

1998

# Master of Science in Computer Science Programs

Nova Southeastern University

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**NOVA SOUTHEASTERN UNIVERSITY**  
The School of Computer and Information Sciences

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## Master of Science Degree Programs

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**Computer Science**  
**Computer Information Systems**  
**Management Information Systems**  
**Computing Technology in Education**

**The School of Computer and Information Sciences (SCIS)**  
**Nova Southeastern University**  
**3100 SW 9th Avenue**  
**Fort Lauderdale, Florida 33315-3025**

**800-986-2247, ext. 2000**  
**(954) 262-2000**  
**[scisinfo@scis.nova.edu](mailto:scisinfo@scis.nova.edu)**  
**<http://www.scis.nova.edu>**

**Notice of Nondiscrimination**

Nova Southeastern University admits students of any race, color, sex, age, nondisqualifying disability, religion or creed, or national, or ethnic origin to all rights, privileges, programs, and activities generally accorded or made available to students at the school, and does not discriminate in administration of its educational policies, admissions policies, scholarship and loan programs, and athletic and other school-administered programs.

Nova Southeastern University is accredited by the Commission on Colleges of the Southern Association of Colleges and Schools (1866 Southern Lane, Decatur, Georgia 30033-4097; telephone number (404) 679-4501) to award bachelor's, master's, educational specialist, and doctoral degrees.

December 15, 1998



## ***In Brief:***

## **The School of Computer and Information Sciences Nova Southeastern University**

A major force in educational innovation, the school provides educational programs of distinction to prepare students for leadership roles in computer science, information systems, information science, and computing technology in education. It is distinguished by its ability to offer on-campus, online (via the Internet and World Wide Web), and hybrid on-campus/online formats that enable professionals to pursue B.S., M.S., and Ph.D. degrees without career interruption. Ranked by *Forbes* magazine as one of the nation's top 20 cyber-universities, the school pioneered online graduate education with its creation of the electronic classroom and has been offering online graduate programs and programs with an online component since 1983. The school has more than 1,000 students. It has been awarding graduate degrees since 1980. The school's research advances knowledge, improves professional practice, and contributes to understanding in the computer and information sciences.

The school offers programs leading to: the B.S. in computer science and computer information systems; the M.S. in computer science, computer information systems, management information systems, and computing technology in education; and the Ph.D. in computer science, information systems, computer information systems, information science, and computing technology in education.

The M.S., which is offered on campus or online, requires 36 credit hours and may be completed in 18 months. To earn the M.S. in 18 months, the student must enroll in two courses each term. Terms are 12 weeks long and there are four terms each year. Master's terms start in September, January, April, and July. NSU master's students may be granted early admission into the doctoral program. Early admission provides the student the opportunity to earn the Ph.D. or Ed.D in a shorter time.

Doctoral students may take one of two formats: *cluster* or *institute*. Clusters and institutes bring together students and faculty for participation in courses, seminars, and dissertation counseling. Between meetings, students work on assignments and projects, and participate in online activities that facilitate frequent interaction with the faculty as well as with other students. Cluster students attend four cluster sessions per year, held quarterly over an extended weekend at the university, during the first two years of their programs. Cluster terms start in March and September. Institute students attend weeklong sessions at the university twice a year at the start of each five-month term. Institute terms start in January and July.

Online activities require use of a computer, modem, and an Internet Service Provider. Interactive learning methods, used throughout the instructional sequence, involve World Wide Web pages to access course materials, announcements, and other information, plus a range of online activities that facilitate frequent student-faculty and student-student interaction. Faculty and students interact via real-time electronic classrooms, online forums using threaded bulletin boards, real-time chat rooms, online submission of assignments in multimedia formats for review by faculty, electronic mail, and the electronic library.

