information Technology and Engineering. Credit is not applicable toward the M.S. in mathematics.

602 Principles of Analysis II (2:2:0). Prerequisite: The undergraduate calculus sequence and permission of instructor. A fast-paced development of topics from advanced calculus including ordinary differential equations, complex analysis, Laplace and Fourier transforms. Prior exposure to some of the topics is assumed. The course is intended for students entering the graduate programs in the School of Information Technology and Engineering. Credit is not applicable toward the M.S. in mathematics.

603 Principles of Linear Algebra (1:1:0). Prerequisite: A course in linear algebra and permission of instructor. A fast-paced development of linear algebra including linear equations, matrices, vector spaces, linear transformations, inner products, and norms. Prior exposure to some of the topics is assumed. The course is intended for those entering the graduate programs in the School of Information Technology and Engineering. Credit is not applicable toward the M.S. in mathematics.

604 Principles of Discrete Mathematics (1:1:0). Prerequisite: Permission of instructor. A fast-paced development of discrete mathematics including combinatorics, difference equations, graphs, trees, and digital systems. Prior exposure to some of these topics is assumed. The course is intended for students entering the graduate programs in the School of Information Technology and Engineering. Credit is not applicable toward the M.S. in mathematics.

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 mathematics, but can be counted toward the master of education.

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 mathematics but can be counted toward the master of education.

620 Applied Matrix Analysis (3:3:0). Prerequisite: MATH 612, 303 or 322. Review of vector and matrix arithmetic, Gaussian elimination, linear programming, eigenvalues, the Jordan form, linear differential systems, positive definite matrices, Markov processes, game theory, applications to numerical analysis, optimization, economic and ecological systems. Emphasis on modeling using matrix algebra to give full view to its applicability.

621 Algebra 1 (3:3:0). Groups, linear algebra, matrix groups.

623 Algebraic Coding Theory (3:3:0). Prerequisite: MATH 303 or permission of instructor. 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.

625 Numerical Linear Algebra (3:3:0). Prerequisite: A course in linear algebra and some programming ability. Computational procedures for linear systems, least-square problems, and eigenvalue problems, with an emphasis on error analysis.

629 Topics in Algebra (3:3:0). Prerequisite: Permission of instructor. Special topics in pure or applied algebra not covered in the regular algebra sequence. May be repeated for credit.


637, 638 Non-Euclidean Geometry I, II (3:3:0), (3:3:0). Prerequisite: Permission of instructor. Affine, projective, hyperbolic, elliptical, differential geometry, transformations and elementary combinatorics.

639 Topics in Topology and Geometry (3:3:0). Prerequisite: Permission of instructor. 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). Prerequisite: Permission of instructor. 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.

644 Combinatorics and Convexity (3:3:0). Prerequisite: Permission of instructor. Separation theory of convex sets, polarity, duality theorems of convex optimization, valuation theory, combinatorial aspects of convexity, and applications to linear and integer programming.

651 Probability Theory (3:3:0). Axioms for a probability space, conditional probability, random variables, distribution functions, moments, characteristic functions, modes of convergence, limit theorems.


671 Fourier Analysis (3:3:0). The 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.


676 Linear Analysis II (3:3:0). Prerequisite: MATH 675 or permission of instructor. Analysis of bounded and unbounded operators, spectral theorems, differential operators, applications. A brief account of Lebesque integration theory may be included.


678 Partial Differential Equations (3:3:0). Prerequisite: MATH 303 and 304. 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). Prerequisite: Permission of instructor. Special topics in analysis not covered in the regular analysis sequence. May be repeated for credit.

681, 682 Systems Optimization and Control I, II (3:3:0), (3:3:0). Prerequisite: MATH 651 or equivalent and MATH 675 or permission of instructor. Systems of linear differential equations, optimization of linear dynamical systems, controllability and optimal control of linear systems, Gauss-Markov Processes, Kalman filtering. Applications to networks, aerospace, information processing.

685 Numerical Analysis (3:3:0). Prerequisite: Linear algebra, advanced calculus or its equivalent and some programming ability. A study of computational methods with an emphasis on error analysis in linear algebra, approximation theory, nonlinear equations, and numerical differentiation and integration.


689 Topics in Applied Mathematics (3:3:0). Prerequisite: Permission of instructor. Special topics in applied math not covered in the regular applied math sequence. May be repeated for credit.

697 Independent Reading and Research (1-3:3:0). Prerequisite: Graduate standing and permission of instructor. In areas of importance, but insufficient demand to justify a regular course, an individual student may undertake a course of study under the supervision of a consent-
ing faculty member. A 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. A literature review, project report, or other written product is normally required. May be repeated for a maximum of 9 credits.

722 Algebra II (3:3:0). Prerequisite: MATH 621 or permission of instructor. Rings, fields, Galois theory.

752 Mathematical Statistics (3:3:0). Prerequisite: MATH 651. Sampling distributions, point and interval estimation (Cramer-Rao theorem), testing of hypotheses (Neuman-Pearson tests, uniformly most powerful tests, sequential tests), linear models, distribution free methods.

795, 796 Seminar (3:3:0). (3:3:0).

799 Thesis (1-6:0:0). Original or compilatory work to be evaluated by a committee of three faculty members.

800 Studies for the Doctor of Arts in Education (varied credit). Prerequisite: D.A. Ed. admission to study in mathematics. 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. The paper is presented in a subsequent D.A.Ed. summer seminar. Enrollments may be repeated.

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 twenty-first century. Each year, despite the sagging economic situation, opportunities increase for creative work by performers, composers, sculptors, painters, dancers, actors, historians, theoreticians, and musicologists.

The Master of Arts with Specialization in Music has been developed by the Department of Music 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, music education, composition, conducting, and accompanying.

Admission Requirements

In addition to fulfilling the admission requirements of the Graduate School, the applicant is expected to hold a baccalaureate degree in music. Before admission to degree status, students must submit two letters of recommendation. The following concentration admission requirements must also be met:

Performance: Audition
Music Education: Certification to teach music in the public schools
Composition: Submission of a portfolio of compositions and an interview with a faculty committee
Conducting: Audition
Accompanying: Audition

Degree Requirements

A student must successfully complete 30 hours of credit in graduate music courses. With the approval of the department, 3 hours of nonmusic graduate credit may be taken.

The student must satisfy the following requirements:

General Requirements (11 credits):

- Introduction to Research in Music (3)
- Analytical Techniques (3)
- History and Literature of Music (3)
- Ensemble (2)

Additional requirements for the concentration in Performance (19 credits):

Music

Faculty

Brawley, Thomas M., Ph.D., Northwestern University, 1975; Associate Professor
Burton, Stephen D., M.M., Peabody Conservatory of Music, 1974; Professor
di Bonaventura, Sam, D.M.A., Peabody Conservatory of Music, 1964; Professor
Gabriel, Arnald D., M.S., Ithaca College, 1953; Professor
Giles, Martha M., D.Mus.Ed., University of Oklahoma, 1977; Assistant Professor
Hill, Thomas H., D.M.A., The Catholic University of America, 1970; Associate Professor
Kanyan, Joseph M., D.M.A., The Catholic University of America, 1972; Associate Professor
Maiello, Anthony J., M.S., Ithaca College, 1967; Professor
Smith, Glenn E., D.Mus., Indiana University, 1973; Associate Professor
Smith, James G., D.M.A., University of Illinois, 1973; Professor

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Additional requirements for the concentration in
Music Education (19 credits):
- Psychology of Music Teaching and Learning (3)
- Aesthetics of Music Education (3)
- Thesis (6) or Orff Schulwerk certification (9)
- Electives (4-7)

Before receiving the degree, students in this concentration must complete the equivalent of one year of full-time public/private school music teaching. Before beginning the thesis or upon completion of Orff Schulwerk certification, students must pass a comprehensive examination in music education.

Additional requirements for the concentration in
Composition (19 credits):
- Graduate Private Music Instruction—Composition (9)
- History and Literature of Music (3)
- Graduate Recital (1)
- Electives (3)

Additional requirements for the concentration in
Conducting (19 credits):
- Graduate Private Music Instruction—Conducting (6)
- Advanced Topics in Conducting (3)
- Orchestration (3)
- Graduate Recital (1)
- Electives (6)

The number of students accepted as graduate conducting majors is limited by the extent to which it is possible to provide them 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 GMU ensemble.

Additional requirements for the concentration in
Accompanying (19 credits):
- Graduate Private Music Instruction—Accompanying (9)
- History and Literature of Music (3)
- Chamber Ensembles (1)
- Graduate Recital (Vocal Accompanying) (1)
- Graduate Recital (Instrumental Accompanying or Chamber Music) (1)
- Electives (4)

The entering graduate student in this concentration must show evidence of having completed one semester of study (or its equivalent) in each of the following foreign languages: French, German, Italian. Deficiencies in this area can be remedied by completing one semester of undergraduate study for each of the languages not previously studied. The recommended music history and literature courses are in the vocal, operatic, or chamber music areas.

**Holbert L. Harris Theatre**
The Holbert L. Harris Theatre, in Robinson Hall, is George Mason's Main Campus performance facility for dance, music, and theatre. This 533-seat modified proscenium theatre houses dance events, music concerts, recitals, theatre productions, and major conference events.

**Music Courses (MUSI)**

**511 Analytical Techniques (3:3:0).** Prerequisite: Baccalaureate degree in music or permission of instructor. A 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 degree in music with a minimum of 3 hours of study in orchestration or permission of instructor. Intensive study through analysis and arranging of advanced methods of instrumentation. Scoring for large forces. Twentieth-century vocal and instrumental techniques such as multiphonics. Unusual instruments. New methods of notation. Late twentieth-century performance practices.

**513 Advanced Topics in Music Theory (3:3:0).** Prerequisite: Baccalaureate degree in music or permission of instructor. Intensive study and analysis of music from the theoretical point of view, comparing trends in compositional techniques through various works. May be repeated for credit as topics change.

**531 Advanced Topics in Music History and Literature (3:3:0).** Prerequisite: Baccalaureate degree 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 are studied in historical and/or analytical contexts. May be repeated for credit as topics change.

**541 Chamber Music Literature (3:3:0).** Prerequisite: Baccalaureate degree in music or permission of instructor. Historical and analytical study of the extensive literature for chamber ensembles (trios through nonets) in various instrumental combinations, from the seventeenth through the twentieth centuries.

**543 Concerto Literature (3:3:0).** Prerequisite: Baccalaureate degree in music or permission of instructor. Historical and analytical study of the concepts which produced the concerto form and its extensive literature, from the seventeenth through the twentieth centuries.
561 Advanced Topics in Music Education (1-3:1-3:0). Prerequisite: Degree in music education 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. Field experience may be required.

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.

581 Graduate Choral Ensembles (1:0:3). Prerequisite: Audition. Performance of works from the choral repertoire. Public concerts are given. May be taken for credit four times.

583 Symphonic Winds (1:0:3). Prerequisite: Audition. Performance of works from the band repertoire. Public concerts are given. May be taken for credit four times.

585 Chamber Ensembles (1:0:3). Prerequisite: Audition. Performance of works from the chamber music repertoire. Public performances are given. May be taken for credit four times.

587 Symphony Orchestra (1:0:3). Prerequisite: Audition. Performance of works from the symphony orchestra repertoire. Public concerts are given. May be taken for credit four times.

597 Advanced Topics in Conducting (3:3:0). Prerequisite: Baccalaureate degree in music with a minimum of two semesters' study in conducting, or permission of instructor. Intensive study of an advanced topic in conducting chosen according to interests of students and instructor from such topics as the following: (1) Choral Music Performance Techniques and Score Preparation; (2) Wind Ensemble Performance Techniques and Score Preparation; (3) Orchestral Performance Techniques and Score Preparation; (4) Performance Practices in Choral Music before 1750; (5) Rhythmic Analysis as a Guide to Score Interpretation in Music of All Periods. Maximum of 6 credits may be earned.

662 Introduction to Research in Music Education (3:3:0). Prerequisite: Baccalaureate degree in music with certification to teach music or permission of instructor. Development of skills, attitudes and understanding necessary in doing and reporting research in the teaching of music, including philosophical bases, scope and organization, stylistic practices in writing the research report, the study of materials and resources in music, education, music education, and the proper use of library and other research services.

663 Aesthetics of Music Education (3:3:0). Prerequisite: Baccalaureate degree with certification to teach 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.

671, etc. Graduate Private Music Instruction. See descriptions at end of music section.

684 Graduate Lecture-Recital (1-3:0:0). Corequisite: Graduate Private Music Instruction at the 3-credit level. A combination of musical performance and scholarly presentation on a well-defined topic. A public presentation is required. Preparation of the program is directed by a member of the full-time music faculty in consultation with the student's private music instructor. May be taken for a maximum of 6 credits.

688 Advanced Musical Theatre Techniques (1-3:1-2:6). Prerequisite: Audition and permission of instructor. Preparation and presentation of works or parts of works from the musical theatre repertoire (opera, operetta, musical comedy). One hour of lecture per week and (for each credit pursued) 2 hours of practicum per week. Students will investigate applicable techniques through topically organized lectures and assignments, and in goal-oriented practicum sessions and rehearsals. Public performance(s) will be given.

699 Independent Study (1-3:0:0). Prerequisite: Baccalaureate degree in music and permission of the music faculty and the department chair. Individual research and study in one of the areas of concentration available in the master of arts degree in a major in music. May be taken for a maximum of 6 credits.

798 Graduate Recital (1:0:0). Prerequisite: At least 3 credits in Graduate Private Music Instruction in the area of concentration at the 3-credit level. A public performance in the area of concentration.

800 Studies for the Doctor of Arts in Education (variable credit). Prerequisite: Open only to D.A.Ed. students admitted to study in music. 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, performing, or creative activity of the discipline director and results in a paper reporting the original contributions of the student. The paper is presented in a subsequent D.A.Ed. summer seminar. Enrollment may be repeated.

Graduate Private Music Instruction

To earn 2 or 3 credits per semester, a student takes 14 one-hour private music lessons. In Graduate Private Music Instruction—Accompanying, a number of these may be spent in a group-practicum at the instructor's discretion. The 3-credit sequence is designed for students who work toward the M.A. degree with a concentration in performance, composition, conducting, or accompanying. Instruction is offered in piano, organ, harp, classic guitar, voice, the standard band and orchestral instruments, composition, conducting, and accompanying. The private music instruction fee applies.

621, 622, 623, 624 Graduate Private Music Instruction—Composition (2:0:1 for each).

625, 626, 627, 628 Graduate Private Music Instruction—Composition (3:0:1 for each). Prerequisite for MUSI 621 and 625: Portfolio of compositions submitted to the faculty and an interview with a faculty committee.

641, 642, 643, 644 Graduate Private Music Instruction—Accompanying (2:0:1 for each).

645, 646, 647, 648 Graduate Private Music Instruction—Accompanying (3:0:1 for each). Prerequisite for MUSI 641 and 645: Audition.

671, 672, 673, 674 Graduate Private Music Instruction—Instrumental/Vocal (2:0:1 for each).
675, 676, 677, 678 Graduate Private Music Instruction—Instrumental/Vocal (3:0:1 for each). Prerequisite for MUSI 671 and 675: Audition.

691, 692, 693, 694 Graduate Private Music Instruction—Conducting (2:0:1 for each).

695, 696, 697, 698 Graduate Private Music Instruction—Conducting (3:0:1 for each). Prerequisite for MUSI 691 and 695: Audition.

Nursing

Faculty

Allinger, Rita L., Ph.D., The Catholic University of America, 1974; Professor

Carty, Rita M., D.N.Sc., The Catholic University of America, 1977; Professor and Dean

Connelly, Catherine E., D.N.Sc., The Catholic University of America, 1979; Associate Professor

Conti, Roberta M., M.S.N., University of Maryland, 1969; Assistant Professor

Dear, Margaret, Ph.D., The Catholic University of America, 1979; Professor and Director of Nursing Research and Faculty Development

Dienemann, Jacqueline A., Ph.D., The Catholic University of America, 1983; Associate Professor

Ehleke, Graceann, D.N.Sc., The Catholic University of America, 1986; Assistant Professor

Fisher, Myra H., D.N.Sc., The Catholic University of America, 1978; Assistant Professor

Harper, Doreen C., Ph.D., University of Maryland, 1980; Associate Professor

Jenkins, Helen, Ph.D., University of Maryland, 1983; Associate Professor

Johnson-Brown, Hazel J., Ph.D., The Catholic University of America, 1978; Professor

Liu, Yuen Chou, Ph.D., New York University, School of Education, 1972; Associate Professor

Malloy, Catherine, Dr.P.H., University of Pittsburgh, 1980; Professor and Associate Dean for Academic Programs

Redmond, Georgine, Ed.D., Virginia Polytechnic and State University, 1987; Assistant Professor and Assistant Dean for Student Affairs

Silva, Mary E., Ph.D., University of Maryland, 1976; Professor

Vail, James D., D.N.Sc., The Catholic University of America, 1980; Associate Professor

Walker, Dorothy J., J.D., Boston College Law School, 1979; Professor

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 major is a collaborative program with George Washington School of Medicine and Health Sciences. The major 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 major in Nursing Administration prepares nurses to function in management positions in hospitals, nursing homes, community health agencies, and other health-related facilities. A variety of health care and health-related settings are used for clinical practice experiences.

Admission Requirements

In addition to meeting the Graduate School admission requirements, an applicant to this program must have a cumulative grade point average of 3.00 (on a 4.00 scale) for the last 60 hours of undergraduate work, hold an active license as a registered nurse, submit three letters of recommendation, and submit the results of the general test of the Graduate Record Examination. Applicants must have successfully completed undergraduate statistics and research courses.

Students applying to the majors in Advanced Clinical Nursing or Adult or Gerontological Nurse Practitioner in Primary Care must have successfully completed a 3-credit course in health assessment or its equivalent.

The Graduate School may offer provisional admission to a degree-seeking applicant even though all admission requirements for degree status have not yet been met if the applicants presents sufficient evidence to suggest a capacity to pursue graduate work. Students admitted provisionally must resolve all deficits and be moved to degree status by completion of 12 semester hours of graduate-level study.

Special Requirements

Graduate students are required to have annual health examinations and immunizations before enrolling in practicum courses.

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Degree Requirements
The master's program in nursing requires 36 semester hours of graduate credit. Of these, a 12-hour core consists of course work in the theoretical foundations of nursing, approaches to data analysis in nursing research, and a seminar in concepts of nursing research. The student has the option of writing a thesis or working on a research project. Twelve hours must be completed in the concentration areas of Adult or Gerontological Nurse Practitioner in Primary Care, Advanced Clinical Nursing, or Nursing Administration.

Core Courses—Required of all students:
NURS 755 Theoretical Foundations Related to Nursing (3)
NURS 759 Approaches to Data Analysis in Nursing Research (3)
NURS 790 Seminar in Concepts of Nursing Research (3)
NURS 791 Projects in Nursing Research (3) or NURS 799 Thesis (3-6)

Nursing Majors—Select one major
Major in Adult or Gerontological Nurse Practitioner in Primary Care
NURS 622 Clinical Concepts in Primary Care Nursing (3)
NURS 746 Practicum in Primary Care Nursing I (3)
NURS 748 Practicum in Primary Care Nursing II (6)
Nursing Support Courses:
*NURS 552/HCS 205 Clinical Diagnosis and Management of Health Deviations (5)
*NURS 554/HCS 207 Advanced Health Assessment (1)
Related Discipline Support Courses:
HCS 206 Clinical Decision Making (2)
PHARM 207 Pharmacology (4)

Major in Advanced Clinical Nursing
NURS 773 Advanced Clinical Nursing I (3)
NURS 775 Advanced Specialty Practice I (3)
NURS 776 Advanced Clinical Nursing II (3)
NURS 778 Advanced Specialty Practice II (3)
Nursing Support Courses:
NURS 550 Pathophysiological Bases of Health Deviations (3)
Nursing Elective (3)
Related Discipline Support Courses (6)

Major in 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 NURS 760 Health Care Finance (3)
NURS Support Course (3)
Related Discipline Support Courses:
Management/Organizational Theory (3) Recommended courses include SOCI 602, PUAD 620, PSYC 632, or MGMT 612
Related Discipline Support Course (3)

D.N.Sc. in Nursing Administration
The Doctor of Nursing Science (D.N.Sc.) program in Nursing Administration prepares nurses for executive roles in a variety of educational and health-related settings. The student chooses a concentration in nursing education or nursing service. Objectives of the D.N.Sc. in Nursing Administration program are to prepare nurse executives who will (1) demonstrate administrative skills that enable effective executive function in the chosen area of concentration, (2) synthesize research knowledge with decision making regarding participation in activities leading to the advancement of nursing science, and (3) analyze societal and governmental functioning to enable the exercise of leadership in the formulation and implementation of public policy in health care.