Located on a beautiful 232-acre campus in Fort Lauderdale, Nova Southeastern University (NSU) has approximately 16,500 students and is the largest independent institution of higher education in Florida. It ranks twenty-fifth in the size of its graduate programs among the 1,560 universities in the U.S. with graduate programs and tenth among private universities. In addition to the School of Computer and Information Sciences, NSU has an undergraduate college and graduate schools of medicine, dentistry, pharmacy, allied health, optometry, law, psychology, education, business, oceanography, and social and systemic studies. To date, the institution has produced approximately 55,000 alumni. Since 1971, NSU has enjoyed full accreditation by the Commission on Colleges of the Southern Association of Colleges and Schools, the regional accrediting body for this region of the United States.

The success of NSU's programs is reflected in the accomplishments of its graduates among whom are:

- 38 college presidents and chancellors
- more than 100 college vice presidents, provosts, deans, and department chairs
- 65 school superintendents in 16 states, including nine of the nation's largest school districts
- hundreds of college and university faculty members nationwide
- more than 100 high-ranking U.S. military officers, including admirals and generals; business presidents, vice presidents, executives, middle managers, and researchers at companies such as American Express, Ameri-First Bank, AT&T, Bellcore, General Electric, GTE, Harris Corporation, IBM, Lenox China, Motorola, Nortel, Racal Datacom, BellSouth, Westinghouse, and William Penn Bank



## **Degrees and Programs of The School of Computer and Information Sciences**

### *Bachelor of Science (B.S.)*

Computer Science  
Computer Information Systems

### *Master of Science (M.S.)*

Computer Science  
Computer Information Systems  
Management Information Systems  
Computing Technology in Education

### *Doctor of Philosophy (Ph.D.)*

Computer Science  
Information Systems  
Computer Information Systems  
Computing Technology in Education (also Ed.D.)  
Information Science

*Graduate Certificate Program in Information Resources Management (IRM)*

*Florida Teacher Certification/Recertification Courses in Computer Science*

## **Application for Admission to the Master's Degree Program**

Applications should be submitted at least three months before the anticipated starting term. Copies of transcripts are acceptable for unofficial early review. To obtain information or application forms, contact:

The School of Computer and Information Sciences  
Nova Southeastern University  
3100 SW 9th Avenue  
Fort Lauderdale, FL 33315-3025  
800-986-2247, ext. 2000 or (954) 262-2000  
Email: [scisinfo@scis.nova.edu](mailto:scisinfo@scis.nova.edu)  
Web Site: <http://www.scis.nova.edu>

Applicants must satisfy the program-specific admission requirements described in the individual program sections of this brochure and must meet the requirements and submit the documents specified below:

1. An earned bachelor's degree from a regionally accredited institution with an appropriate major.
2. A completed application and application fee.
3. Official transcripts of all graduate and undergraduate education showing an undergraduate GPA of at least 2.5 and a GPA of 3.0 in a major field.
4. Three letters of recommendation.
5. Score report of the Graduate Record Examination (GRE) or a comprehensive portfolio of appropriate work experience and credentials.
6. Proficiency in the English language is a prerequisite for graduate study at the School of Computer and Information Sciences. Applicants whose native language is not English must take the Test of English as a Foreign Language (TOEFL). A minimum TOEFL score of 550 is required for admission. (The score must be no more than two years old.) Test results must be sent directly to the School of Computer and Information Sciences from TOEFL/TSE Services, P.O. Box 6153, Princeton, NJ, 08541-6153, USA; phone: (609) 771-7100; fax: (609) 771-7500, Web site: [www.toefl.org](http://www.toefl.org).



7. Students on J-1 visas are required to secure an affidavit of support, from an agency or government who will be the financial sponsor, stating that they have a sufficient amount of money to support themselves for the duration of their study. Students on F-1 visas need an affidavit of support and a notarized/attested financial statement proving that they have a sufficient amount of money to support themselves for one academic year (generally nine months). See the SCIS Catalog for additional information regarding international student requirements.

### **Provisional or Conditional Admission**

A degree-seeking applicant who has missing documents but appears to be acceptable based on documents received by SCIS may be offered *provisional admission*. Official admission will be granted upon receipt and acceptability of the remaining required documents. Examples of missing documents are an official transcript and a letter of recommendation. An applicant who has not met all admission requirements may be given *conditional admission* if sufficient evidence exists to suggest the ability to perform successfully in the program. A student with *conditional* status must remove stated deficiencies before advancement to degree status.