Admission Requirements
In addition to fulfilling the admission requirements of the Graduate School for degree status, the applicant must have earned a master's degree from an accredited program and have a minimum grade point average of 3.25 on a 4.00 scale in the master's program. The applicant must submit evidence of three years of nursing experience, at least one year of which must have been postbaccalaureate and in the selected area of concentration, nursing education, or nursing service. Graduate Record Examination (GRE) scores in the quantitative, verbal, and analytic areas must be submitted, along with evidence of current licensure to practice professional nursing. (Students on a foreign student visa must present evidence of profess-
sional standing in their respective countries.) The applicant must also provide evidence of professional liability insurance coverage and submit three letters of recommendation: one from an academic source, one from an administrative superior in the most recent position, and one from an administrative superior in the selected area of concentration. (If the latter two requirements are met by the same letter, the applicant must submit a third letter of recommendation from a professional nursing employment source.)

The Graduate School 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 completion of 12 semester hours of doctoral-level study.

Degree Requirements

In addition to Graduate School doctoral degree requirements, students must satisfy the specific D.N.Sc. degree requirements. To earn the D.N.Sc. degree at George Mason University the doctoral candidate must have earned a minimum of 90 graduate-level semester credits beyond the baccalaureate degree and a minimum of 60 graduate-level semester credits beyond the master's degree. A minimum of 48 graduate-level semester credits after admission to degree or provisional status in the D.N.Sc. 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-level credit hours toward the D.N.Sc. degree, but may present only graduate-level credits in which satisfactory grades have been earned and which meet the requirements of the D.N.Sc. curriculum.

A written qualifying examination must be successfully completed in addition to the program of studies outlined in the curriculum of the D.N.Sc. program in Nursing Administration. Successful completion of a dissertation for which 9 credits are awarded but to which no grade is assigned and the final oral doctoral examination are required.

Program of Study

The curriculum of the D.N.Sc. program in Nursing Administration includes the nursing core (24 semester hours), cognate core (3 semester hours), research core (21 semester hours), and nursing and related discipline electives (12 semester hours). Prior to advancement to candidacy and enrollment for dissertation credit, the student's program of study must be approved within the School of Nursing and by the dean of the Graduate School.

Internship in Nursing Administration

Students are required to enroll in a one-semester internship, NURS 865 Internship in Nursing Administration (6), for experiential learning in nursing administration, which includes planned seminars. For the internship, students are assigned to a nurse executive who serves as the preceptor in the student's area of concentration.

Qualifying Examinations

The written qualifying examinations serve as the candidacy examination in the D.N.Sc. program. The qualifying examinations are taken after the student has completed all course work or in the semester in which the student will complete all planned course work, excluding electives.

Advancement to Candidacy

After successful completion of the qualifying examinations, the dean of the School of Nursing recommends advancement to candidacy for approval by the dean of the Graduate School.

Doctoral Dissertation Proposal

Students must have participated in the NURS 990 Advanced Empirical Nursing Research Seminar prior to submitting the doctoral dissertation proposal. The proposal must focus on a topic in nursing administration and must be approved by the Doctoral Supervisory Committee, doctoral program coordinator, School of Nursing dean, and Graduate School dean. The dissertation proposal and written dissertation must be consistent with the guidelines of the Graduate School of the university outlined in Guide for Preparing Graduate Theses, Dissertations, and Projects.

Doctoral Dissertation

Prior to enrolling for dissertation credit, the student must have been advanced to candidacy. The student must also have an approved program of study and an approved doctoral dissertation proposal. In addition, the Graduate School dean must have appointed the student's Doctoral Supervisory Committee. The student's completed dissertation must be approved by the Doctoral Supervisory Committee, School of Nursing dean, and Graduate School dean.

Final Oral Doctoral Examination

The chair of the Doctoral Supervisory Committee, upon preliminary approval of the doctoral dissertation by the committee, petitions the dean of the Graduate School to schedule the final oral doctoral examination, which includes a defense of the doctoral dissertation. The final oral doctoral
examination also demonstrates the D.N.Sc. candidate's intellectual command and maturity of judgment in the area of concentration chosen by the candidate and approved by the Doctoral Supervisory Committee. At the close of the final oral doctoral examination, the Doctoral Supervisory Committee makes a final judgment regarding approval of the doctoral dissertation and successful completion of the D.N.Sc. degree requirements. The original and two copies of the approved doctoral dissertation must be submitted to the Graduate School for approval by the graduate dean.

Time Requirements

The student must complete all planned course work, excluding electives, and must advance to candidacy within five years of admission to degree or provisional status in the D.N.Sc. program. The student must successfully complete the doctoral dissertation, final oral doctoral examination, and all D.N.Sc. degree requirements within five years of advancement to candidacy.

Continuing Nursing Education

Continuing nursing education is a commitment of the School of Nursing and the university. Activities are planned to meet the special needs of individuals and groups in the community. The School of Nursing, in cooperation with the School of Continuing and Alternative Learning, 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.

See Certificates, Programs, and Other Graduate Courses in this catalog for information about graduate certificate programs in nursing.

Nursing Courses (NURS)

505 Case Management (3:3:0). Prerequisite: B.A., B.S., or permission of instructor. Open to seniors. A course for health and human service professionals on case management program development and delivery. Study and application of the role of the case manager in identifying and coordinating cost-effective services. Topics include information management, socio-legal issues, funding, communication, and self-care/independent living.

550 Pathophysiologic Bases for Major Health Deviations of Individuals (3:3:0). Health deviations in individuals occurring in the U.S. which require long-term and/or terminal health care interventions. Presented within developmental framework, as they influence physiologic integrity at the cellular level. Focus on the human being as a whole open system. Complex health programs from the perspective of maintaining homeodynamics.

552/HCS 205 Diagnosis and Management of Health Deviations (5:5:0). Corequisite: HCS 206. Common health deviations occurring in adults of all ages. Emphasis placed on the normal physiological and pathophysiologic aspects of system functioning. Course focuses on the systematic assessment and management of health deviation, which are foundational to clinical decision making for adult and gerontological nurse practitioners in primary care.

554/HCS 207 Practicum in Advanced Health Assessment (1:0:3). Application of advanced health assessment skills and clinical decision making with adults of all ages in primary care settings. The performance of skills and techniques needed to collect data for comprehensive health assessment is emphasized in this supervised practicum by nurse practitioner faculty preceptors.

Collected with George Washington University School of Medicine and Health Sciences.

565 Issues in Oncology Nursing (3:3:0). Addresses the major professional nursing concerns in the field of cancer nursing. These encompass philosophical, ethical, and legal aspects of nursing practice. The issues of collaborative roles, professional organizations, and research in oncology nursing are addressed.

570 Cultural Dimension of Aging (3:3:0). Impact of cultural definitions of aging, research methodologies, and findings of cross-cultural studies. Implications for health care and nursing.

611 Anthropology of Health (3:3:0). Cross-cultural issues of health and illness are explored from the standpoint of medical anthropology theory. Cultural dimensions of the developmental cycle and health care systems.

612 Health Care and the Political Process (3:3:0). Explores issues of power, political and legislative action as they relate to nursing. Effects of political establishment on nursing practice.

621 Components of Health Appraisal (3:2:3). Principles, skills, and techniques in health appraisal of clients of all ages. Methods of recording, interpreting, and auditing problem-oriented profiles provide a framework for development of a health appraisal data base.

622 Clinical Concepts in Primary Care Nursing (3:3:0). Students should be currently enrolled in, or have completed, the courses in their nursing major. Students with an M.S.N. from an accredited nursing program will be considered on an individual basis. Analysis of the scope of the advanced nurse clinician role in the management of primary care nursing. An integrated approach to the assessment and management of common physical and psychosocial health problems. Advanced skills in biopsychosocial assessment and development of plans for health maintenance.

625 Entrepreneurial Nursing Practice (3:3:0). 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.

626 Nursing Informatics and Computer Systems (3:3:0). Study of information and data management in nursing and the application of computer systems to solve problems of nursing practice, education, administration,
and research. Course focuses on generic concepts of information science and the use of computers to manage nursing health care data, incorporating computing skills for using specific software packages.

637 Gerontological Nursing: Normal Aging and Health Deviations (3:3:0). Examines the biopsychosocial aspects of aging. Emphasis is placed on examining the effects of age changes and health deviations on the functional capacity of older persons. The focus on interventions and promotion of the elderly's capacity for self-care.

640 Interpersonal Dimensions in Nursing (3:3:0). Examination of 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). Survey course designed to introduce students to the impact of courts and legislatures on rights and responsibilities of health care consumers and health care providers. Focus is on definitions of standards of care, legal theories of liability, and legally effectual consent.

654 Nursing Administration Financial Management (3:3:0). Investigation of managerial technologies related to financial planning and control functions of mid-level nurse administrators. Develops knowledge and skills prerequisite to effective participation in financial activities of program development and management.

655 Quality Assurance in Health Care (3:3:0). Issues, trends, and methodologies in nursing quality assurance with particular emphasis on roles and responsibilities of the nurse middle manager in health-related agencies.

657 Perspectives in Nursing Education (3:3:0). Prerequisite: Admission to the graduate nursing program or post-master's status. Focus on history and philosophy of nursing education; principles and methods 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). Prerequisite: Admission to the graduate nursing program or post-master's status; NURS 657 is pre- or corequisite. Analysis and application of the dynamics of nursing education. Emphasis on selected curriculum designs with application of instructional strategies appropriate to implementing selected programs.


690 Independent Study in Nursing (1-3:0:0). Prerequisite: Admission to graduate nursing program and permission of associate dean for academic programs. In-depth study of 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.

698 International Nursing: Theoretical and Practical Dimensions (3:3:0). International nursing organizations, programs, and projects in relation to comparative health care systems. Theoretical conceptualization, research approaches, and methodological issues in the development of international nursing.

699 Practicum in International Nursing (3:1:8). Pre- or corequisite: NURS 698. Practicum in a selected international health agency. The nursing programs are analyzed using a health care systems framework.

746 Practicum in Primary Care Nursing I (3:2:7). Pre- or corequisite: NURS 622 and 755. Analysis of the scope of the nurse practitioner role in the management of adult primary care. An integrated approach to the assessment and management of common physical and psychosocial health care problems. Advanced skills in biopsychosocial assessment and development of plans for health maintenance. Clinical specialty track option for primary care of adults or the elderly.

748 Practicum in Primary Care Nursing II (6:2:16). Prerequisite: NURS 746. The nurse practitioner student progressively assumes increased responsibility in the delivery of primary care (to the elderly and other adult medically underserved groups). Clinical specialty track option for primary care of adults or the elderly in a one-semester practicum.

750 Legal Issues Relevant to Health Care Administration (3:3:0). An examination of federal, state, and local statutes and regulations that impinge upon the operation of health-care agencies and health-care education enterprises.

755 Theoretical Foundations Related to Nursing (3:3:0). Prerequisite: Admission to graduate nursing program. Assumptions, concepts, and propositions inherent in selected nursing and related discipline theories.

759 Approaches to Data Analysis in Nursing Research (3:3:0). Prerequisite: Admission to graduate nursing program. Examination of uni- and bivariate procedures appropriate for analyzing nursing research data. Emphasis on selection and application of procedures in relation to level of data and type and size of sample in nursing research.

760 Health Care Financial Management (3:3:0). Prerequisite: Admission to the Graduate School or master's degree. Investigation of selected theory decision analysis and techniques of accounting and financial management in health care administration. Develops the knowledge and skills prerequisite to effective participation in a health institution's financial planning and analysis. Course includes lecture, seminar, case study, and microcomputing experience.

763 Administrative Theory in Nursing (3:3:0). Prerequisite: Admission to graduate nursing program. NURS 755 and Management/Organizational Theory are pre- or corequisites. Utilization of administrative theory and management principles and processes as related to roles and functions of the nurse in management in health-related agencies.

765 Practicum in Nursing Administration I (3:1:8). Prerequisite: Admission to graduate nursing program; NURS 755. NURS 763 is pre- or corequisite. Application
of administrative theory and management principles and processes in a selected health-related agency. Roles and functions of the nurse in management. Lab arranged.

766 Administrative Strategies in Nursing (3:3:0). Prerequisite: NURS 763. Roles and functions of the nurse in management as the nurse manager develops patterns of nursing care, articulating nursing education and nursing service.

768 Practicum in Nursing Administration II (3:1:8). Prerequisite: NURS 763, 765. NURS 766 is pre- or corequisite. Implementation and integration of the roles and functions of the nurse in management. Emphasis on using appropriate management principles and processes in a selected health-related agency. Lab arranged.

773 Advanced Clinical Nursing I (3:3:0). Prerequisite: Admission to graduate nursing program. Pre- or corequisite: NURS 550, 755. Foundational theory relevant to the biophysical, psychological, and cultural self-care needs of individuals and families who have long-term care needs. Emphasis on potential long-term problems across the life span; includes elderly and chronically ill.

775 Advanced Specialty Practice I (3:2:7). Prerequisite: Admission to graduate nursing program and NURS 755. Pre- or corequisite: NURS 773. 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.

776 Advanced Clinical Nursing II (3:3:0). Prerequisite: NURS 773. Expansion of selected content in long-term care and as it applies to roles of an advanced clinical nurse specialist. Collaboration with other health care providers in groups and communities is examined. Emphasis on evaluation of nursing care and advanced standards of practice.

778 Advanced Specialty Practice II (3:2:7). Prerequisite: NURS 773, 775; NURS 776 is pre- or corequisite. Opportunity to apply roles of an advanced nurse clinician in a selected clinical setting. Lab arranged.

790 Principles and Methods of Nursing Research (3:3:0). Prerequisite: Admission to graduate nursing program and NURS 755. Principles and methods of nursing research applied to problem identification, research design, and data collection and measurement.

791 Projects in Nursing Research (3:3:0). Prerequisite: NURS 790. Pre- or corequisite: NURS 759. Research projects by students, individually or in groups, under direction of faculty.

799 Thesis (3:6:0:0). Prerequisite: NURS 790. Exploration of a nursing problem using appropriate research methodology under supervision of graduate faculty member(s).

800 Contemporary Health Care Issues Seminar (3:3:0). Focus is on executive decision making related to contemporary issues affecting administration in nursing education and nursing service.

863 Health Care Administration (3:3:0). Focus is on creating awareness of the principal underlying forces that will influence the role of the nurse executive in the care delivery system, including educational and service environments.

865, 868 Internship in Health Care Administration (6:1:17), (6:1:17). Experiential learning in nursing administration in an educational or service enterprise (de-

pending on concentration chosen). The internship spans two consecutive semesters and includes planned seminars.

866 Health Care Public Policy (3:3:0). Focus on the process of formulating health care policy and analyzing its implications for nursing administration in nursing education and nursing service. Current and impending health issues, the legislative process, and program implementation evaluation will be examined.

870 Seminar in Health Care Administration I (3:3:0). Examination of forces influencing the roles of executives in health care education and health care delivery. Topics include governance, ideologies, theories of management and leadership, intergovernmental relations, decision making, and ethics.

871 Seminar in Health Care Administration II (3:3:0). Prerequisite: NURS 870. Continuation of NURS 870. Topics include human resource management, health economics, strategic management, research utilization, professional issues, and ethics.

955 Nursing Science (3:3:0). A critical assessment and synthesis of the process of development and testing of theoretical foundation of nursing science.

990 Advanced Empirical Nursing Research Seminar (3:3:0). An in-depth examination of advanced principles of empirical research methodologies from the formulation of the research question to preparation of data for analysis. The student is expected to develop and defend an appropriate proposal in nursing administration.


993 Advanced Methods in Nursing Research (3:3:0). Prerequisite: NURS 955 and 992, and intermediate statistics. Pre- or corequisite: NURS 871. Examination of advanced principles and special problems in research methodology from the formulation of the research question through the analysis of data and interpretation of findings. Emphasis on measurement as it relates to nursing research and health policy research. Lecture-discussion.

994 Nursing Research Seminar (3:3:0). Pre- or corequisite: All required courses except NURS 999. Seminar for doctoral students to accompany the development of the dissertation proposal. Discussion of the development of the research problem with analysis and critique of methodology.

999 Doctoral Dissertation (9:0:0). This course 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). Drugs and their actions. Principles of pharmacology and drugs, including their therapeutic and toxic action and their fate in the body. Admission by permission of instructor.

HCS 206 Clinical Decision Making (2:2:0). Corequisite: NURS 552. Analysis of varied cases using student participation in decision making formulation. Students learn to correlate pathophysiology with symptom manifes-
Major components of the program include mathematical programming, queuing and network theories, computer simulation and modeling, applied and computational probability and statistics, and the application of these 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 and statistical methods.

To achieve this objective, the program includes core courses and electives selected by the student with the aid of a faculty adviser. To obtain the master of science degree, students complete an approved plan of study that contains a minimum of 33 semester hours of graduate-level course work.

Students may take courses through the Cooperative Graduate Engineering Program, in affiliation with the University of Virginia and Virginia Tech. Appropriate courses may be transferred, with adviser approval, into this GMU degree program. Refer to section on Certificates, Programs, and Additional Graduate Courses in this catalog.

Admission Requirements

To be admitted to the program, a candidate must:

1. Fulfill all admission requirements of the Graduate School;
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; MATH 303 Matrix Algebra or 322 Linear Algebra;
3. Have a 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 cannot be counted toward the degree. Students whose undergraduate training was in the quantitative social sciences or quantitatively oriented business administration may be allowed to complete the mathematics prerequisite requirement by taking INFT 500 (this course cannot be used as credit in the program).

Degree Requirements

The program consists of 33 credits, divided as shown below. The core curriculum includes the following five courses (15 credits):
Three additional elective courses are chosen with the concurrence of the student's adviser. These courses may be taken in an area appropriate to the student's interest, such as statistics, business administration, computer science, information systems, systems engineering, electrical and computer engineering, economics, psychology, mathematics, and public administration.

With the permission of their advisers, qualified students may elect to write a thesis in place of 3 credits of course work from the methodological or applications area.

Students whose primary interest is in optimization must complete three courses from OR 641, 642, 643, 644, 645, 647, 648, and 682. The remaining three courses are chosen with the written concurrence of the adviser and should be tailored to the student's interest. These may be chosen from the department's offerings, from appropriate offerings in other departments within the School of Information Technology and Engineering, 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, two 600-level STAT courses, and one course from OR 645, 647, 648, or 677. The remaining two courses are chosen with the concurrence of the student's adviser.

A third option is available to students interested in applied systems modeling. For this, the three required OR methodology courses must be chosen from OR 635, 641, 643, 647, 648, and 677. Two of the three additional electives must be selected with adviser's approval from the offerings of the other departments in the School of Information Technology and Engineering.

Particularly important to students planning a Ph.D. program in information technology are the core courses that satisfy the breadth requirement for the Ph.D. in Information Technology.

**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 non-research options and the other dimension offering a choice of subject emphases including applied statistics, engineering statistics, computational statistics, and statistical signal processing. 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 non-research 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 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 of the Graduate School, all applicants to this program must:

1. Hold a bachelor's degree from an accredited institution with an appropriate undergraduate major. Examples include, but are not limited to, 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. Course work taken to correct deficiencies in undergraduate preparation is not counted toward the degree.

2. Have an acceptable score on the Graduate Record Examination. Applicants' undergraduate record and work experience may justify waiving this requirement.

3. Demonstrate basic computer literacy including knowledge of at least one basic operating system and knowledge of at least one scientific programming language.
Degree Requirements

Students in both the research and non-research options must complete the 12-credit-hour core requirements for the degree:

- STAT 644 Applied Probability
- STAT 652 Statistical Inference
- STAT 654 Applied Statistics
- STAT 656 Regression Analysis

The core course work covers the basic elements of statistics at the graduate level. Probability (STAT 644) 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 654) is a survey of statistical methods that have become the backbone of statistical practice. Focus in this course is on techniques that quantify the random behavior. The final core course is Regression Analysis (STAT 656), which focuses on determining the relationship among two or more random quantities, particularly with emphasis on broad scientific and technological applications.

From these basic elements, the prospective M.S. student may choose one of four predefined tracks or may, with the concurrence of his or her adviser, design a customized curriculum. The predefined tracks are (a) Computational Statistics, (b) Statistical Signal Processing, (c) Engineering Statistics, and (d) Applied Statistics.

Research Option

The research option requires 33 credit hours, of which 6 credit hours must be in independent research (thesis). Research is done under the guidance of a faculty member affiliated with the Department of Operations Research and Applied Statistics or the Center for Computational Statistics and Probability. Research may be carried out at the university or, if appropriate, at nearby facilities. For example, students may pursue research at their place of employment on topics of interest to the employer, provided the research meets the standards of the university. The remaining 27 credit hours must include the 12 core credit hours and elective courses taken from the approved list or added with the consent of the thesis adviser.

In addition to satisfying the general degree requirements of the Graduate School, candidates for the research option must:

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 School policies.
2. Pass a final oral examination that concentrates on, but is not limited to, the area upon 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 as to whether the candidate passes or fails.

Non-research Option

The non-research option focuses on the completion of course work in modern statistical theory and practice. The basic course work requirements include 30 credit hours. Twelve hours must be the core courses taken by all M.S. students, with 18 additional credit hours taken from the approved list or with the approval of the student's adviser. Students in this program are encouraged to pursue a broad background in statistical science and may elect to concentrate on applications of statistical methodology to other disciplinary areas.

In addition to satisfying the general degree requirements of the Graduate School, students in the non-research option must:

1. 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 adviser, 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, the M.S. Seminar.
2. Pass a final oral examination that covers both the areas of course work undertaken by the student and the subject matter of the student's essay. The examination is administered by the department's Graduate Committee during the student's final semester after the essay has been approved. All interested members of the graduate faculty are invited to participate. The final decision as to whether the candidate passes or fails is made by the Graduate Committee.
Areas of Study

Operations Research Courses (OR)

540 Management Science (3:3:0). Prerequisite: MATH 108 and STAT 250, or equivalent. Operations research techniques and application to managerial decision making. Mathematical programming, Markov processes, queuing theory, inventory models, PERT and CPM, and simulation. Use of contemporary computer software for problem solving. OR/MS majors will not receive credit.


635 Discrete System Simulation (3:3:0). Prerequisite: STAT 354 and OR 542, or equivalents, 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. Lecture, project, and lab.

641 Linear Programming (3:3:0). Prerequisite: OR 541 or permission of instructor. First, an in-depth look at the simplex method. Next, computational enhancements: the revised simplex method; sparse-matrix techniques; bounded variables and generalized upper bounds; and large-scale decomposition methods. Computational complexity of the simplex algorithm. The Khachian and Karmarkar algorithms.

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; knapsack problem, matching problem, 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). Prerequisite: OR 541 and 542 or permission of instructor. 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). Prerequisite: MATH 213 or equivalent and knowledge of a scientific programming language. Optimization theory and techniques applicable to problems in engineering, economics, operations research, and management science. Convex sets and functions, optimality criteria and duality. Algorithms for unconstrained minimization, including descent methods, conjugate directions, Newton-type and quasi-Newton methods. Algorithms for constrained optimization, including active set methods and penalty and barrier methods.

645 Stochastic Models in Operations Research (3:3:0). Prerequisite: MATH 351 or STAT 644; OR 542 is recommended. Selected applied probability models including Poisson processes, discrete- and continuous-time Markov chains, renewal and regenerative processes, semi-Markov processes, queuing and inventory systems, reliability theory, stochastic networks. Emphasis on applications in practice as well as analytical models.

647 Queuing Theory (3:3:0). Prerequisite: OR 542, STAT 644, or permission of instructor. A unified approach to queuing organized by type of model. Single and multiple channel exponential queues; Erlangian models, bulk and priority queues, networks of queues; general arrival and/or service times; statistical inference and simulation of queues.

648 Production and Inventory Systems (3). Prerequisite: OR 541 and OR 542 or permission of instructor. Analysis of production-inventory systems. Introduction to the use of mathematical modeling for solutions of production planning and inventory control problems. Stochastic inventory systems of lot sized reorder type; periodic review and single period models. Application of dynamic programming theory to deterministic and stochastic cases. Static and dynamic production-planning models.

649 Topics in Operations Research (3:3:0). Prerequisite: Permission of instructor. Advanced topic chosen according to interests of students and 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, combinatorics.

676 Dynamic Programming (3:3:0). Prerequisite: OR 541 and 542. Introduction to the theory and computational aspects of dynamic programming. The course studies sequential decision processes, optimal resource allocations, continuous-time dynamic programming, network models, Markov decision processes, and production models. Special attention is directed toward applications.

677/STAT 677 Quality Assurance (3:3:0). Prerequisite: STAT 610, 654 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 is 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.

682/STAT 682 Computational Methods in Engineering and Statistics (3:3:0). Prerequisite: MATH 213 and 303 or equivalent. 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. This course discusses such methods, in particular, variance, nonlinear equations, differential and difference equations, and nonlinear optimization. Applications in statistics and engineering are emphasized.

743/DESC 743 Applications Seminar (3:3:0). Prerequisite: OR 542 or DESC 742. Model development and implementation involved in the practice of operations research and management science.

744/DESC 744 Contemporary 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, analysis and solution implementation, emphasizing contemporary approaches to decision analytic techniques.

746 Stochastic Models in Operations Research II (3:3:0). Prerequisite: OR 645 or permission of instructor. Advanced applied probability models in Markov decision processes, semi-Markov decision processes, Brownian motion, random walks and martingales, stochastic order relations, queuing networks. Recent developments in the area will also be presented.

Statistics Courses (STAT)

610 Statistical Foundations for Technical Decision Making (3:3:0). Prerequisite: 6 credits of math. The 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; elementary decision theory; time series analysis; linear regression and correlation; the analysis of variance. Credits not applicable toward M.S. (OR/MS) or M.S. (Statistical Science).

612/CS 612 The Use of Computer Statistical Packages (3:3:0). Prerequisite: Course in statistics. Introduction to use of computer packages in the statistical analysis of data. Emphasizes techniques common to use of all statistical packages, including data checking, cleaning, manipulation, and transformation. 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. Credits are not applicable toward the 30 credits required for the M.S. in mathematics, CS, OR/MS, or statistics, but may be applicable toward a degree in some other fields.

644 Applied Probability (3:3:0). Prerequisite: STAT 344 or MATH 351. A course in probability with applications in computer science, engineering, operations research, and systems engineering. Random variables and expectation, conditional expectation, random vectors, special distributions, parameter estimation, limit theorems, stochastic processes. Problems in engineering, operations research, and computer systems.

652 Statistical Inference (3:3:0). Prerequisite: STAT 644, ECE 528, or equivalent. Critical aspects of probability, random variables and distributions, characteristics functions, and stochastic convergence. Optimal estimation, maximum-likelihood estimation, asymptotic theory, Bayesian methods, likelihood-ratio tests, statistical decision theory, sequential methods.

653 Survey Sampling (3:3:0). Prerequisite: A 300-level course in probability or statistics. Review of probability and statistics, basic definitions of sampling, simple random sampling, stratified sampling, systematic sampling, cluster sampling, estimation problems. Emphasizes practical problems encountered in conducting a survey as well as the theoretical background. Class project using a statistical package.

654 Applied Statistics (3:3:0). Prerequisite: STAT 344, MATH 351, or equivalent. Sampling theory, estimation, hypothesis testing, comparison of data, various classical tests, linear models and analysis of variance, decision theory.

655 Analysis of Variance (3:3:0). Prerequisite: STAT 654 and a working knowledge of matrix algebra. Single and multifactor analysis of variance, planning sample sizes, introduction to the design of experiments, random block and Latin square designs, analysis of covariance.

656 Regression Analysis (3:3:0). Prerequisite: STAT 654 and a working knowledge of matrix algebra. Simple and multiple linear regression and correlation, polynomial regression, general regression, search techniques for best regression equation, multicollinearity, autocorrelation, normal correlation models.

657 Nonparametric Statistics (3:3:0). Prerequisite: STAT 654 or equivalent. Nonparametric procedures for two or more samples (independent as well as correlated), tests of significance and estimation methods, independence problems with nominal and rank data, comparison of parametric vs. nonparametric methods. Emphasis on application of nonparametric techniques to data.


659 Topics in Statistics (3:3:0). Prerequisite: Permission of instructor. Topics in statistics not covered in the regular statistics sequence. May be repeated for credit.

677/OR 677 Quality Assurance (3:3:0). Prerequisite: STAT 610, 654 or equivalent. Introduction to the concepts of quality control and reliability. Acceptance sampling, control charts, and economic design of quality control systems are discussed, as are system reliability, fault-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.

682/OR 682 Computational Methods in Engineering and Statistics (3:3:0). Prerequisite: MATH 213 and 303 or equivalent. 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. This course
discusses such methods, in particular, 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.

Physical Education

Faculty
Metcalf, James A., Ph.D., University of Maryland, 1970; Associate Professor
Ruhling, Robert O., Ph.D., Michigan State University, 1970; Professor and Department Chair
Schack, Frederick K., Ph.D., Ohio State University, 1976; Associate Professor
Stein, Julian U., Ed.D., George Peabody College, 1966; Professor

Physical Education, M.S.

This program is offered through the Department of Health, Sport, and Leisure Studies. It serves the needs of those currently employed in teaching, sport, or fitness fields; those with baccalaureate degrees in physical education who desire to improve their skills before entering a career; and those who wish to earn a master's degree as a prelude to additional graduate work in physical education, exercise science, or related areas. Students may emphasize teaching or exercise science in selecting a degree program.

Admission Requirements
In addition to fulfilling Graduate School admission requirements, the applicant must hold a bachelor's degree in physical education or a related field; must submit three letters of recommendation and transcripts of all college course work; and must have completed courses in human anatomy and physiology, kinesiology, and exercise physiology. Applicants who do not meet these requirements may be offered provisional or non-degree status in accordance with the general regulations of the Graduate School.

Departmental Program Options and Degree Requirements
In addition to fulfilling the Graduate School degree requirements, the candidate must complete the following program:

Core Courses (12 semester hours required of all students):

EDUC 590 Education Research (3)
EDUC 591 Education Statistics (3)
PHED 508 Seminar in Special Physical Education (3)
PHED 604 History of Sport and Physical Education through the Middle Ages (3) or PHED 605 History of Sport and Physical Education from Renaissance to Present (3)

Support Area Courses (12-18 hours):
HEAL 612 Scientific Foundations of Health and Fitness (3)
PHED 610 Advanced Exercise Physiology and Sports Medicine (3)
PHED 616 Motor Behavior and Development (3)
PHED 630 Exercise, Health and Fitness Program Development (3)
PHED 650 Scientific Principles of Motor Learning (3)
PHED 660 Management and Administration of Physical Education and Sport (3)
PHED 671 Teaching Physical Education in the Secondary School (3)
PHED 673 Program Development in Physical Education and Sport (3)
PHED 680 Seminar in Current Issues in Physical Education and Sport (3)
PHED 799 Thesis (6)

Students selecting the thesis option must successfully complete a written comprehensive examination at the end of course work and prior to beginning the thesis. They must also present an oral defense of their thesis.

Program Patterns and Options
Two program patterns are available:

Non-Thesis Pattern
Core ........................................... .12 hours
Support Area .................................. 18 hours
Total ......................................... .30 hours

Thesis Pattern
Core ............................................. .12 hours
Support Area .................................. 12 hours
Thesis ........................................... .6 hours
Total ........................................... .30 hours

Two major options are available:

Teaching
In addition to teaching, this includes such areas as administration, supervision, curriculum development, developmental/adapted physical education. Representative of support area courses for this option are:
PHED 660 Management and Administration of Physical Education and Sport (3)
PHED 671 Teaching Physical Education in the Secondary School (3)
PHED 673 Program Development in Physical Education (3)

Exercise Science
This includes such areas as exercise physiology, sport management, and fitness/wellness management. Representative of support area courses for this option are:
PHED 610 Advanced Exercise Physiology and Sports Medicine (3)
PHED 630 Exercise, Health, and Fitness Program Development (3)
HEAL 612 Scientific Foundations of Health and Fitness (3)

These options and patterns enable students to identify their personal goals and professional directions more precisely through 12 hours of core courses and 12-18 hours of support area courses according to personal interests and professional directions of each student.

Graduate Assistantships
Administrative, research, and teaching-related graduate assistantships are available in the Department of Health, Sport, and Leisure Studies. To be eligible for an assistantship, a student must be admitted to degree status and take a minimum of 6 semester hours of graduate credit each semester. Interested students should contact the Department of Health, Sport, and Leisure Studies for applications.

Physical Education Courses (PHED)

500 Workshop in Physical Education (1-3:0:0). Prerequisite: Graduate standing or permission of instructor. Concentrated full-time workshops, weekend seminars and workshops dealing with selected topics in physical education and ancillary fields. May be repeated. No more than 6 semester hours may be applied for degree credit.

508 Seminar in Special Physical Education (3:3:0). Prerequisite: Graduate standing or permission of instructor. Discussion of current problems, issues, and research in special physical education. Practica may be included.

599 Independent Study in Physical Education (1-3:0:0). Prerequisite: Graduate standing or 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 3 hours total credit may be earned.

604 History of Sport and Physical Education through the Middle Ages (3:3:0). Prerequisite: Graduate standing or permission of instructor. Role of sport and physical education in ancient civilizations through the Middle Ages.

605 History of Sport and Physical Education from Renaissance to Present (3:3:0). Prerequisite: Graduate standing or permission of instructor. Role of sport and physical education in Europe and its impact on developments in America.

610 Advanced Exercise Physiology and Sports Medicine (3:3:0). Prerequisite: PHED 450, graduate standing or equivalent or permission of instructor. Lecture, demonstration, and seminar experiences in the application of research findings to the understanding of physiological function and the effects of exercise on people.

616 Motor Behavior and Development (3:3:0). Prerequisite: Graduate standing or permission of instructor. Human motor behavior development and theory with application to evaluation of skill acquisition.

630 Exercise, Health and Fitness Program Development (3:3:0). Prerequisite: Graduate standing or permission of department. Health and exercise program development related to fitness and health of special adult populations. Three to 6 hours of field experience.

650 Scientific Principles of Motor Learning (3:3:0). Prerequisite: Graduate standing or permission of instructor. Biomechanical analysis and application of scientific principles of movement to instructing sport skills in physical education and sport programs.

660 Management and Administration of Physical Education and Sport (3:3:0). Prerequisite: Graduate standing or permission of instructor. Advanced study in fiscal management, legal liability, facility planning, and policy development.

671 Teaching Physical Education in the Secondary School (3:3:0). Prerequisite: Graduate standing or permission of instructor. Advanced study of methods, materials, content and organization of physical education programs. Emphasis on curriculum planning, current methodologies, and trends.

673 Program Development in Physical Education and Sport (3:3:0). Prerequisite: Graduate standing or permission of instructor. Curriculum design and program development with attention to organization and implementation of physical education and sport programs.

680 Seminar in Current Issues in Physical Education and Sport (3:3:0). Prerequisite: Graduate standing or permission of instructor. Current issues in physical education and sport are identified and analyzed.

799 Thesis (3-6:0:0). Prerequisite: Graduate standing or permission of instructor. Exploration of a physical education problem using appropriate research methodology under supervision of graduate faculty member(s).
Physics

Faculty
Ceperley, Peter, Ph.D., Stanford University, 1973; Associate Professor
Dworzecza, Maria, Ph.D., Warsaw University, Poland, 1969; Associate Professor
Ehrlch, Robert, Ph.D., Columbia University, 1964; Professor
Ellsworth, Robert, Ph.D., University of Rochester, 1965; Associate Professor
Kafatos, Minos, Ph.D., Massachusetts Institute of Technology, 1972; Professor

Applied and Engineering Physics, M.S.

The Master of Science in Applied and Engineering Physics is a two-track program. The applied physics track 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, computer science, and other related areas. The engineering physics track, jointly administered with the Department of Electrical and Computer Engineering, allows more flexibility in selecting a larger fraction of courses in electrical engineering.

All courses are offered during late afternoon or evening hours to allow full-time employed persons to attend easily. Persons employed at area high technology organizations may take up to 6 credits (out of 33) for work done "on the job" under the guidance of a faculty member. This employment-related research may be conducted either under an optional 3-credit research project or an optional 6-credit master's thesis. Master's students who are not employed full time may apply for financial aid or for a limited number of research assistantships.

Admission Requirements
Those holding a baccalaureate degree in physics or a related field from an accredited institution and who earned a GPA of 2.75 (out of 4.00) in their last 60 hours 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 adviser's assessment, and still be permitted to enroll in the program. Two letters of recommendation must be submitted, preferably from former professors. The Graduate Record General examination 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 33 credits as follows:

1. For both tracks of the program, a 9-credit core consisting of:
   PHYS 502 Quantum Mechanics I
   PHYS 513 Electromagnetic Theory
   PHYS 613 Physical Modeling and Simulation
   Students who completed PHYS 502 or its equivalent as undergraduates will be required to take PHYS 514 Quantum Mechanics II in its place. (Before 1986 a somewhat different set of core requirements applied—see earlier catalogs.)

2. For the applied physics track only, any three of the following five courses:
   PHYS 510 Continuum Mechanics
   PHYS 511 Statistical Mechanics
   PHYS 512 Solid State Physics
   PHYS 514 Quantum Mechanics II
   PHYS 610 Modern Instrumentation

3. Electives to complete the 33-credit program chosen from courses in physics, engineering, mathematics, or computer science subject to the following conditions:
   a. For the engineering physics track, at least 3 credits of engineering are required.
   b. For either the applied physics or engineering physics track, no more than 6 credits may be chosen from areas outside engineering or physics.
   c. Credit may be received for either ECE/PHYS 798: Research Project (3 credits) or ECE/PHYS 799: Master's Thesis (6 credits), but not both. The research project may be performed at a student's place of employment with the concurrence of a faculty adviser. 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.

All candidates for the degree must pass a comprehensive examination administered once a year in May.
Astronomy Course (ASTR)

505 Fundamentals of Astronomy (3:3:0). Prerequisite: Graduate standing or permission of instructor. Emphasis on the connection of astronomy to other disciplines as well as recent developments in astronomy. Planet earth, its origin and past history, and the origin of life. Ancient, Renaissance, and modern astronomers. Basic physics. Tools of the astronomer. The solar system, the sun, stars, and our galaxy. Quasars, general relativity and cosmology. Recommended for teachers of general science.