### **Transfer Credit Policy**

Up to six graduate credits may be transferred from a regionally accredited institution. Courses proposed for transfer must have received grades of at least B. Students must request approval of transfer credits in writing at the time of application. Copies of catalog course descriptions or course syllabi are required to process requests for transfer credits.

### **Orientation and Advisement Program**

New students must attend an orientation weekend on the campus in Fort Lauderdale which includes introductions to the program office staff and faculty, computer requirements, online access, software tools that enhance the educational process, and library services available to on-campus and online students. Advisement is conducted regularly by the student's program office and the faculty.

### **Early Admission into the Doctoral Program**

NSU master's students may apply for early admission into a Ph.D. program. Early admission provides the student the opportunity to earn the Ph.D. or Ed.D. in a shorter time. When eight courses (24 credits) are completed in the master's program with a GPA of at least 3.25, the student may apply for acceptance into a doctoral program. If accepted, after completing twelve credits in the doctoral program, the student is awarded the M.S. degree. These twelve credits also count toward the Ph.D. or Ed.D.

### **Thesis and Non-Thesis Options**

For the thesis option, 30 credit hours of course work and six credit hours for the master's thesis are required. For the non-thesis option, 36 credit hours of course work are required. Students interested in completing the master's thesis should contact the master's program office.

### **Online Computing Resources**

Students are provided computer accounts and must have an Internet Service Provider. Students may gain access to the university's computing resources from computer laboratories on the campus or from off-campus locations such as homes, offices, or elsewhere using either an IBM-compatible PC or an Apple Macintosh computer and a modem. Students attend an orientation on computer and software requirements, online access, and online tools and methods. Interactive learning methods involve World Wide Web pages to access course materials, announcements, and other information, plus a range of online activities that facilitate frequent student-faculty and student-student interaction. Faculty and students interact via real-time electronic classrooms, online forums using threaded bulletin boards, real-time chat rooms, online submission of assignments in multimedia formats for review by faculty, electronic mail, and the electronic library.

### **Term Dates**

Terms are twelve weeks in duration and four terms are offered each year. Terms start in September, January, April, and July.



## **Program Formats**

The 36-credit hour programs are designed so they may be completed in 18 months without interrupting the student's professional career. To earn the degree in 18 months, students must enroll in two courses per term. Terms are twelve weeks long and there are four terms each year. Terms start in September, January, April, and July. Students select one of two formats: *online* or *on campus*. With the permission of the program office, a student in one format may take a course in another format.

### *Online Format*

All of the school's master's programs are available in the online format which requires the completion of twelve courses via online techniques. Online courses are taken via computer (IBM-compatible PC or Apple Macintosh) and modem from home, office, or on the road while traveling. The student may participate in courses from anywhere in the United States or outside the U.S. via the Internet. The format involves the use of online interactive learning methods throughout the instructional sequence. Courses use World Wide Web pages to access course materials, announcements, and other information, plus activities that facilitate frequent student-faculty and student-student interaction. Faculty and students interact via real-time electronic classrooms, online forums using threaded bulletin boards, real-time chat rooms, online submission of assignments in multimedia formats for review by faculty, electronic mail, and the electronic library.

### *On-Campus Format*

This format is available for all master's degree programs except for the M.S. program in computing technology in education which is offered only in the online format. The on-campus format requires the completion of twelve courses. Courses are held on the campus in Fort Lauderdale. Each class meets once a week from 6:30 p.m. to 9:30 p.m. for twelve weeks.

## **Grade Requirements and Time Limitations**

Students must maintain a cumulative grade point average of at least 3.0 for the duration of their master's degree program. Failure to do so will result in probation and possible dismissal. Students in a master's degree program must complete requirements for the degree within five years from the date of their first registration.

## **Independent Study**

Students wishing to take a course as independent study must first appeal to the program office. If the program office agrees, it will attempt to obtain the agreement of a faculty member to supervise the independent study and will then notify the student of its decision.