Physics Courses (PHYS)

500 Physics for High School Teachers (3:3:0). Prerequisite: Certification as a secondary school physics instructor or permission of department. Techniques of teaching high school physics. Introduction to modern physics with emphasis on concepts rather than mathematical formalism. Recent developments in physics.

501 Physics Laboratory Techniques for High School Teachers (3:3:0). Prerequisite: Graduate standing. Theory and performance of experiments applicable to high school teaching with practical sessions on use of lab apparatus and computer. Recommended for high school teachers of physics.

502 Introduction to Quantum Mechanics and Atomic Physics (3:3:0) (Same as PHYS 402). Prerequisite: PHYS 303 or permission of instructor. Experimental basis of quantum mechanics; the wave function; systems in one, two, and three dimensions.

510 Mechanics of Continuous Media (3:3:0). Prerequisite: PHYS 303 and 305. Study of continuous media. Includes physical perspective, mathematical formulation, and solution of problems in ideal fluids, viscous fluids, waves in fluid media, turbulence, thermal convection, stability considerations, elastic deformations, stress-strain tensor and body waves in elastic media.


512 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, magnetism.

513 Applied Electromagnetic Theory (3:3:0). Prerequisite: PHYS 305, 306, MATH 313, 314 or equivalent. Classical electromagnetic theory with applications. Topics include electrostatics, magnetic fields and materials, electromagnetic wave propagation, wave guides, transmission lines, radiation, and antennas.


520 The Physics of Energy and Environmental Technology (3:3:0). Prerequisite: B.A. or B.S. degree in natural science or mathematics or permission of instructor. Contemporary problems of energy and the environment with emphasis on the underlying principles of physics within the constraints of engineering and economics. Intended for those pursuing careers in energy research and development, business administration, economics, ecology, and high school science instruction.

530 Astrophysics (3:3:0). Prerequisite: PHYS 342 or 351 and MATH 113 or 115. Topics include physical concepts, magnitudes of stars, Hertzsprung-Russell diagram, stellar radiation, interstellar matter, dust, molecules, and other topics.

531 Relativity and Cosmology (3:3:0). Prerequisite: PHYS 352; MATH 214 or 216, and PHYS 303, 305, or permission of instructor. Special relativity, 4-dimensional space-time, general relativity, non-Euclidian geometries, geodesic and field equations, tests of general theory of relativity, black holes, cosmology, models of the universe, remnant blackbody radiation, big bang cosmology, thermodynamics and the universe.


540 Nuclear and Particle Physics (3:3:0). Prerequisite: PHYS 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; nuclear science and technology.


590 Selected Topics in Physics (3:3:0). Prerequisite: Graduate standing or permission of department. Selected topics from recent theoretical developments and applications. Designed to satisfy the needs of the professional community to keep abreast of current developments.

610 Modern Instrumentation (3:3:0). Prerequisite: 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.

611 Electro-optics (3:3:0). Prerequisite: 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 Physical Modeling and Simulation (3:3;0). A study of algorithms used to solve problems in physics and engineering and their computer implementation, data handling and data processing techniques in physics and engineering.

620 Radiation Hydrodynamics (3:3;0). Prerequisite: PHYS 303 and 305; PHYS 510 recommended or equivalent course in hydrodynamics. Study of high-temperature plasma flows in which radiative processes contribute significantly to the transfer of energy and momentum. Course includes review of tensor calculus and hydrodynamics formulation, dynamics of viscous and heat conducting fluids, relativistic fluid flow, waves, shocks, winds, radiative transfer, radiative contributions to plasma flows. Some applications to computer methods in modeling radiating plasma flows are included.

798 Research Project (3:0;0). Prerequisite: 9 hours of graduate-level course work 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 (3:6;0:0). Prerequisite: 9 hours of graduate-level course work and permission of instructor. Project chosen and completed under the guidance of a graduate faculty member, which results in an acceptable technical report and an oral defense.

800 Studies for the Doctor of Arts in Education (variable credit). Prerequisite: D.A.Ed. admission to study in physics. Program 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. The paper is presented in a subsequent D.A.Ed. summer seminar. Enrollments may be repeated.

Psychology

Faculty

Allen, John A., Ph.D., North Carolina State University, 1971; Associate Professor

Ballas, James A., Ph.D., The Catholic University of America, 1980; Research Assistant Professor

Barocas, Ralph, Ph.D., Pennsylvania State University, 1964; Professor (Director of Clinical Doctoral Program)

Blaha, John, Ph.D., Ohio State University, 1971; Associate Professor

Boehm-Davis, Deborah A., Ph.D., University of California, 1980; Assistant Professor

Boneau, Alan C., Ph.D., Duke University, 1957; Professor

Buffardi, Louis C., Ph.D., Kansas State University, 1970; Associate Professor (Director of Applied Experimental Doctoral Program)

Denham, Susanne, Ph.D., University of Maryland, 1985; Assistant Professor

Erdwins, Carol J., Ph.D., Washington University, 1975; Associate Professor

Fleishman, Edwin A., Ph.D., Ohio State University, 1951; D.Sc. (Honorary), University of Edinburgh, 1982; University Professor of Psychology

Flinn, Jane M., Ph.D., The George Washington University, 1974; Associate Professor (Chair)

Friedman, Lee, Ph.D., Rice University, 1986; Assistant Professor

Gessner, Theodore L., Ph.D., University of Maryland, 1971; Associate Professor

Holt, Robert W., Ph.D., University of Maryland, 1971; Associate Professor

Lehman, Elyse B., Ph.D., The George Washington University, 1970; Associate Professor (Master’s Program Coordinator)

Maddux, James E., Ph.D., University of Alabama, 1982; Associate Professor

Mandes, Evans J., Ph.D., The George Washington University, 1966; Professor

Mellinger, Jeanne C., Ph.D., University of Chicago, 1952; Associate Professor

Moretz, Walter J., Ph.D., Florida State University, 1970; Associate Professor

Pasnak, Robert, Ph.D., Pennsylvania State University, 1969; Professor

Riskind, John H., Ph.D., Yale University, 1977; Associate Professor

Rugel, Robert P., Ph.D., Florida State University, 1971; Associate Professor

Sanford, James F., Ph.D., Kansas State University, 1971; Associate Professor

Smith, Robert F., Ph.D., University of Wisconsin, 1976; Associate Professor (Undergraduate Program Coordinator)

Smith, Virginia, Ph.D., University of Maryland, 1981; Adjunct Assistant Professor

Tangney, June Price, Ph.D., University of California, 1985; Assistant Professor

Tyer, Zita E., Ph.D., Texas Tech University, 1968; Professor

Wahl, Otto F., Ph.D., University of Pennsylvania, 1974; Associate Professor

Weisman, David S., Ed.D., The Catholic University of America, 1979; Adjunct Associate Professor

http://catalog.gmu.edu
George Mason University

Psychology, M.A.

The Department of Psychology offers an M.A. degree in industrial, school, life-span development, experimental neuropsychology, or general psychology. The department does not offer an M.A. in clinical or counseling psychology; therefore, most M.A. students may not enroll in the clinical skills courses such as psychological assessment and psychotherapy.

Within the industrial psychology specialization students may specialize in one of two areas: industrial/organizational psychology, which focuses on the application of psychological knowledge and methods to industry, government, or other organizations; and human factors, which focuses on psychological knowledge regarding human-machine interfaces.

The school psychology specialization 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 and the Division of School Psychology of the American Psychological Association.

Within the life-span development specialization students may specialize in one of two areas: child development or gerontology, which focus on the psychological knowledge in these areas. Students interested in gerontology may also earn a graduate certificate (see section on Certificates in this catalog).

The specialization in experimental neuropsychology emphasizes training in the neurobiological bases of behavior. Students are prepared for doctoral work or employment in government or industry research laboratories.

The general master's program provides students with a knowledge of the basic content areas in psychology. It emphasizes flexibility so that students may enroll in courses fitting their specific needs.

Admission Requirements

In addition to fulfilling admission requirements of the Graduate School, applicants are expected to have 15 hours in psychology including a course in statistics and a laboratory course in psychology; results of the Graduate Record Examination 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 hours and a minimum of 3.25 in undergraduate psychology courses are required. Work experience, publications, or special recommendations may compensate for deficiencies in other qualifications.

Applicants must have admissions requirements completed by February 15 if they wish an early decision regarding admission to the program for the fall semester.

Financial Assistance

Financial assistance is available through graduate assistantships and various forms of grants, loans, or employment. Information and forms for financial aid are sent to applicants when their application is received by the Graduate School. The application deadline for financial aid requests is February 15.

Master of Arts in Industrial Psychology

Specializing in Industrial/Organizational Psychology

Students must complete the following requirements:

- 30 semester hours of graduate credit
- 3 hours from PSYC 701 or 703
- 4 hours of PSYC 553
- 3 hours of PSYC 653
- 12 hours of specialized content: PSYC 636 and 640; 3 hours from PSYC 557, 592, 631, 638, 733, or 736; and 3 hours from PSYC 533, 536, 592, 632, 639, or 735
- Practicum or Thesis (optional): 6 hours; thesis only with permission of chair
- Electives: no more than 6 hours of department-approved electives from outside the department

Master of Arts in Industrial Psychology

Specializing in Human Factors Engineering

Students must complete the following requirements:

- 30 semester hours of graduate credit
- 3 hours from PSYC 701 or 702
- 4 hours of PSYC 553
- 3 hours of PSYC 653
- 12 hours of specialized content: PSYC 530 and 645; and 6 hours from PSYC 638, 734, 736, or 737

Zaccaro, Stephen, Ph.D., University of Connecticut, 1981; Associate Professor

http://catalog.gmu.edu
Practicum or Thesis (optional): 6 hours; thesis only with permission of chair
Electives: no more than 6 hours of department-approved electives from outside the department

Master of Arts in School Psychology
Students must complete the following requirements. Specific course requirements are delineated during advising after admittance to the school psychology program.

60 hours of graduate credit
50 hours of required courses. Students must pass core courses with a grade of B or better. These courses must be passed prior to the internship and the awarding of the master's degree.

One practicum is required during the second year of training at the Psychological Clinic of the university and the second may be completed in the school system. 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.

Master of Arts in Life-Span Development with Specialization in Child Development or Gerontology
Students must complete the following requirements:

30 semester hours of graduate credit
PSYC 702 and 703
PSYC 553
9 hours of specialized content: PSYC 704; child specialization, select 6 hours from PSYC 508, 513, 565, or 669; gerontology specialization, select 6 hours from PSYC 614, 684, or 786
12 hours of electives (6 hours of thesis only with permission of chair)

Master of Arts in Experimental Neuropsychology
30 hours of graduate credit including the following:
6 hours of core: PSYC 701 and 702 (704 is recommended)
4 hours of quantitative methods: PSYC 553
3 hours of research methods/statistics: PSYC 652, 653, 755, or 756
6 hours of specialized content: PSYC 559, 592 (Special Topics: neuronal bases of learning and memory), or 772
6 hours of electives
6 hours of practicum or thesis (unlike other tracks, practicum or thesis is required)

Master of Arts in General Psychology
Students must complete the following requirements:
30 semester hours of graduate credit
12 hours of general psychology including PSYC 553 and 9 hours from PSYC 701, 702, 703, 704, or 705
Practicum or Thesis (optional): 6 hours; thesis only with permission of chair
Electives: Up to 9 hours in graduate courses may be taken from other departments with the adviser's approval.

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 semester hours of credit earned in nondegree status may be applied to a degree program.

Provisional Students
Provisional students must take 12 semester hours in psychology before applying for degree status. Provisional students must obtain a minimum GPA of 3.25 in those courses. The grade point average is a major (but not sole) factor in determining acceptance to the degree program. The courses needed before a student requests a change to degree status are PSYC 553 and 9 additional graduate hours, excluding Individualized Study.

Psychology, Psy.D.
The goal of the doctoral program is to train students in the principles and applications of psychology. To accomplish this, the program has been developed to provide the student with both a knowledge of the basic content areas in psychology and the practical experience required to apply these principles to problems arising in nonacademic work settings. The program contents are ap-
The clinical program focuses on educating clinical psychologists to deal with the unique demands of mental health systems and private practice. A student in the first year of training in the clinical specialization is required to complete a minimum of 30 credits during the calendar year.

Admission

Criteria

Entering students are accepted only for fall semesters. The deadline for receipt of all application materials is February 15 of each year. Space in the program is normally limited to 20 new students each year — 10 in the clinical specialization and 10 in the applied experimental with specializations in industrial/organizational and human factors. The department does not consider applications that fail to meet the minimum criteria of 3.0 undergraduate GPA and 3.25 in psychology work. Applicants who meet this minimum receive continued consideration for the final candidate pool based on experience, letters of recommendation, objective test scores, and interview. No particular set of qualifications guarantee admission.

Documents

Each applicant must provide the Graduate School with the following materials by February 15 to be considered for admission:

1. Completed Graduate School Admission application, with $20 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 (enclosed forms with general graduate application) from individuals who have first-hand 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 Psy.D.
7. Graduate Record Examinations taken within the last five years and before the February 15 deadline (applicants should plan to take the GRE at least two months before the deadline since 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 (optional) 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 Office of Admissions, George Mason University, Fairfax, VA 22030-4444. Applicants are responsible for ensuring that all materials arrive before the February 15 deadline.

Requirements

In addition to fulfilling the admission requirements, applicants in the program are expected to have the following:

For the Psy.D. in Applied Experimental, at least 15 hours in psychology including a statistics course and a laboratory course. A tests and measurements course is recommended.

For the Psy.D. in Clinical Psychology, at least 15 hours in psychology including a statistics course, a laboratory course, and courses in personality and abnormal psychology. Courses in developmental, physiological, and tests and measurements are desirable.

Financial Assistance

Financial assistance is available through graduate assistantships; doctoral fellowships; and various forms of grants, loans, or employment. Information and forms for financial aid are sent to applicants when their application is received by the Graduate School. The application deadline for financial aid requests is February 15.

Transfer Credits

Transfer credits are reviewed by a committee only after acceptance to the Psy.D. program.

Degree Requirements

The program of doctoral training in psychology has four educational components: (1) core courses, (2) upper-level specialty courses, (3) supervised practica, and (4) dissertation.
**Core Courses**

The core requirement consists of four proseminars, two quantitative courses, and a course in history and systems. The 12-semester-hour proseminar sequence covers the basic subject matter identified by the American Psychological Association as the sine qua non of doctoral training: biological bases of behavior, social bases of behavior, cognitive-affective bases of behavior, and individual behavior. After successful completion of 30 hours (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. These advanced courses focus on the comprehensive study of theoretical, applied, and methodological issues within the different specialty areas.

**Practica**

Both applied experimental and clinical 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' fields of specialization. For example, individuals in the clinical specialization might take practica in adult assessment, child assessment, individual psychotherapy, and group psychotherapy. Clinical graduate students must be screened and approved by the department before they may conduct psychological testing in the George Mason University Psychological Clinic. An individual in industrial might take practica in survey research, and human factors in applied perception or training program development. One practicum for applied experimental students is in-house and culminates in a formal paper.

**Dissertation**

The dissertation requirement is designed to demonstrate the student's ability to apply psychological principles to research problems. The dissertation may involve an experimental approach to a basic or an applied problem or may organize and summarize in a scholarly fashion a project done in a practicum or internship placement.

**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 emphasis of this program requires the development of communication skills. Written and oral communication skills will be 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.

**Psy.D. in Human Factors Engineering**

Students must complete 88 hours of graduate credit to include the following requirements:

- 15 hours of proseminars from PSYC 701, 702, 703, 704, and 705
- 7 hours of qualitative and methods courses: PSYC 553 and 653
- 12 hours of advanced quantitative and specialized methods including PSYC 645 and 755 and one from PSYC 652, 654 or 756
- 18 hours of specialized content: PSYC 530, 636, 666, and 668; and 6 hours from PSYC 638, 734, 736, 737, 592/892
- 12-15 hours of practica and research from PSYC 730 or 897
- 3 hours of special topics in professional issues: PSYC 892
- 12 hours of dissertation proposal and dissertation: PSYC 998 and 999 (minimum of 3 hours of 998 and 6 hours of 999)
- 0-12 hours of electives, 9 of which may be taken outside the department from a department-approved list

**Psy.D. in Industrial/Organizational**

Students must complete 88 hours of graduate credit to include the following requirements:

- 15 hours of proseminars from PSYC 701, 702, 703, 704, and 705
- 7 hours of quantitative and methods courses: PSYC 553 and 653
- 12 hours of advanced quantitative and specialized methods including PSYC 654 and 754 and one from PSYC 541, 633, 640, 652, 755, or 756
- 18 hours of specialized content: PSYC 530 and 636; 6 hours from PSYC 631, 638, 733, 736, 592/892; and 6 hours from PSYC 533, 536, 632, 639, 667, 735, 592/892
- 12-15 hours of practica and research from PSYC 730 or 897
Psy.D. in Clinical Psychology

Students must complete the following requirements:

12 hours of proseminars: PSYC 701, 702, 703, and 70S
7 hours of quantitative and methods courses: PSYC 553 and 650
11 hours of assessment and basic skills: PSYC 810, 811, and 880
12 hours of supervision: PSYC 881
9 hours of Theory and Techniques of Psychotherapy: PSYC 830, 831, and 832
6 hours of Community PSYC: PSYC 840 and 841
6 hours of Psychopathology: PSYC 822 and 823
6 hours of Externship: PSYC 885
6 hours of Professional Seminar: PSYC 890, thesis and electives

Psychology Courses (PSYC)

506 Theories of Personality (3:3:0). Prerequisite: PSYC 220. Comparative review of prevalent theories of personality with special emphasis on their fundamental models and their similarities and differences. 

508 Theories of Development (3:3:0). Prerequisite: PSYC 313 or 211. Major theories of infant and child development including works of Piaget, Freud, Erikson, and Spitz.

513 Infant Development (3:3:0). Prerequisite: PSYC 313 or permission of instructor. Examination of current issues, research methods, and clinical evaluation techniques in the field of infant development.

530 Human Factors Engineering (3:3:0). Prerequisite: An experimental lab course or permission of instructor. Investigation of complex man-machine interactions found in industry today. Extensive empirical research findings are examined.

533 Seminar in Industrial/Organizational Psychology (3:3:0). Prerequisite: PSYC 230 or PSYC 636 or permission of instructor. Rotating topics (e.g., leadership theories and management development, performance appraisal) announced in advance. May be repeated for credit.

536 The Psychology of Work Motivation (3:3:0). Prerequisite: PSYC 230 or permission of instructor. Examination of the psychological literature of (1) the need, cognitive, and reinforcement theories of motivation; (2) organizational attachment (commitment, absenteeism, and turnover); (3) job design and quality of work issues. Methodological and psychometric issues in the interpretation and evaluation of work motivation research receive particular attention.

541 Survey Research (3:3:0). Prerequisite: PSYC 300 or SOCI 221 or equivalent. This course is designed to acquaint students with the theory, method, and practice of survey research. The course requires students to 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. Practical experience in a gerontological setting under supervision of a qualified professional. 150 contact hours per three semester hours credit.

553 Quantitative Methods I: 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. Topics in introductory psychological statistics from an advanced perspective. Additional topics are included. Lab introduces use of computer packages in data handling and analysis. Required for degree students. Requirement may be satisfied by demonstrating competence on an independent examination.

557 Psychometric Methods (3:3:0). Prerequisite: PSYC 553 or permission of instructor. Examines the concepts of psychological measurement with emphasis on predictor test and criterion development. Reliability, validity, and specialized techniques used to develop tests of ability, interest, and personality are discussed.

559 Drugs, Hormones, and Behavior (3:3:0). Prerequisite: PSYC 572 or equivalent or permission of instructor. Overview of the chemistry of behavior, including neurotransmitters, mechanisms of action of therapeutic drugs such as antidepressants, actions of hallucinogens and other psychoactive drugs, chemical theories of memory and effects of hormones on behavior.