## **Cross-Registration**

Students may apply to cross-register for courses offered in other SCIS master's degree programs. Approval for cross-registration must be obtained from the student's program office prior to registration.

## **Library Services**

The university library system has more than 500,000 volume equivalents. The Einstein Library, on the main campus, houses the university's major collection of books and journals in the humanities and sciences. Its more than 162,000 volume equivalents can be searched through the library's online catalog. Also, more than 25 specialized indexes in CD-ROM format are available as well as dial-up access to the online catalog and to First Search. The Einstein Library is equipped to perform online literature searches using DIALOG information databases. Reference librarians will assist the students in structuring searches. The library is a member of SEFLIN and FLIN, cooperative library networks that speed access to materials from other institutions throughout Florida. The Einstein Library has also been named a cooperating library of the Foundation Center in New York, giving students access to a special collection for grants and foundation research.

Through the Distance Library Services Office, students off campus have access to books, journal articles, Educational Resource Information Center (ERIC) documents, interlibrary loans, database searches, and reference librarians specializing in research services to remote student locations. Students may call the DLS Office to request materials 24 hours a day, use email, fax, or regular mail.



To contact the DLS Office by phone, call 800-541-6682 (automated attendant—enter number for *General Student Services* and follow the menu) or (954) 262-7388. All materials mailed by the DLS Office are sent by first-class mail. When books are borrowed, the student will have to pay a small charge for third-class postage to return the books. Books are loaned for one month. Periodical copies or ERIC documents need not be returned.

Many services may be obtained by accessing the DLS's online electronic library including access to the library's catalog and periodical holdings, holdings of other libraries, and online databases/information services. The online student will be able to request materials and gain access to a librarian. DLS provides students with books and photocopies of periodical articles via U.S. mail. Students must be registered in order to use the university's library services.

Also, for distance students, the university has made possible the use of many local libraries. The SCIS admissions office provides information to new students about libraries in their geographical area that are included in this arrangement and the procedures to follow.

#### **Tuition and Fees** (Rates effective starting July 1, 1998. Rates are subject to change.)

Tuition .....	\$370 per credit hour
Application Fee.....	\$50 non-refundable
Orientation Fee.....	\$60 non-refundable
Registration Fee .....	\$30 non-refundable
Late Registration Fee .....	\$100 non-refundable
Reinstatement Fee.....	\$50 non-refundable
Graduation Fee.....	\$75
Finance Charge for Installment Payment.....	\$50
Continuing Services.....	\$160 (leave of absence with online privileges per term)

#### **Financial Aid**

The Office of Student Financial Aid administers the university's financial aid programs of grants, loans, scholarships, and student employment, and provides professional financial advisors to help students plan for the most efficient use of their financial resources for education. Underlying the awarding of financial assistance is the philosophy that students have a responsibility for contributing from earnings and savings toward their education. Financial aid resources serve to supplement the student's financial resources.

In order to qualify for financial aid, a student must be admitted into a university program, must be a U.S. citizen or a resident alien, and must plan on registering for a minimum of six credit hours per term. **A prospective student who requires financial assistance should apply for financial aid while a candidate for admission.** To continue financial aid, at a minimum, enrolled students must demonstrate satisfactory academic progress toward a stated educational objective in accordance with the university's policy on satisfactory progress for financial aid recipients. For financial aid information or application forms, call (954) 262-4031 or 800-522-3243.

#### **Tuition Payment Policy**

There are five options available for the payment of tuition. These options are described below:

1. *Full Payment by the Student.* Full payment of tuition and fees is to be made at the time of registration. Registration after the registration period, when permitted, will involve payment of a late registration fee.
2. *Installment Payment by the Student.* The student may elect an installment payment plan which requires three payments spread over the first 90 days of the term. The first payment must be made by check, money order, or credit card. At the time of registration, the student must submit postdated checks or credit card authorizations for the second and third installments. The first payment, due at registration, includes all fees, 50 percent of the tuition, plus a \$50 deferment fee. The second payment, due sixty days from the beginning of the term, shall equal 25 percent of the tuition. The third payment, due ninety days from the beginning of the term, shall equal 25 percent of the tuition. **Registrations received without the three payments cannot be processed.**



3. *Direct Payment by the Student's Employer.* If a letter of commitment, or a voucher from the student's employer accompanies the registration form, then the student will not be required to make a payment at registration time. The letter of commitment, or the voucher, must indicate that the employer will remit full payment of tuition and fees to Nova Southeastern University upon receipt of the invoice from the university's accounts receivable office.