560 Advanced Applied Social Psychology (3:3:0). Prerequisite: PSYC 231. Study of major trends in social psychological research with emphasis on the ethical and practical problems posed by human experimentation. Topics include attitude measurement, attitude change, conformity, social perception and small group interaction.

565 Cognitive and Perceptual Development (3:3:0). Prerequisite: Six hours of developmental psychology or permission of instructor. Experimental study of child development. Topics include biogenetic factors in development, sensory processes, learning, perception, motivation, language, and cognitive development.

581/ENGL 581 Survey of Psycholinguistics (3:3:0). Prerequisite: ENGL 391 or PSYC 305 or permission of instructor. Study of the psychological basis of human language acquisition and competence, including research on aphasia, association, autism, second language learning, grammatical transformations and the psychological reality of transformational rules.

592 Special Topics (3:3:0). Prerequisite: Permission of instructor. Special topics reflecting interest in specialized areas.

614 The Psychology of Aging 13:3:0). Prerequisite: Undergraduate or graduate course in aging. Review of the experimental literature in psychology of aging, including intellectual functioning, personality and adjustment.
minor and major adjustment problems, and role changes in later life.

616 General Psychopathology (3:3:0). Prerequisite: PSYC 325. Intensive survey of the current psychiatric nomenclature (DSM-III) of major types of psychopathological disturbances.

617 Child Psychopathology (3:3:0). Prerequisite: PSYC 373 or 211 and 325. Intensive survey of major types of psychopathological disturbances of infancy and childhood.


633 Evaluative Research in Psychology (3:3:0). Prerequisite: PSYC 300 or permission of instructor. Examination of research techniques that are specifically designed to evaluate the human effectiveness of organizations and mental health programs.

635 Topics in Organizational Psychology (3:3:0). Prerequisite: PSYC 230 or 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 Applied 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: personnel, social-organizational, human factors/engineer psychology.

637 Techniques in Applied Psychology (3:3:0). Prerequisite: PSYC 300 and permission of department. A skills-oriented course in the development and use of job analysis, task analysis, link analysis, performance appraisal, interview, and questionnaire techniques. Emphasis on group/individual projects.

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 Organizational Processes (3:3:0). Prerequisite: PSYC 230 or PSYC 632. Course trains students at both a theoretical and an experiential level in organizational processes. Includes intrapsychic, interpersonal, intragroup, and intergroup behavior 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. A skill-oriented course that enables students to construct instruments and perform functions critical to both researchers and practitioners in I/O psychology. Course 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 Engineering (3:3:0). Prerequisite: PSYC 530 and 553. Survey of the methods and techniques in human factors presented with a hands-on approach. Topics include systems analysis techniques, accident/critical incident analysis, task analysis, mission analysis, reliability/error analysis, workload measures, and training evaluation techniques.

650 Clinical Research Methods (3:3:0). Open only to degree students. Prerequisite: PSYC 553 or permission of instructor. Overview and discussion of research design and strategy for the conduct of research on human adjustment processes.

651 Quantitative Analysis of Experiments (3:3:0). Prerequisite: PSYC 300. Intermediate statistical techniques and introduction to computer packages. Requirement may be satisfied by demonstrating competence on examination.

652 Quantitative Methods II: Analysis of Variance (3:3:0). Prerequisite: PSYC 300 and either 304, 305, or 309. Basic concepts in experimental design, fundamental assumptions in analysis of variance, analysis of variance and covariance designs and multiple comparison tests are also reviewed.

653 Research Methods I: Experimental and Research Design (3:3:0). Open only to degree students. Prerequisite: PSYC 553. Overview of the various research designs used in psychology. The use of these designs in applied settings is discussed.

654 Naturalistic Methods in Psychology (3:3:0). Prerequisite: 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 Sensation and Perception (3:3:0). Prerequisite: PSYC 309. Important trends and issues related to sensory and perceptual methods, process, models, and theories are surveyed. Classic papers and other original source materials of both historical and contemporary interest are emphasized.

667 Small Group Behavior (3:3:0). Prerequisite: PSYC 231. Theories, methods and topics relevant to individual behavior in a small group setting. Effects of individual on the group, effects of the group on the individual, and interaction effects among individuals.

668 Learning, Memory, and Cognition (3:3:0). Prerequisite: PSYC 304, 305, or 309. Discussion of past and current theories and research in the areas of learning, memory, and cognition. Areas of focus include verbal learning, organization in memory, concept identification, and the nature of human mental processes that enable the acquisition, organization, and use of knowledge, such as attending, remembering, and thinking.

669 Social and Personality Development (3:3:0). Prerequisite: 6 hours of developmental psychology or permission of instructor. Survey of socialization theory and research relevant to infant social relationships, development of aggressive and altruistic behaviors, sex-role development, moral development, parent and adult influences, social class, and cultural influences.

671 Role and Function of the School Psychologist (3:3:0). Open only to school M.A. students or by permission.
678 Topics in School Psychology (1-6:0:0). Open to practicing school psychologists and advanced students in school psychology or by permission of instructor. Selected topics reflecting interest in a specialized area of school psychology. Content varies.

684 Psychological Counseling Techniques (3:3:0). Prerequisite: Graduate standing or permission of instructor. Application of various counseling techniques generated by current approaches to counseling. Students will be given experience in techniques used in contemporary practice.

687 Intervention Strategies in Alcohol and Polydrug Dependency (3:3:0). Prerequisite: PSYC 616 or equivalent and PSYC 684 or equivalent or permission of instructor. Review of multidisciplinary theory and practice in treatment of the alcohol or polydrug dependent client. Emphasis on coordination of relationship counseling and psychotherapy with interventions derived from corrective education and vocational rehabilitation. Problems of transition from institutional to open community settings.

701 Cognitive and Affective Bases of Behavior (3:3:0). Open only to degree students. A 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 role of specific neurotransmitters.

703 Social Bases of Behavior (3:3:0). Open only to degree students. Survey of social influences on behavior, including group processes, person perception, and attitude formation.

704 Life-Span Development (3:3:0). Open only to degree students. Survey of theories and research regarding life-span development and personality formation.

705 Historical and Philosophical Issues in Psychology (3:3:0). Open only to degree students. Important historical and systematic approaches to psychology and their relationship to the philosophy of science, structure of theory and philosophical issues in psychology.

709 (formerly 715) The Measurement of Intelligence (4:3:2). Open only to Psy.D. or M.A. school students. Permission of department required. Prerequisite: PSYC 617 or 822 and PSYC 320 or equivalent. 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.

710 (formerly 711) Psychological Assessment (4:3:2). Open only to Psy.D. or M.A. school students. Prerequisite: Satisfactory completion as certified by the School Psychology Committee of PSYC 709 (formerly 715), 822 or 810, and permission of department. Study of major instruments used in clinical assessment; their nature, problems and predictive value; administration and scoring of the major techniques for evaluation of personality and psychopathology; principles of interpretation of these procedures.

722 Advanced Child Assessment (4:3:2). Open only to Psy.D. or M.A. school students. Prerequisite: PSYC 709 (formerly 715) and 710 (formerly 711) or PSYC 810 and 811 and 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.

730 Practicum in Applied Psychology (1-6:0:0). Open only to degree students in psychology. Prerequisite: Permission of department. Apply in writing to the area coordinator 60 days prior to the beginning of the semester. Practical experience in an organizational setting as assigned. Psy.D. students may repeat this course to a maximum of 15 hours; M.A. students to a maximum of 6 hours. Course is graded S, NC.

733 Issues in Personnel Psychology (3:3:0) Prerequisite: PSYC 636 or permission of instructor. Examination of the psychological literature on (1) job analysis, (2) job evaluation and compensation, (3) performance appraisal, (4) training, and (5) EEO/L selection issues. Methodological and psychometric issues in the interpretation and evaluation of personnel psychology research receive particular attention.

734 Seminar in Human Factors Engineering (3:3:0). Prerequisite: PSYC 530 or graduate experimental course in psychology or PSYC 701. Rotating topics (e.g., systems theory, human factors in computer systems, office automation) announced in advance. May be repeated for credit.

735 Psychological Perspectives on Organizational Development (3:3:0). Prerequisite: 3 graduate credits in I/O psychology or permission of instructor. Theories and methods in I/O psychology as they relate to organizational change and development. Actual training in organizational diagnosis and change through supervised field work.

736 Research in Human Performance Assessment (3:3:0). Prerequisite: 3 graduate credits in I/O psychology or permission of instructor. This seminar reviews taxonomic issues in the description and prediction of human performance. Concepts and methods in assessment of human abilities are discussed. Emphasis is on the cognitive, psychometric, physical, and sensory-perceptual capacities required to perform human tasks.

737 Psychology of Human-Technology Interfaces (3:3:0). Prerequisite: PSYC 530 or permission of instructor. Investigation of psychological factors as they affect current human and technology interfaces of all kinds, e.g. aircraft traffic control systems, nuclear power plant control consoles, and personal computer-human interfaces. Considers capabilities to minimize error and to optimize on a number of dimensions such as ease of learning, “user-friendliness,” etc. Current literature is reviewed in depth, and practical applications are presented and discussed, including applications that serve as examples of design flaws.

740 Seminar in Psycholical Issues (3:3:0). Prerequisite: Permission of instructor. Intensive examination of selected aspects of the law-psychology interface. Focus on how psychology contributes to the legal process and how law affects the application of psychology. Students select issues relevant to their career goals, search the literature and present their findings to the class.
750 Psychological Practicum (1-6:0:0). Open only to M.A. school students. Prerequisite: assessment courses: PSYC 709 (formerly 715), 710 (formerly 711), 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 a school setting as assigned.

754 Quantitative Methods III: Psychological Applications of Regression Techniques (3:3:0). Prerequisite: PSYC 553. Psychological applications of regression techniques will be reviewed in a variety of contexts including experimental, field, and survey settings.

755 Statistical Packages for Psychology (3:3:0). Prerequisite: PSYC 553, 652 or 653, or equivalent. Introduction to manipulation techniques of statistical analysis appropriate for applied problems in psychology with three widely used statistical packages—BMD, SPSS and SOUPAC.

756 Quantitative Methods IV: Multivariate Techniques in Psychology (3:3:0). Prerequisite: PSYC 553 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.

772 Seminar in Behavioral Assessment of Toxic Effects (3:3:0). Prerequisite: Graduate course in physiological psychology or animal behavior and a course in drugs and behavior or environmental hazards, or permission of instructor. Intensive introduction to methodology of behavioral assessment of adverse drug or chemical effects. In-depth discussion of major research in behavioral toxicology, such as the effects of heavy metals, inhalants, gases, and abused drugs on behavior.

786 Assessment and Treatment in Gerontology (3:3:0). Prerequisite: Course in the psychology of aging, PSYC 320 and PSYC 423, or equivalent courses. Functional assessment of older adults including the conceptual and methodological problems involved. Intervention strategies with older adults are examined, including interviewing, group work with older persons, milieu therapy, reality therapy, and the design of supportive environments.

791 School Psychology Practicum (3:0:0). Prerequisite: PSYC 709, 710, 722, 750, and permission of department. Fieldwork with a practicing school psychologist in a school system two days a week. Introduces student to observation, assessment, and consultation within a school system. This pre-internship experience is supervised by university faculty and is a prelude to an internship with the same school system the following academic year.

798 Practical Research in School Psychology (4:0:0). Prerequisite: Required courses in school psychology program and permission of program coordinator. Practical project in the school system under the supervision of a faculty member. The student completes a paper on a project and has it approved by adviser and at least one other faculty member. Not available to students enrolled in EDUC 599 or PSYC 799.

799 Thesis (3-6:0:0). Research on approved thesis topic under the direction of a thesis committee with approval of the chair.

800 Studies for the Doctor of Arts in Education (variable credit). Prerequisite: D.A.Ed. admission to study in psychology. Program of studies designed by student's discipline director and approved by student's doctoral committee, which brings the student to participate in the research of the discipline director and results in a paper reporting the original contributions of the student. The paper is presented in a subsequent D.A.Ed. summer seminar. Enrollments may be repeated.

810 Intellectual Assessment (4:3:2). Open only to Psy.D. students. Course covers 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 Psy.D. students. Prerequisite: PSYC 810. Course covers administration, scoring, and interpretation of adult and child projective and objective tests of personality functioning.

812 Advanced Assessment (4:3:2). Open only to Psy.D. students. Prerequisite: PSYC 810 and 811. Course covers the interpretation and integration of multiple test findings for purposes of differential diagnosis of mental disorders.

816 (formerly 716) Neuropsychological Assessment (3:3:0). Prerequisite: PSYC 702, 810, 811. Course explores the nature of brain-behavior relationships in adults and children. It concentrates on the major assessment techniques including Luria Nebraska, Halsted-Reitan, and Michigan Neuropsychological batteries.

822, 823 (formerly 723) Seminar in Experimental Psychopathology I, II (3:3:0), (3:3:0). Open only to Psy.D. students. A seminar that provides an intensive integration of the psychopathology literature with mastery of the current psychiatric nosology.

830 (formerly 775) Theories of Psychotherapy (3:3:0). Open only to Psy.D. students. Prerequisite: 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 (formerly 729) Behavior Therapy (3:3:0). Open only to Psy.D. students. Investigation of specific procedures for altering emotional distress and behavioral dysfunction as they are implemented within the conceptual framework of clinical psychology.

832 (formerly 727) Group and Family Psychotherapy (3:3:0). Open only to Psy.D. students. Prerequisite: PSYC 822, 823 (formerly 723), and 830 (formerly 775). Review of major approaches to group and family psychotherapy. Group therapy approaches include the psychoanalytic approaches of Slavson and Ezriel, Yalom's interactionist approach, and Bion's Tavistock model and the encounter approaches of Schultz and Perls. Family therapy approaches include Bowen's systems approach, the communication models of Haley and Satir, Minuchin's structural theory, and Ackerman's psychoanalytic approach.

840, 841 (formerly 731, 732) Community Psychology: Theory and Practice (3:3:0) (3:3:0). Open only to Psy.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.

880 (formerly 618) Clinical Foundations (3:3:0). Open only to Psy.D. students. Focus on basic clinical/interational 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 (formerly 793) Assessment and Psychotherapy Supervision (3:0:0). Open only to Psy.D. students Prerequisite: Permission of clinical director. The course 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 hours of credit and may be repeated for up to 18 hours of credit.

885 (formerly 795) Clinical Externship (3:3:0). Open only to Psy.D. students in the third year of training. Students are placed in a local mental health facility, where they will have the opportunity to develop their psychodiagnostic and psychotherapy skills under the supervision of a clinical psychologist. Presentation of clinical material at department seminars is also required. May be repeated for credit.

890 (formerly 790) Seminar in Professional Psychology (1:1:0). Open only to Psy.D. students. Clinical students are required to enroll for each semester they are in the program. Focuses on the role of psychologists in various work settings. Consideration given to the functions performed by psychologists in those settings; to contributions by psychologists to the overall goals of those settings; to relationships with other professionals, managers, and personnel; and to management and policy issues arising in the various settings. Ethical issues addressed. Course is graded S, NC. May be repeated for credit.

892 (formerly 792) Special Topics in Psychology (3:3:0). Open only to Psy.D. students. Selected topics reflecting specialized areas in psychology. Content varies. May be repeated.

897 (formerly 797) Directed Reading and Research (1-3:0:0). Independent reading on a topic agreed to by a student and a faculty member. May be repeated once, except it may not be repeated for degree credit by students who also register for PSYC 799. (Clinical Psy.D. students may not take this for elective credit.)

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 credit hours 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 credit hours of PSYC 998 and 999 may be applied to doctoral degree requirements.

Public Administration

Faculty

Anderson, Wayne F., M.S., University of Wisconsin, Madison, 1949; Distinguished Professor
Brown, Brack, Ph.D., Syracuse University, 1977; Associate Professor
Clark, Robert P., Ph.D., Johns Hopkins University, 1966; Professor
Cole, John D. R., M.A., University of Redlands, 1951; M.P.A., University of Southern California, 1983; Research Professor
Conlan, Timothy J., Ph.D., Harvard University, 1982; Assistant Professor
Cook, Elizabeth A., Ph.D., Ohio State University, 1987; Assistant Professor
Dawisha, Adeed, Ph.D., London School of Economics, 1974; Professor of Government and Politics
Fisher, Joseph L., Ph.D., Harvard University, 1947; Visiting Distinguished Professor
Friedlander, Melvin A., Ph.D., The American University, 1982; Assistant Professor
Gifford, Jonathan L., Ph.D., University of California, Berkeley, 1983; Assistant Professor
Gortner, Harold F., Ph.D., University of California, Berkeley, 1974; Associate Professor
Hart-Nibbrig, Nand E., Ph.D., University of California, Berkeley, 1974; Associate Professor
Heclo, Hugh, Ph.D., Yale University, 1970; Robinson Professor
Katz, Mark N., Ph.D., Massachusetts Institute of Technology, 1982; Assistant Professor
Knights, Barbara B., Ph.D., The George Washington University, 1971; Associate Professor
Knutsen, Torbjorn L., Ph.D., University of Denver, 1986; Assistant Professor
Mahler, Julianne G., Ph.D., State University of New York, Buffalo, 1976; Associate Professor, Director, M.P.A. Program
Nguyen, Hung M., Ph.D., University of Virginia, 1965; Associate Professor
Paden, John, Ph.D., Harvard University, 1968; Robinson Professor
Pfiffner, James P., Ph.D., University of Wisconsin, Madison, 1975; Professor
Regan, Priscilla M., Ph.D., Cornell University, 1981; Assistant Professor

http://catalog.gmu.edu
Rubenstein, Richard E., J.D., Harvard Law School, 1963; Professor
Sacco, John F., Ph.D., Pennsylvania State University, 1973; Associate Professor
Sandoles, Dennis J. D., Ph.D., University of Strathclyde, 1979; Associate Professor
Stillman, Richard J. II, Ph.D., Syracuse University, 1971; Professor
White, Louise G., Ph.D., The American University, 1974; Associate Professor (Director, Doctoral Program in Public Administration and M.P.A. in International Management)

Master of Public Administration, M.P.A.

The Master of Public Administration program falls within the Public Affairs Department. The program increases students' competence in public service careers by improving their understanding of the processes of management and policy analysis within the public bureaucracy and the public policy system. As the standard professional credential in the public service field, the M.P.A. is designed to serve the career needs of those filling or expecting to assume responsible managerial and staff positions in public service in a wide variety of organizational settings.

All courses are available in the evening. While most are taught by a distinguished full-time faculty, part-time instructors who hold advanced degrees and positions of responsibility in the public sector teach some classes. Thus, a good balance between theory and practice is maintained.

Admission Requirements

In addition to fulfilling the entrance requirements of the Graduate School, applicants must submit:
1. A grade point average of at least 3.00 on a 4.00 scale for the last 60 hours of undergraduate work or in the major field of study;
2. Three letters of recommendation (letters should assess the applicant's academic and career potentials);
3. A resume detailing work and civic activities undertaken if the applicant is employed;
4. Training certificates or other work-related or postbaccalaureate training information (no credit need be given for this experience, but the information is used in helping plan the student's education program);
5. GRE General Test scores (not required of persons who have completed another graduate degree, e.g., master's, J.D.). GMAT or LSAT scores may be substituted for the GRE.

Degree Requirements

The M.P.A. program requires 42 semester hours of graduate course work. In addition, a student must demonstrate proficiency in statistics by completing an appropriate course or by satisfying the M.P.A. faculty that his or her work experience clearly demonstrates proficiency. The structure of the program is based on four levels of course work: core courses (24 hours), distributive requirements (9 hours), issues seminar (3 hours), and elective courses (6 hours). Four concentrations—public management, policy analysis, public financial management, and public personnel administration—predominate in the program, but others may be tailored to meet the needs of students with special interests. A concentration in international management is also available.

Courses Outside the Public Administration Program

Courses from another graduate program of this university may be allowed, provided they are from a related field and prior approval is received from the faculty adviser and director of the public administration program.

With the approval of the student's adviser, the chair of the Department of Public Affairs, and the dean of the Graduate School, graduate credits earned at other accredited colleges or universities may be accepted for transfer. Normally, 6 hours of graduate credit may be transferred at the time of admission. With prior approval, an additional 6 hours may be earned at other institutions while students are enrolled in the program. In a few cases, equivalency credit (6 credits maximum) may be granted for training received of an academic setting if the training is proven equal in quality to graduate course work. A maximum of 12 semester hours from all sources (including extended studies) is accepted.

M.P.A.—Management and Analysis Track

All students are required to take eight M.P.A. core courses that provide a common body of knowledge about public administration, its political environment, and the special tools required in its study and practice. These courses are:
- PUAD 502 Theory and Practice of Public Administration
- PUAD 610 Computer Uses in Managing Public Organizations
- PUAD 611 Methods of Analysis for Public Managers I
- PUAD 612 Methods of Analysis for Public Managers II
- PUAD 615 Administrative Law
- PUAD 620 Organization Theory and Manage-
ment Behavior  
PUAD 640 Public Policy Process  
PUAD 700 Ethical Dimensions of Public Administration  

Each student is expected to complete an education plan, with the help or his or her adviser, after completing the first 12 hours of the M.P.A. course work. This plan may be revised as needed, but it must be completed prior to enrollment for further courses. The education plan covers the courses to be taken in addition to completing the core courses, and includes three courses chosen from the following list, one issues seminar, and two electives.

Choose three courses from:
- PUAD 621 Principles and Practices in Government Organization and Management  
- PUAD 622 Program Planning and Implementation  
- PUAD 641 Policy Analysis  
- PUAD 642 Program Evaluation  
- PUAD 650 Intergovernmental Relations in the United States  
- PUAD 660 Public Financial Management  
- PUAD 661 Public Budgeting Systems  
- PUAD 662 State and Local Financial Management  
- PUAD 670 Personnel Administration in the Public Sector  
- PUAD 671 Public Employee Labor Relations  
- PUAD 672 Methods in Public Personnel Administration  

Choose one issues seminar:
- PUAD 729 Issues in Public Management  
- PUAD 749 Issues in Public Policy Analysis  

The two elective courses are chosen, with the help of an adviser, to build upon the student’s concentration whenever possible and looking outside the public administration program when appropriate courses are available. A thesis option is available and encouraged as one way of fulfilling the last 6 hours of the program. An internship is encouraged for preprofessional students.

**M.P.A.—International Management Track**
This program is for students who intend to manage government or business programs that have an international dimension or who are working in international organizations. The program requires 42 hours of graduate course work, drawing from work in public administration and international studies. PUAD 502 introduces the literature on public administration and PUAD 504 provides a foundation in the international relations literature. Required core courses emphasize management skills, methodology, and economic analysis. Electives allow students to examine key issues in international security, technology transfer, relations between public and private sectors, and the management of cooperation among economic competitors. The concluding course, PUAD 701, deals with cross-cultural and ethical problems that program managers may confront in the international arena.

**Core Courses:**
- PUAD 502 Theory and Development of Public Administration  
- PUAD 504 Managing in the International Arena: Theory and Practice  
- PUAD 611 Methods of Analysis for Public Managers I  
- PUAD 612 Methods of Analysis for Public Managers II  
- PUAD 620 Organization Theory and Management Behavior  
- PUAD 701 Cross-Cultural and Ethical Dimensions of International Management  
- ECON 602 Economic Analysis  

**Electives in Public Administration and International Management.** Select at least 15 of the remaining 21 hours from this list:
- PUAD 631 The Dynamics of Development  
- PUAD 632 Managing Development Programs and Projects  
- PUAD 633 Management of International Organizations  
- PUAD 634 Management of International Security  
- PUAD 635 Selected Problems of Development  
- PUAD 641* Policy Analysis  
- PUAD 660* Public Financial Management  
- PUAD 731 International Political Economy  
- PUAD 749* Issues in Public Policy Analysis  
- PUAD 732 Managing Technology Transfer  
- PUAD 733 Managing International Competition and Cooperation  
- PUAD 738 Issues in International Security  
- PUAD 739 Issues in International Management  

* When available, take the section on international issues.

**Offerings in Other Departments**
With the approval of the student’s adviser, a student may take 6 hours of relevant courses offered in other departments.

**Doctor of Public Administration, D.P.A.**
The primary goal of the Doctor of Public Administration (D.P.A.) program is to advance the education of those who plan to pursue careers related to the public service. Doctoral education, as distin-
guished from the M.P.A., allows greater depth of inquiry into the issues and problems that confront the field of public administration.

George Mason's D.P.A. has two major objectives. First, it prepares students to carry out significant, independent scholarly research on important problems and issues in public administration. The program encourages flexible, individual programs of study. After a year of required foundation courses in public administration, students design a program of study to enable them to do original research on a subject of their own professional interest, chosen in consultation with the faculty. Students identify their research interests early in their studies, and move as quickly as possible to complete their dissertations. Part-time students who enter with a master's degree and take 6 credit hours a semester may graduate in approximately five years.

Second, the D.P.A. promotes professional development, broadly defined. The program seeks to develop leaders who have the intellectual and moral capacity to understand, analyze, and influence advances in the art and science of public administration. It encourages students to place their substantive interests within a broad framework of understanding. Through course work and readings, they examine their research topics from a number of perspectives to appreciate the philosophical, political, organizational, and behavioral dimensions.

The program is for students who enter with a general interest in government, administration, and management, and for those who wish to study specific public policy issues. In either case, students focus on a particular research area and relate that concern to a broader framework. All students must take a set of required core courses that encompass philosophical, historical, and analytical approaches to public administration. They also take a set of research courses that introduce different ways of conducting research in the field. Students with a particular interest in policy issues take additional courses that provide a grounding in analytical approaches to policy, courses that stress implementation and program management, and courses that link the policy issue to the social and political setting. Those oriented toward generic management issues may take courses in such general areas as leadership or change and innovation. They may also select advanced classes in finance, budgeting, personnel, planning, and other administrative processes that examine practical, creative, and effective ways to respond to current operational problems.

Admission Requirements
The class size each year is limited to approximately 20 participants. Therefore, only applicants with outstanding records and potential are chosen. Admission to the D.P.A. program depends on the following criteria:

1. **Academic record.** An applicant's previous record should demonstrate high intellectual capacity, an analytical ability, and facility in writing. Applicants should have a minimum 3.0 GPA in any prior graduate work.

2. **Master's degrees.** Normally, applicants should have completed an M.P.A., M.B.A., M.S., M.A., J.D., or equivalent postbaccalaureate work at the time of entry into the D.P.A. program. Applicants whose master's degrees are not in public administration should consult with the coordinator of the D.P.A. program to determine whether they need to fulfill specific prerequisite courses. At a minimum, all applicants should have taken the equivalent of PUAD 502 Theory and Practice of Public Administration.

An applicant who does not have a master's degree or its equivalent may apply for the D.P.A. program. Such individuals should have outstanding credentials to justify entry directly into the D.P.A. program. If accepted, on completing 42 hours of work in the doctoral program, such individuals would be awarded an M.P.A. degree.

Students enrolled in the M.P.A. program in the Department of Public Affairs may apply to enter the program after completing 30 hours of work at the master's level. They are considered along with all other applicants. If accepted, they enter the doctoral program and are awarded their M.P.A. degrees after completing 42 hours of course work.

**Application for Admission**
In addition to fulfilling the general admission requirements of the Graduate School, applicants must arrange to have the following items submitted to the Admissions Office. Applicants should submit:

1. Scores from the GRE General Test, GMAT, or LSAT. Normally these scores should have been earned within the past five years;
2. Three letters of reference, ideally two of which refer to the applicant's academic, analytical, and writing abilities;
3. A detailed resume (not the SF171) including information on all work, civic activities, and interests;
4. An essay of 1,500 to 2,000 words that describes how the applicant believes the D.P.A. program at George Mason can help achieve stated intellectual and professional objectives;
5. Certification from instructional institutions attended other than colleges and universities. (No academic credit need be given for such courses; however, the information is considered as part of the total individual profile for admission).

Applications, including all supporting materials, must be received by the Graduate Admissions Office no later than April 1 to be considered for the annual D.P.A. class admitted for the following fall semester. Applicants are admitted during the spring semester in extenuating circumstances. The deadline for spring admission is November 1.

Degree Requirements
The D.P.A. program requires 84 semester hours of work beyond the baccalaureate degree. Students may be granted up to 30 hours of credit for master's level work. Credit is given for courses in which at least a B was earned and which are relevant to a degree in public administration.

Orientation
All admitted students must attend a one-day orientation to the program, which is offered once in the summer and once at the beginning of fall semester.

Required Foundation Courses
All admitted students must enroll in 12 hours of foundation courses during their first year in the program (PUAD 801, 802, 803, 804).

Qualifying Comprehensive Examination
After completing the 12 hours of foundation courses, all students must take and pass an examination to remain in the program. This examination is given mid-May of each year. Students who do not pass may retake the exam one time (offered at the beginning of the following fall semester).

Research Tools
Six hours of course work in research methods is required of all students. (PUAD 804, one of the foundation courses, plus PUAD 805). In addition, students must show proficiency in both descriptive and inferential statistics. They usually take PUAD 805 during the summer after completing PUAD 804. If they need to take undergraduate course work in statistics, however, they should fulfill this prerequisite prior to taking PUAD 805.

Students who intend to use more advanced quantitative techniques for their dissertations may be required by their advisers to take further course work in research tools.

Advancement to Candidacy
After completing the foundation courses and passing the qualifying comprehensive exam, students take a minimum of 15 hours of elective courses as agreed upon with their advisers. Six of these hours must consist of 800-level doctoral seminars. Upon completing these, students prepare and orally defend an acceptable dissertation proposal (described below). They have three years after passing the qualifying comprehensive to meet the requirements for advancing to candidacy.

Students consult with their advisers during the first year in the program to identify their areas of research interest and to plan their electives; advisers must approve the choice of electives. Normally students take courses at the 700 or 800 level, although with advisers' consent, they may take up to two 600-level courses. Students are encouraged to consider courses throughout the George Mason University curriculum or in other universities if they are directly relevant to the students' research interests.

After consulting with their advisers, students prepare a dissertation proposal. They orally defend this to the faculty, and it must be accepted by a committee of two faculty advisers. The proposal consists of two parts. The first is an in-depth essay in which students relate their research interests to the broader literature in the field of public administration. This essay should address the importance of the topic and show its relation to the relevant literature in the field. The second part of the proposal consists of a research design.

When a student has completed a minimum of 15 hours of electives and has successfully written and defended a dissertation proposal, the faculty recommends that the student be advanced to candidacy.

Students may be granted an extension beyond the three years limitation for advancing to candidacy in three situations:

1. A student does not have a master's degree or is granted less than 30 hours from prior study in a master's degree program;
2. A student's adviser states that the student needs to take more than 15 hours of electives; or
3. A student's written appeal for a one-year extension is accepted by the doctoral faculty.

Dissertation
Candidates must present a dissertation that represents technical mastery of the subject, originality in research, independent thinking, and scholarly ability. Its conclusions must be logical, its literary form must be acceptable, and its contributions to
knowledge must be recognizable to others in the field. Students earn 24 hours for completing their dissertations. The dissertation committee must agree that it meets these criteria, and that a student has successfully defended it orally to the faculty.

**Grades**

A student is dismissed from the program on receiving 9 hours of C or F while enrolled as a doctoral student, or on receiving 6 hours of unsatisfactory grades (C or F) in the PUAD 801-804 sequence.

**Public Affairs Course (PUAF)**

850 Studies for the Doctor of Arts in Education (variable credit). Prerequisite: D.A.Ed. admission to study in public affairs. Program of studies designed by student’s discipline director and approved by 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. The paper is presented in a subsequent D.A.Ed. summer seminar. Enrollments may be repeated.

**Public Administration Courses (PUAD)**

502 Theory and Practice of Public Administration (3:3:0). Prerequisite: Graduate standing or permission of department. Survey and review of the field of public administration to include development of U.S. governmental administration, theories of administrative organization and behavior, administrative processes, management of people and money, administrative responsibility, and the public policy-making/public policy-implementation nexus.

503 The Political Environment of Public Management (3:3:0). Prerequisite: Graduate standing or permission of department. Skills involved in a public manager’s interaction with private groups, legislative bodies, advisory committees, the press, other administrative agencies, political executives and other levels of government. Case studies of administrative participation in the political process of public policy making.

504 Managing in the International Arena: Theory and Practice (3:3:0). Prerequisite: Acceptance in M.P.A. or permission of department. Theoretical and empirical examination of the international system which both affects, and is affected by, the decisions, behaviors, and subsystems of state and nonstate (organizational) actors.

610 Computer Uses in Managing Public Organizations (3:3:0). Prerequisite: Admission to graduate school or permission of instructor. Examines how managerial and analytical functions in public organizations can be performed via end-user computer applications. Provides in-depth coverage of selected data base and decision support packages. Gives attention to logic and integration of application software.

611 Methods of Analysis for Public Managers I (3:3:0). Prerequisite: Statistics proficiency. Techniques and skills available to, and used by, public managers to solve policy-related problems or to analyze policy-related data. Focus on problem definition, research design, and problem solving under conditions of uncertainty in the public sector.

612 Methods of Analysis for Public Managers 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 on data gathering and analysis, use of computers, systems theory and analysis, and operations research.


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.


622 Program Planning and Implementation (3:3:0). Prerequisite: PUAD 620. Practical exploration of operationalizing public legislation in the American federal system. Construction of organizational apparatus, development of operational plans, and systems of control and evaluation necessary to implement government programs. Emphasis on coordination of tasks and resources required for effective program implementation.

631 The Dynamics of Development (3:3:0). Prerequisite: Graduate standing of permission of department. Internal and external factors and forces that affect the political development of Third World countries, including North-South relations, dependence theory, and development strategy within the context of resource scarcity.

632 Managing Development Projects and Programs (3:3:0). Prerequisite: PUAD 502. Design, implementation, and evaluation of development projects and programs, with emphasis on management and organizational strategies and processes to accomplish development goals. Particular attention to socioeconomic-political environments and organizations’ structures and routines in the Third World context.

633 Management of International Organizations (3:3:0). Prerequisite: PUAD 502 and 504. Structure of decision making within international organizations, their internal structures, behavior of individuals and groups working within these organizations, and impact of external pressures on their management. Emphasis on factors and procedures that promote or hinder effectiveness of international organizations.

634 Management of International Security (3:3:0). Prerequisite: PUAD 504. Examination of theory and prac-
tice of managing international security. Emphasis 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.

635 Selected Problems of Development (3:3:0). Prerequisite: Graduate standing or permission of department. Third World development problems, including development management, a new international economic order, foreign aid, multinational corporations, and international organizations. May be repeated with permission of department.

640 Public Policy Process (3:3:0). Processes of making public policy, including detection of public issues, consideration of alternatives, and adoption and implementation of solutions. Highlights the major actors in the policy process, as well as the environment within which they work.

641 Policy Analysis (3:3:0). Prerequisite: PUAD 611. Substantive issues in the conceptualization and practical applications of policy science and other formal perspectives to policy articulation, program formulation and program evaluation in the public sector.

642 Program Evaluation (3:3:0). Prerequisite: PUAD 611. Practical exploration of assessment techniques utilized by central analytical units in government, including program impact and program strategy evaluations, cost analysis, field experiments, productivity studies and evaluation research.

650 Intergovernmental Relations in the United States (3:3:0). In-depth study of intergovernmental relations, with emphasis on contemporary patterns of fiscal relations and operational grant programs.

651 Administration in the Commonwealth of Virginia (3:3:0). 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.

660 Public Financial Management (3:3:0). Analysis of revenue forecasting, revenue strategy, impact of inflation, interest rates, taxation, accounting, budgeting, "back door" spending, pension funding, user charges and other aspects of governmental finance.


662 State and Local Financial Management (3:3:0). Prerequisite: PUAD 660 or permission of department. Systems of public finance at state level. Impact of budgetary systems and taxation on state government, impact of federal grants-in-aid, revenue sources, and the relationship of national, state and local jurisdictions as partners in a federal system. Program auditing and new budgetary techniques are examined for their applicability at the state level.


671 Public Employee Labor Relations (3:3:0). Prerequisite: PUAD 670 or permission of department. 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.

672 Methods in Public Personnel Management (3:3:0). Prerequisite: PUAD 670. Introduction to some of the more important basic methods used in public personnel management and administration, including workforce planning and analysis; job evaluation and compensation; examining and selection; workforce management; and training and development.

700 Ethical Dimensions of Public Administration (3:3:0). Prerequisite: Final semester of a student's 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). Prerequisite: PUAD 504. Examination of normative issues in management of programs in international context. Emphasis on interplay of cultural, sociopolitical, legal, and ethical factors and on management and policy problems arising from conflicting goals, values, and inequities among nations and regions.


731 International Political Economy (3:3:0). Prerequisite: PUAD 504. Theories and issues pertaining to the production and distribution of wealth and power in the modern world. Explores the history of political economy as a field of study and applies concepts to current issues.

732 Managing Technology Transfer (3:3:0). Prerequisite: PUAD 502 and 504 or permission of department. Examination of how governments, businesses, and international organizations manage cooperation and competition in the transfer of technology. Includes case studies on East-West, West-West, and North-South relations.

733 Managing International Competition and Cooperation (3:3:0). Prerequisite: PUAD 504. Alternative perspectives on the role of the public sector in stimulating international economic development. Emphasis on the role that governing institutions can play both to promote the productivity of businesses within the United States, and to facilitate cooperation in the international arena.

738 Issues in International Security (3:3:0). Prerequisite: PUAD 504. Examines issues of topical interest in the general area of international security. Possible topics in-
clude nuclear strategy, disarmament, American defense policy, international terrorism.

739 Issues in International Management (3:3:0). Prerequisite: At least one course from the PUAD 630 sequence. Examination of significant current issues in public international management. Emphasis on practical applications of theories and analysis of problems in the public international management arena. Competence in improving management practices in international management settings.


759 Issues in Local Government Administration (3:3:0). Contemporary problems—such as land use, transportation, economic development, growth management, and environmental impact—in the management of counties, cities, towns and special districts, with emphasis on local government in Virginia.

794 Internship (2:3:0:0). Prerequisite: Open to authorized graduate majors only; contact the department one semester prior to enrollment. Internships are work-study programs with specific employers. Credit is determined by the department.

795 Research Design (3:0:0). Prerequisite: PUAD 612 and at least 12 hours of approved graduate credit and completion of proficiency tools. Review of project-related background material. The research design must include a statement of purpose, identification of data sources, data collection strategies, possible alternate hypotheses to be tested, the framework of analysis and a statement of anticipated results.

796 Directed Readings and Research (3:0:0). Prerequisite: Permission of department and instructor. Reading and research on a specific topic under the direction of a faculty member. Written report required; oral examination over the research and report may be required. May be repeated once.

798 Research Project (3:0:0). Prerequisite: PUAD 795 and permission of department. Completion of an original research project related to public sector administration. On the basis of the approved research design each student prepares and defends a final report that is the result of the research project. Final report must be approved by the Department of Public Affairs.

800 Introductory Doctoral Program Seminar (2:2:0). Prerequisite: Permission of department accepted in DPA program. Intensive orientation, self-appraisal and planning seminar for individuals entering the DPA program.

801 Philosophical Theories of Communities and Their Administration (3:3:0). Prerequisite: Acceptance into doctoral program. Philosophical understandings of political states, authority, and community. Emphasis on theories that have been most influential in the tradition of Western thought and that serve as a foundation for public administration.


803 Postwar Analytic Approaches to Public Administration (3:3:0). Prerequisite: PUAD 801, 802, or permission of instructor. Examination of the different analytical approaches to public administration that became significant with the rise of behavioralism. Includes attention to research implications and critiques of the approaches.

804 Conduct of Social Inquiry I: Research Design (3:3:0). Prerequisite: PUAD 801, 802, or permission of instructor. 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.


820 Doctoral Seminar in Leadership (3:3:0). Prerequisite: Permission of instructor and advisor. Leadership in the political and administrative world with special emphasis on the leader’s social influence, intellectual guidance, and role in policymaking and organizational creation and direction. Inquiry is also made into the effect of internal and external forces upon leadership styles and effectiveness.

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.

822 Doctoral Seminar in Change, Innovation, and Public Administration. (3:3:0). Prerequisite: Permission of instructor and advisor. Analysis of economic, political, social, and technological change as it influences and is influenced by public administration. Nature of change, innovation, and creativity in society with the object of enhancing student sensitivity to and knowledge about the future. Ways for designing the structures and procedures of public organizations so they can adapt to change.

823 Doctoral Seminar in Policy Analysis and Evaluation (3:3:0). Prerequisite: Permission of instructor and advisor. Quantitative and qualitative approaches and techniques used in recognizing, defining, and assessing public issues and problems. Conceptualizing and assessing problems, employing and judging the strengths and weaknesses of tools and techniques, and identifying and categorizing the information required for competent analysis and evaluation.

824 Doctoral Seminar in Policy Studies (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 adviser. Major issues confronting public management, such as civil service reform, presidential leadership, and management reviews. Analysis of current proposals for reform of public management.

826 Doctoral Seminar in Future Issues in Public Administration (3:3:0). Prerequisite: Permission of instructor and adviser. Examination of an emerging issue or issues confronting public administration in the 1990s with an emphasis on issues that raise important analytical and theoretical questions. Emphasis on current literature and research on this issue.

830 Doctoral Tutorial in Leadership (1-3:0:0). Prerequisite: Permission of instructor and adviser. Individualized, intensive study of particular features of leadership. Study is arranged with and supervised by the appropriate tutorial professor.

831 Doctoral Tutorial in Theories of Organization and Bureaucracy (1-3:0:0). Prerequisite: Permission of instructor and adviser. Individualized, intensive study of particular features of theories of organization and bureaucracy. Study arranged with and supervised by tutorial professor.

832 Doctoral Tutorial in Change, Innovation, and Public Administration (1-3:0:0). Prerequisite: Permission of instructor and adviser. Individualized, intensive study of particular features of change, innovation, and public administration. Study arranged with and supervised by tutorial professor.

833 Doctoral Tutorial in Analysis and Evaluation (1-3:0:0). Prerequisite: Permission of instructor and adviser. Individualized, intensive study of particular features of analysis and evaluation. Study is arranged with and supervised by the tutorial professor.

998 Doctoral Proposal Research (1-6:0:0). Prerequisite: Permission of adviser. 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 credit hours may be spread over a multisemester contiguous period. D.F.A. candidates must register for at least 3 hours each semester until the dissertation is completed.

Sociology

Faculty

Avruch, Kevin A., Ph.D., University of California, San Diego, 1978; Associate Professor

Bateson, Mary Catherine, Ph.D., Harvard University, 1963; Robinson Professor

Black, Peter W., Ph.D., University of California, San Diego, 1977; Associate Professor

Borkman, Thomasina S., Ph.D., Columbia University, 1969; Associate Professor

Burns, Tom R., Ph.D., Stanford University, 1969; Robinson Professor

Colvin, Mark W., Ph.D., University of Colorado, 1985; Assistant Professor

Dennis, Rutledge, Ph.D., Washington State University, 1975; Visiting Commonwealth Professor

Dietz, Thomas M., Ph.D., University of California, Davis, 1979; Associate Professor

Dumont, Jean-Paul, Ph.D., University of Pittsburgh, 1972, Robinson Professor

Gittler, Joseph B., Ph.D., University of Chicago, 1941; Visiting Professor

Golomb, Louis, Ph.D., Stanford University, 1976; Associate Professor

Horton, Lois E., Ph.D., Brandeis University, 1977; Associate Professor

Jacob, Mark, Ph.D., 1987, University of Chicago; Assistant Professor

Kolker, Aliza, Ph.D., Columbia University, 1975; Associate Professor

Lancaster, Roger N., Ph.D., University of California, Berkeley, 1987; Assistant Professor of Anthropology

Laue, James H., Ph.D., Harvard University, 1966; Vernon M. and Minnie I. Lynch Professor of Conflict Resolution

Palkovich, Ann M., Ph.D., Northwestern University, 1978; Associate Professor

Rader, Victoria F., Ph.D., University of Chicago, 1973; Associate Professor

Rosenblum, Karen E., Ph.D., University of Colorado, 1979; Associate Professor

Scimecca, Joseph A., Ph.D., New York University, 1972; Professor

Stone, John, Ph.D., Oxford University, 1969, Professor and Department Chair

Tavani, Nicholas J., Ph.D., University of Maryland, 1969; Associate Professor

Williams, Thomas R., Ph.D., Syracuse University, 1956; Professor

Sociology, M.A.

The Department of Sociology and Anthropology offers a master’s degree in sociology. A student may choose a concentration in general sociology, applied sociology, sex and gender, race and ethnicity, or conflict analysis and management. The general sociology concentration allows maximum flexibility in the application of sociological knowledge to the analysis of social processes and sys-

http://catalog.gmu.edu
tems. The applied concentration serves as a professional degree for the practitioner. The concentrations in race and ethnicity, sex and gender, and conflict analysis provide advanced training in these areas. All five concentrations 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, criminology and juvenile delinquency, development and social change, deviance, environmental sociology, gerontology, medical sociology, occupations and professions, policy analysis, race and ethnicity, sociology of science and technology, and survey research.

Admission Requirements
In addition to meeting the general admissions requirements of the Graduate School, applicants must present:

1. A minimum of 3 semester hours 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.

Acceptance of applicants to the program will depend upon assessment by the departmental graduate committee. While the Graduate Record Examination is not required for admission, it is recommended.

Nondegree Status
Students who do not wish to pursue a degree or who have not supplied all required documents may be admitted to nondegree status. Nondegree students may later apply for degree status. With approval, a maximum of 12 graduate credit hours earned in nondegree status may be applied to a master's degree.

Degree Requirements

General Sociology
The degree requires 33 semester hours, including a core of 6 hours of social theory (SOCI 611, 612) and 6 hours of research methods (SOCI 620, 630). Students are also required to complete a master's thesis or equivalent.

Applied Sociology
The degree requires 33 semester hours, including a core of 3 hours of social theory (SOCI 612), 6 hours of research methods (SOCI 620, 630), and 9 hours of applied sociology (SOCI 515, 632, 640).

Students are also required to complete a master's thesis or equivalent.

Sex and Gender
The degree requires 33 semester hours, including a core of 6 hours of social theory (SOCI 611, 612), 6 hours of research methods (SOCI 620, 630), and 9 hours in the sex and gender concentration (SOCI 505, 525, and 695). Students are also required to complete a master's thesis or equivalent.

Conflict Analysis
The degree requires 33 semester hours, including a core of 6 hours of social theory (SOCI 611, 612), 6 hours of research methods (SOCI 620, 630), and 9 hours in the sociology of conflict and conflict management. Students are also required to complete a master's thesis or equivalent.

Race and Ethnicity
The degree requires 33 semester hours, including a core of 6 hours of social theory (SOCI 611, 612), 6 hours of research methods (SOCI 620, 630), and 9 hours in the race and ethnicity concentration. Students are also required to complete a master's thesis or equivalent.

The Master's Thesis
A master's thesis or equivalent, such as a research report, is required for the M.A. degree in sociology to demonstrate a candidate's capacity to carry out independent research. The thesis or its equivalent 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 323-2900.

Sociology Courses (SOCI)
503 Family Law (3:3:0). Prerequisite: Undergraduate senior status in sociology, graduate standing or permission of instructor. An examination of the salient aspects of the law as it affects the family in our dynamic society. Topics include the nature and formalities of the marital relationship, intra-family torts and crimes, termination of the marital relationship, child custody and support, adoption, separation agreements, and the economic and sociological aspects of marriage, separation, and divorce.
505 Sociology of Sex and Gender (3:3:0). Prerequisite: Graduate standing or permission of instructor. An 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.
510 Employees, Employers, and the Changing Labor Force (3:3:0). Prerequisite: Graduate standing or permission of instructor. Focusing on the nature and origin of recent developments, e.g., in technology, affirmative action policy and debates, migration and immigration, and public and private job training programs, the course examines their impact on the social structure of work.

515 Applying Sociology (3:3:0). Prerequisite: Undergraduate senior status in sociology; graduate status. Course provides overview of the ways sociologists have applied their theoretical and methodological skills and understanding in sociological practice in nonacademic settings.

523 Racial and Ethnic Relations: American and Selected Global Perspectives (3:3:0). Prerequisite: Graduate standing or permission of instructor. Demographic purview of racial and ethnic groups in the United States; nature and meaning of racial and ethnic groups; 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: Graduate standing or permission of instructor. An advanced study of current social science research and research methodology used in the study of sex and gender.

541 Survey Research (3:3:0). Prerequisite: PSYC 300 or SOCI 221 or equivalent. Course acquaints students with the theory, method, and practice of survey research design and analysis. Students must complete a survey research project.

599 Issues in Sociology (3:3:0). Prerequisite: Undergraduate senior status in sociology; graduate status. Course explores topics of contemporary interest in sociology. Topics change from one semester to next and include issues in sociological theory, crime and delinquency, advanced research methods, social and cultural change, urban sociology, medical sociology, sociology of aging, rural sociology. May be taken only once for credit.

602 Sociology of Formal Organizations (3:3:0). Prerequisite: Graduate standing or permission of instructor. Classical and contemporary theories governing formal organization, and issues such as nature of authority, implementation of change, and relationship between formal organization and society.

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.

606 Socialization Processes (3:3:0). Prerequisite: Graduate standing or permission of instructor. Selected aspects of the cultural transmission process in specific local cultures selected from various world cultures regions—e.g., Oceanic, Sub-Saharan Africa, India—emphasizing the origins, course of development, and present structure and functions of the intergenerational transmission of culture.

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 (508) 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 Corrections (3:3:0). Prerequisite: Graduate standing or permission of instructor. Critical assessment of American adult and juvenile correctional systems. In-depth analysis of current American correctional ideology of punishment and incarceration. Alternative models are advanced which stress community-based, community-controlled programming.

610 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, with an emphasis on case studies, unobtrusive methods, participant observation, long-term residence, choices of observer status—role, recording data, use of technical equipment, key informants, interviewing techniques, and ethical considerations in employing such methods and procedures.

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, ethnomet hodology, humanist sociology and critical theory are examined. Contemporary theorists are analyzed in relation to the schools.

615 Social and Cultural Change (3:3:0). Prerequisite: Graduate standing in sociology or permission of instructor. Social and cultural change in a transnational and transcultural (or comparative) perspective, with particular attention to theories, research methods, and conclusions concerning development and modernization in post-Colonial and "Third World" societies and cultures.

616 Society, Culture, and Personal Character (3:3:0). Prerequisite: Graduate standing in sociology or permission of instructor. Transcultural (comparative) examination of the interrelationships between social and cultural actors and individual personal character; focus on life history of individuals in particular social and cultural settings. Readings and discussions center upon theoretical concerns, methodological approaches, and current research in study of social/cultural factors in personal character.

619 Conflict and Conflict Management: Perspectives from Sociology (3:3:0). Prerequisite: Graduate standing in sociology or conflict management or permission of instructor. The course deals with the sociology of conflict. Such major sociological theories of conflict as those of Marx, Weber, Simmel, Dahrendorf, Coser, and Col-
lins 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 social 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 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; (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. Advanced strategies of social research used in the area of social policy analysis, focusing on analytic techniques such as analysis of variance and covariance, multiple regression and correlation, path analysis and elaborative contingency table analysis.

632 Evaluation Research for Social Programs (3:3:0). Prerequisite: SOCI 620, 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.

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 Health Systems Delivery (3:3:0). Prerequisite: Graduate standing or permission of instructor. Analysis of the social factors associated with the delivery of health care. Several theoretical perspectives are used to highlight relevant elements. Planning for health from individual to federal processes is studied. The processes and problems of measuring the quality of health care are investigated.
Certificates, Programs, and Additional Graduate Courses
Certificates, Programs, and Additional Graduate Courses

Certificates

Graduate Certificate in Community College Education

The graduate certificate in Community College Education is for persons who are planning a career in community college teaching and for current teachers who want to strengthen their skills as community college teachers. The program combines course work in community college teaching with an internship in which the student teaches under the supervision of a master community college teacher.

Certificate Requirements

The certificate requires 12 hours of course work in the core curriculum and 6 hours of internship in community college teaching with a master teacher. Students select 12 hours of course work from the core curriculum that focus on applied teaching techniques specifically related to community college teaching. Core curriculum offerings include the following, all of which require admission to the doctor of arts in community college teaching program or permission of instructor:

- EDCC 801 The Community College (3)
- EDCC 802 Community College Teaching through Learning Style (3)
- EDCC 805 Teaching Thinking (3)
- EDCC 806 Seminar in Communication Skills for Teaching (3)
- COMC 885 Internship in Community College Education (3-6)
- EDCC 850 Research: Improving Teaching through Research (4)
- EDCC 892 Special Topics in Community College Education (3)

All students are required to complete EDCC 801 The Community College. A maximum of three 3 credits of completed course work may be transferred from another institution. At least 9 hours of GMU course work must be completed before the student may enroll in the teaching internship.

Students applying to the certificate program must be in graduate degree status or hold a master's degree in a teaching field appropriate for the community college. Students who are not enrolled should apply to the Graduate School for non-degree status. Enrolled students should apply directly to the certificate program.

Graduate Certificate in Gerontology

Committee: Doreen Harper, Mary Montebello, Robert Ruhling, Aliza Kolker, Jeanne Mellinger, Molly Davis

The Graduate Certificate in Gerontology is administered by the School of Continuing and Alternative Learning through the Office of Individualized Study Programs.

Five departments, including Sociology and Anthropology, Psychology, Nursing, Curriculum and Instruction, and Health, Sport, and Leisure Studies, have developed a graduate certificate program in gerontology. This program combines theoretical and applied course work in aging with the student's graduate curriculum in one of these departments. Since gerontology is by definition multidisciplinary, the certificate program requires students to take course work outside their major field.

A student applying to the certificate program must be in graduate degree status or hold a master's degree in psychology, education, nursing, or a service-related discipline (e.g., social work, recreational therapy, physical therapy). A student who already holds a master's degree must choose an area of specialization. As a prerequisite, a student must have had an undergraduate or graduate survey course in aging. The certificate requires 18 hours of graduate courses: 6 in the major area of

http://catalog.gmu.edu
specialization, 6 outside the major, and 6 hours of practicum (if applicable).

Students may obtain counseling and an application form from the Office of Individualized Study Programs, Room 10, Central Module, 323-2342.

**Graduate Certificate in International Nursing**

The graduate certificate in international nursing provides an opportunity for students to enrich their understanding of international health through a sequence of courses including, but not limited to, international nursing, anthropology, international relations, and economics.

**Program Requirements**

A student applying to the certificate program must be in degree status in the graduate nursing program or hold a master's degree from an NLN-accredited program. Application is made through the Graduate School of the university.

**Required Courses:** 6 credits

- NURS 698 International Nursing (3)
- NURS 699 Practicum in International Nursing (3)

**Suggested Electives:** 9 credits

- COMM 505 Intercultural Communication
- HIST 555 Problems in Asian History
- HIST 603 Themes in Latin American History I
- HIST 604 Themes in Latin American History II
- GOVT 537 Selected Problems of Third World Development
- NURS 570 Cultural Dimensions of Aging
- NURS 611 Anthropology of Health
- PUAD 739 Issues in International Management
- SOCI 523 Racial and Ethnic Relations: American and Selected Global Perspectives

Total: 15 credits

Students must complete all courses with a 3.00 GPA to earn the certificate.

**Graduate Certificate in Nursing Administration**

The certificate program offers formal study in theory and practice in nursing administration in the health care delivery system for the nurse with a master's degree in nursing or a bachelor's degree in nursing and a master's degree in another discipline from an accredited institution.

**Program Requirements**

Applicants to the certificate program must have either a master's degree in nursing or a bachelor's degree in nursing and a master's degree in another discipline from an accredited institution. Application is made through the Graduate School of the university. A requirement for the certificate is 15 credits of graduate course work in which a 3.00 GPA is earned.

**Program Content**

The program for the certificate consists of the following:

**Required Courses:** 6 credits

- 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:** 9 credits

Graduate courses related to nursing administration as approved by the student's adviser.

Total: 15 credits

**Graduate 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.

**Program Requirements**

Individuals applying to the graduate certificate in nursing education must be in degree status in the graduate nursing program or hold a master's degree in nursing from an NLN-accredited program. Application is made through the Graduate School of the university.

**Program Content**

- NURS 657 Perspectives in Nursing Education (3)
- NURS 658 Practicum in Nursing Education (3-6) (Students must complete 15 credits with a 3.00 GPA. Those who qualify for a 3-credit practicum because of their educational experiences may choose the remaining 3 credits from courses designated by the School of Nursing.)
- EDUC 531 Educational and Psychological Measurement (3)
Graduate Certificate in Software Systems Engineering

The graduate certificate program in software systems engineering is for individuals who have a master's degree in a scientific or engineering discipline, or who are enrolled in an appropriate master's degree program. The certificate program provides knowledge, tools, and techniques to those who are working in, or plan to work in, the field of software systems engineering, but do not want to complete all of the requirements for a master's degree in software systems engineering. The certificate in software systems engineering may be pursued concurrently with any of the graduate degree programs in the School of Information Technology and Engineering; however, the certificate is not awarded until all requirements for that graduate program have been completed.

Admission Requirements

Applicants to the graduate certificate program in software systems engineering must hold a master's degree in a scientific or engineering discipline from an accredited university or be in graduate degree status in an appropriate master's program. In addition, each applicant must possess knowledge equivalent to the following undergraduate courses: structured programming in a modern programming language, data structures, discrete mathematics, and assembly language programming. Also, it is desirable, but not necessary, for applicants to have at least one year of appropriate work experience in the software field upon admission.

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 systems engineering, and to complete a self-assessment form that provides summary information concerning background and preparation for the program. Application for the certificate program in software systems engineering is made through the Graduate School of the university.

Certificate Requirements

Certificate candidates must complete the following set of courses, achieving a grade of B or better in each, for a total of 15 credits of graduate study.

- SWSE 520 Introduction to Software Engineering
- SWSE 623 Formal Methods and Models in Software Engineering

Software Engineering

- SWSE 624 Requirements, Prototyping, and Design Methods
- SWSE 625 Software Project Management
- SWSE 626 Software Project Laboratory

Applicants may obtain more information by contacting the ISSE/SWSE certificate program advisor in Room 203, Science and Technology I, (703) 323-3530.

Graduate Certificate in the Teaching of English as a Second Language (TESL)

The TESL certificate prepares students to teach nonnative 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 adviser.)

Admission Requirements

Applicants interested in a Certificate in the Teaching of English as a Second Language must be admitted to graduate study through the Graduate School or approved for graduate course enrollment through the School of Continuing and Alternative Learning. Students who initially enroll in the certificate program through the School of Continuing and Alternative Learning must apply for regular admission through the Graduate School no later than the second semester of study. At the time formal admission to graduate study is sought, applicants must submit one copy of a writing sample of approximately 1,000 words and two letters of recommendation. The certificate may be pursued concurrently with any of several degree programs offered through the College of Education and Human Services, the Department of English, and the Department of Foreign Languages and Literatures, 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. ENGL 520, 521, 522, and 582 (EDCI 519 may be substituted for ENGL 521)
2. One of the following courses: ENGL 507 (EDCI 507), 581, 615, 690, 785, 786. (Additional courses, including some from other departments, may be used to fulfill this requirement. Apply to the Department of English for a list of approved electives.)

Northern Virginia Cooperative Graduate Engineering Program

Graduate programs in engineering and information technology are offered under the auspices of a Cooperative Network in Northern Virginia. This network includes George Mason University (the host institution), Virginia Polytechnic Institute and State University (VPI), Old Dominion University (ODU), and the University of Virginia (UVA), and employs a mix of direct classroom laboratory instruction from GMU and live interactive televised lectures from VPI, ODU, and UVA. Afternoon and evening instruction is provided at several classroom sites, including the GMU Fairfax Campus, the GMU Arlington Campus, the UVA/VPI Northern Virginia Center, and additional off-campus corporate televised receive sites.

Master's degrees are offered by either UVA, VPI, ODU, or GMU following successful completion of the appropriate program of study. Students apply to a degree program at one of these four institutions based upon course offerings and programs sponsored by an institution and the individual direction a student wishes to follow. Program requirements are the responsibility of the degree-granting institution and, subject to the requirements, courses may be taken from any of the four 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 among the four cooperating institutions. UVA, ODU, and VPI degree programs are composed primarily of televised courses and are supported by additional courses from the host institution, GMU. These degree programs do not generally have a thesis or research component. GMU degree programs do have a research project or thesis component and are composed primarily of live classroom instruction, with the possibility of transferring televised courses into these degree programs.

Discipline areas of the degree programs from the University of Virginia include the Master of Materials Science, the Master of Engineering in Chemical Engineering, Mechanical and Aerospace Engineering, Electrical Engineering, Systems Engineering, or Civil Engineering (Structural Focus). From VPI the following degree programs are offered: Master of Engineering Administration, Master of Science in Mechanical Engineering, Electrical Engineering, Civil Engineering (Environmental Focus), and Aerospace and Ocean Engineering, and the Master of Science and Master of Engineering in Systems Engineering. ODU offers the Master of Engineering Management. GMU offers master of science degree programs (described within this catalog) in Computer and Electronics Engineering, Computer Science, Information Systems, Operations Research and Management Science, Statistical Science, Software Systems Engineering, and Systems Engineering. Also offered from GMU is the doctor of philosophy in Information Technology and a certificate program in Software Systems Engineering.

Qualified students who want to take particular graduate courses for professional development may enroll without pursuing formal graduate degree programs. Admission is based on the student's background and available space. The Northern Virginia Cooperative Graduate Engineering Program is one of three cooperative efforts in the commonwealth, the others hosted by Virginia Commonwealth University in Richmond and Old Dominion University in Tidewater. This statewide network, with five participating major universities, is also supported by the Virginia Department of Information Technology and the State Council of Higher Education in Virginia, and provides expanded academic resources to three major urban communities of the commonwealth.

For program information, contact the Cooperative Graduate Engineering Program, School of Information Technology and Engineering, GMU, (703) 323-3194.

Additional Graduate Courses

American Studies Courses

(AMST)

502 Problems in American Culture (3:3:0). Prerequisite: Graduate standing. Interdisciplinary study of a particular aspect of American culture. Limited to 15 students. Specific content varies and is announced be-
fore registration. May be repeated with permission of chair.

690 Internship (2-6:0:0). Prerequisite: Permission of chair. Internships are nonpaying, work-study positions established by AMST program with employers involved in interdisciplinary AMST issues. Qualified students are placed with area schools, interest groups, agencies, museums, parks or corporations. Placement depends upon availability of positions.

Art History Courses (ARTH)

592 Exhibitions Projects (3:3:0). Prerequisite: B.A. or equivalent or permission of instructor. Planning, promotion and production of visual art presentations and related events on the GMU campus. Exhibitions are produced by students who alternately serve in all operational capacities from proposal research and budget planning to the graphic design of announcements and the installation of exhibitions.

593 Art Apprenticeships (3-6:0:0). Prerequisite: B.A. or equivalent or permission of instructor. Seminar followed by an apprenticeship or internship project with a professional individual or organization in the field of visual arts in the D.C. area. An apprenticeship may provide an introductory work experience in the professional area in which the student is considering a career.

596 Independent Study (3:3:0). 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. A written report is required. May be repeated for credit.

Communication Courses (COMM)

Communication courses at the 500 level are open to postbaccalaureate students or communication majors with advanced undergraduate standing and other seniors with permission of 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 individual students to assess theories of communication and their applications in individual professional fields.

502 Theories of Mass Communication (3:3:0). Investigation into the various theories of mass communication that have guided the development of mass communication (broadcast, cablecast, telecommunications, etc.). Emphasis is placed upon the major scientific, humanist, and critical approaches to the question of mass media impact and effects.

504 Communication and Interpersonal Conflict (3:3:0). Prerequisite: Admission to Graduate School or senior standing and permission of instructor. This course provides a theoretical introduction and experiential learning in the role of communication in conflict and conflict management. The focus is upon interpersonal interactions, including dyadic and small group levels in various settings such as friendships, marriage, family, and the workplace. The course 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, perceptual and attitudinal foci, 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. Focus on interpersonal aspects of government and business relations both outside the U.S. and with foreign visitors in the U.S., with extensions being made to management of subcultural differences within U.S. national organizations. Emphasis on developing an understanding of how cultural differences influence managerial activities, and upon learning to deal effectively with these cultural differences.

510 Studies in Oral Interpretation (3:3:0). A comprehensive examination of the role of the oral communicator in the selection, adaptation and performance of literature. Seminar course topics vary depending upon 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 levels of theory and practice of small group interaction. Examination of current research in small group communication; a focus on learning the theory and application of the theory to relevant setting.

531 Approaches to Group Facilitation (3:3:0). Introduces various theoretical and practical approaches to group facilitation with in-depth focus and practice with one approach. Students participate in group sessions, analyze videotapes of decision-making groups, and practice different methodologies for facilitating group interaction.

534 Theories of Interpersonal Communication (3:3:0). Prerequisite: COMM 301 or permission of instructor. Contemporary theories of interpersonal communication. Analysis of theories, concepts and approaches to the improvement of interpersonal communication. Extensive examination of interpersonal communication research is included.

535 Organizational Communication (3:3:0). An analysis of communication systems and processes within organizations, both public and private. Specific topics include conflict management, group decision making, interviewing, technical presentations, and use of various channels to improve internal and external communication for the organization.

536 Communication Consulting (3:3:0). Prerequisite: COMM 335. Investigation of theories which serve as the foundation for communication consulting. Designed to provide both the theoretical information and mechanisms for application necessary to modify communicative behavior within organizations.

540 Directing Forensics Programs in Individual Events (3:3:0). An 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 tournament management.

542 Directing Debate Activities (3:3:0). Theory and practice of competitive debate. Emphasis on traditional and contemporary theories of debate, administrative activities related to the direction of a debate program, and methods of instruction in debate, including analysis of current debate topics. 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 revisions in theories desired to enhance academic debate.

550 Communication in the Classroom (3:3:0). Prerequisite: 84 hours. Examination of both oral and nonverbal elements in the classroom which produce meaning among teachers and students. Communication theories and skills needed to manage the communication environment in the classroom. Nonverbal aspects of space, time, action, and form are considered as they impact teaching choices. Verbal patterns for skills of classroom management: questioning skills, enhancing students' self-concept, systematic feedback, enhancing students' self-concept.

551 Developing Students' Speaking and Listening Skills (3:3:0). Prerequisite: 84 hours. Speaking and listening skills which develop the oral communication competency of children and adolescents. Emphasis on development of assignments that both directly and indirectly develop communication competence. The five functions of communication and steps in developing them are developed in the context of integrating the basic skills at the elementary level and direct teaching at the secondary level. Issues of definition in terms of philosophies of communication education and curriculum development, as well as competency assessment are covered.

554 Telecommunications Policy and Regulation (3:3:0). A review of the history and principles of telecommunications regulation. A study of the relevant policy-making and regulatory institutions and their roles in charting the course of telecommunications in the United States. Examination of the role of citizens and groups in the regulatory process.

555 Theories of Telecommunications Production (3:3:0). Prerequisite: Approval of M.A.L.S. or permission of instructor. Telecommunications production theories involving computers, computer graphics, television cameras, computerized editing, audio mixing, and other production tools available for electronic communication. Explores problems of fitting messages to various media, including aesthetic demands on product imposed by new technologies.

556 Global Communication (3:3:0). The study of global telecommunication channels and artifacts of international mass communication, with focus on discussion of problems of free flow of information, the roles of national and international organizations in fostering global communication, and the roles of the old and new mass communication and other telecommunications technologies in 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 (1-3:0:1-3). Prerequisite: Graduate standing and permission of department. Reading and research on a specific topic, under the direction of a faculty member. A written report is required; an oral or written examination over the material may be required. Course may be repeated for a maximum of 6 credits.

597 Independent Production (1-3:0:1-3). Prerequisite: Graduate standing and permission of department. Media or creative production activities, under the direction of a faculty member. A completed production is required; a written report and an oral examination may be required. Course may be repeated for a maximum of 6 credits.

800 Studies for the Doctor of Arts in Education (variable credit). Prerequisite: D.A. Ed. student admission to study in communication. A 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 discipline director and results in a paper reporting original contributions of the student. The paper is presented in a subsequent D.A.Ed. summer seminar. Enrollment may be repeated.

Dance Courses (DANC)

510 Independent Study (3:0:0). Prerequisite: Dance major with 84 hours, graduate standing in dance or theatre or permission of instructor. Individual research or a creative project in close consultation with an instructor. Projects selected from performance, choreography, technical theatre as it applies to dance management, dance history, or criticism.

527 Advanced Modern Dance (3:0:6). Prerequisite: Audition. Course provides the advanced student the opportunity for continued training. Emphasis and importance is placed on the attainment of high technical quality and performing skills. Six hours per week. May be taken for a total of 18 credits.

560 Advanced Choreography (3:3:0). Prerequisite: DANC 360 or permission of instructor. Intensive study and exploration of advanced choreographic forms culminating in a public performance of a complete dance work. Three hours per week. May be taken for a total of 12 credits.

570 Advanced Dance Performance (3:0:6). Prerequisite: Audition or permission of instructor. Advanced exploration into performance, repertory, and/or production skills through participation in university dance productions, special guest artist programs, or professional dance companies. May be taken for a total of 12 credits.

598 Philosophy and Aesthetics of Dance (3:3:0). Prerequisite: DANC 390 and 391 or permission of instructor. A study of the philosophical theories and aesthetic principles of dance as a performing art. What dancing is, what it expresses, what it creates, and how it is related to other arts and artists are explored.

Geology Courses (GEOL)

500, 501 Selected Topics in Modern Geology (1-3:1-3:0, 1-3:1-3:0). Prerequisite: Baccalaureate degree in geology or permission of instructor. Lecture/lab/field trip. Topic is designated in the class schedule.

514 Biostratigraphy and Biofacies Analysis (4:3:3). Prerequisite: Baccalaureate degree in geology or permission of instructor. Use of fossils in correlating and dating rock units in various fields of energy exploration. Relationships between fossils and paleoenvironments. May include field trips.

515 Advanced Structural Geology (4:3:3). Prerequisite: Baccalaureate degree in geology or permission of instructor. The concepts of stress and strain in rock materials, and the application of this theory to understanding complex three-dimensional structures in deformed rocks. Emphasis is placed on a quantitative approach to resource deposits. May include field trips.

516 Appalachian Stratigraphy (3:3:0). Prerequisite: Baccalaureate degree in geology or permission of instructor. Analysis of the stratigraphy and tectonics of sedimentary rocks of the Appalachian Mountain system, with emphasis on the stratigraphic provinces that contain energy resources.

618 Geochemical Methods of Analysis (4:3:3). Prerequisite: Baccalaureate degree in geology or permission of instructor. Principles and application of geochemical analysis as applied to rocks found in areas of energy resources. Concentration on techniques of x-ray and optical spectroscopy and atomic absorption.

620 Organic Geochemistry (4:3:3). Prerequisite: Baccalaureate degree in geology or permission of instructor. The production of natural organic compounds. Discussions on the influence of diageneric factors such as hydrolysis, heat, and pressure on such compounds as cellulose, lignin, proteins and lipids, and a consideration of the origin of soil organic matter, carbonaceous shales, coal, and crude oil. May include field trips.

800 Studies for the Doctor of Arts in Education (variable credit). Prerequisite: D.A.Ed. admission to study in geology. 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 students. The paper is presented in a subsequent D.A.Ed. summer seminar. Enrollments may be repeated.

Philosophy and Religious Studies Courses (PHIL)

505 Professional Ethics (3:3:0). Advanced study of ethical theory as it applies to moral problems that arise in business and professional contexts.

510 Seminar in the Ethics of Health Care (3). Prerequisite: Junior-senior or graduate standing or permission of instructor. An examination of moral dilemmas within the health care profession based 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 (4:3:0). Pre-
requisite: Senior standing, 6 hours of 300-level English and
6 hours of 300-level philosophy or permission of instructor.
The topic of the seminar varies from term to term; possible
topics include structuralism, technology, form and
matter, conceptions of the future. The course is cross-
listed and team taught.

531 Freud and Philosophy (3:3:0). Prerequisite: 6
hours in philosophy or a course in personality theory, or per-
mission of instructor. Exploration of philosophical as-
pects of Freud’s thought, focusing on Freud’s philosophy
of human nature and culture and its influence on contem-
porary thought.

555 Environmental Ethics (3). Prerequisite: Junior-se-
nior or graduate standing, and 3 credits in philosophy plus
a combined total of 9 additional credits in philosophy and
science or permission of instructor. Examination of ethical
principles affecting environmental issues with special em-
phasis on the problems encountered by environmental bi-
ologists.

574 Current Issues in Philosophy of Psychology
(3:3:0). Prerequisite: A combined total of at least 12 cred-
its in philosophy or psychology, at least 3 of which must be
in philosophy and at least 3 of which must be at 300 level or
above, or permission of instructor. A careful examination
of some issue or issues of current interest to both philoso-
phers and psychologists. Typical of issues examined are
the mind-body problem, philosophical and psychological
implications of work in artificial intelligence, and philo-
sophical issues in psycholinguistics.

591 Special Topics in Philosophy (3:3:0). Prerequi-
site: Graduate standing and permission of instructor. Exam-
ination of specific topics in philosophy which are of
central interest in that field and of interdisciplinary inter-
est as well. Topics will be selected with special reference
to the areas of philosophy of technology, aesthetics, phi-
losophy of religion, and ethics and social and political
philosophy. Course may be repeated for credit up to
three times (when the course content differs) with permis-
sion of the instructor and the student’s adviser.

800 Studies for the Doctor of Arts in Education (vari-
able credit). Prerequisite: D.A.Ed. admission to study in
philosophy. Program of studies designed by student’s dis-
cipline director and approved by student’s doctoral com-
mittee 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 stu-
dent. The paper is presented in a subsequent D.A.Ed.
summer seminar. May be repeated.
General Policies
General Policies

Conduct
The university respects and protects the individual dignity, integrity, and reputation of its students. Students 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.

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) confers upon the university the responsibility for maintaining order within the university and the right to exclude those who are disruptive.

The Office of the Associate Vice President and Dean for Student Services 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 under Academic Policies, is responsible for adjudicating violations of the Honor Code that relate to academic matters. Questions regarding student conduct should be directed to the Office of the Associate Vice President and Dean for Student Services, located in Room 302 of Student Union I (323-2522).

Privacy of Student Records
Annually, George Mason University informs students of the Family Educational Rights and Privacy Act of 1974. This act, with which the institution intends to comply fully, protects the privacy of education records, to establish the right of students to inspect and review their education records, and to provide guidelines for the correction of inaccurate or misleading data through informal and formal hearings. Students also have the right to file complaints with the Family Educational Rights and Privacy Act office (FERPA) concerning alleged failures by the institution to comply with the act.

Local policy explains in detail the procedures to be used by the institution for compliance with the provisions of the act. The Office of the Registrar keeps a copy of the policy and also maintains a Directory of Records listing all education records maintained on students by this institution.

Questions concerning the Family Education Rights and Privacy Act may be referred to the Office of the Registrar.

Statement on Drugs and Alcohol
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 in dealing with such problems are encouraged to seek the confidential services of the university's Counseling Center or the Student Health Center.

Drugs
The university prohibits the possession and use of illegal drugs. Possession, sale, use, or distribution of controlled substances, including marijuana, is a violation of both federal and state laws and university regulations.

Alcohol
The use of alcoholic beverages on campus is at the discretion of the university and is subject to state alcoholic beverage regulations. Unless the university has specifically sanctioned the location and condition of alcohol use, the possession and consumption of alcohol on campus is prohibited.

Individuals involved in the sale, use, or distribution of controlled substances (drugs and alcohol) are subject to arrest and university disciplinary action. The university imposes a variety of sanctions, which include eviction from university housing and suspension or dismissal from the university.

Adopted by the Board of Visitors on May 12, 1987.
Computer Use Policy

George Mason University has established regulations regarding computer resources. These regulations define computer violations and actions that are taken when a violation is confirmed.

University computer resources are restricted to use for research, instructional support, and administrative purposes. Unauthorized access, including illegal use of passwords on mainframe systems, is prohibited. Also prohibited is use of legal access for unauthorized purposes, such as tampering with or destroying files, soliciting, or harassing. Illegal use or copying of licensed software or student files is also an offense.

In all cases where a violation is reported, the user's access to hardware and/or software is terminated until a final decision is made. Depending on the status of the person involved and the nature of the violation, referral may be made to Student Services, Human Resources, or University Police. Section II of the Honor Code also applies to computer programs. A complete copy of the policy may be obtained from the Office of the Associate Vice President for Student Services or from University Computing and Information Services.

Motor Vehicles Policy

The privilege of operating and parking a motor-driven vehicle at George Mason University is extended to all students, subject to the following procedures:

Vehicles must be registered with the Traffic and Parking Office. At the time of registration, operators must certify that (a) vehicles have a valid state registration and valid insurance from a recognized insurance company, evidencing coverage for public liability in conformance with the laws of the Commonwealth of Virginia; (b) they have a valid state driver's license; and (c) they understand that they are governed by University Motor Vehicle and Traffic Rules and Regulations, a copy of which is furnished at the time of registration of the vehicle. A state vehicle registration card must be provided at the time of registration. Vehicular registration decals may be purchased for the full academic year or by the semester or summer session.

The Parking Services office is in N. Chesapeake Module behind the library.

Registered vehicles must display in full view the university's vehicular registration decal, affixed immediately upon issue as per the instructions on the reverse side of the decal.

Other Regulations

Firearms

The unauthorized possession, storage, display, or use of any kind of ammunition, firearms, fireworks, explosives, air rifles, air pistols, or other lethal instruments is prohibited on university property. Any questions regarding this regulation should be directed to the University Police (323-2158).

Smoking

Smoking is not permitted in classrooms, lecture halls, theaters, or in the university libraries. Lounge areas in the student union buildings and other university buildings have been set aside for this purpose.

Bicycles/Skateboards

Bike racks are provided at various locations on campus for the convenience of students who bike to and from the university. For resident students, storage areas for bikes are near Buildings 2, 4, and 8. Bikes may be parked only in these areas.

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

Pets

No pets are permitted in university buildings at any time. Additionally, pets that are on campus grounds must be on a leash and under supervision at all times.

Solicitors and Salesmen

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