4. *Tuition Reimbursement by the Student's Employer.* If the student submits a letter from the employer at registration time that establishes eligibility for tuition reimbursement, the student may choose a two-payment plan. The first payment, due at registration, shall include all fees, 50 percent of the tuition, plus a \$50 deferment fee. The second payment, due five weeks after the end of the term, shall equal 50 percent of the tuition. To secure this plan, the student must provide, at registration, a postdated check or credit card authorization for the deferred portion.

5. *Financial Aid Award.* If a student has received an official financial aid award letter and all documents have been completed, then the student may register without payment. If a student's application for financial aid is still being processed at the time of registration, then the student must register using the installment payment option (see 2. above).

Tuition and fees may be satisfied with payment by check, money order, credit card, or official financial aid award letter with associated financial aid documentation. Cash will not be accepted as payment for tuition and fees unless paid at the Office of the University Bursar. All postdated checks or credit card authorizations will be held by the university for processing until the due dates specified in this policy.

The tuition payment policy is subject to change at any time at the discretion of the administration of Nova Southeastern University.

## **Master's Degree Programs**

### **Master of Science (M.S.) in Computer Information Systems**

This program offers a course of study leading to the master of science (M.S.) in computer information systems. It focuses on the technological foundations of computer information systems including areas such as database systems, human-computer interaction, data and computer communications, computer security, computer graphics, software engineering, and object-orientation. It is designed to give students a thorough knowledge of the field and to provide an enduring foundation for future professional growth. The program blends theory and practice into a learning experience that develops skills applicable to complex real-world problems. Its formats offer professionals the opportunity to earn the master's degree in 18 months while continuing to work in their current positions. The curriculum is consistent with recommendations for a model curriculum in computer information systems as outlined by the Association of Computing Machinery (ACM). Official information about programs and policies are contained in the graduate catalog of the School of Computer and Information Sciences.

#### **Program-Specific Admission Requirements** (See pp. 2-3 for general admission requirements.)

This program is designed for students with undergraduate majors in computer science, information systems, engineering, mathematics, or physics. Applicants must have knowledge of data structures and algorithms, assembly language and computer architecture, structured programming in a modern high-level language, college algebra, and discrete mathematics. An applicant who does not have an adequate background in mathematics or computer concepts may be required to take one or more of the following graduate-level courses during the first year of the student's program. Courses at the 500 level, when required, must be completed prior to taking courses at the 600 level, however, some exceptions may be permitted by the program office. MCIS 501 is prerequisite to MCIS 503.

MCIS 500 Assembly Language and Architecture  
MCIS 501 Java Programming Language

MCIS 502 Mathematics in Computing  
MCIS 503 Data Structures and Algorithms



## **The Curriculum for the M.S. in Computer Information Systems**

Core courses and electives are listed below. The student may substitute up to two electives in lieu of two core courses. If the thesis option is elected, two courses may be omitted. (Plans for the thesis option must be made with the program office.)

The student may request permission from the program office to register for MCIS 682, Project in Information Systems, to pursue a project under the supervision of a faculty member in lieu of a core course.

Students wishing to take a course as independent study must first appeal to the program office. If the program office agrees, it will attempt to obtain the agreement of a faculty member to supervise the independent study and will then notify the student of its decision.

Students may apply to cross-register for courses offered in other SCIS master's degree programs. Approval for cross-registration must be obtained from the student's program office prior to registration.

### **Core Courses:**

- MCIS 611 Survey of Programming Languages
- MCIS 615 Operating Systems Concepts
- MCIS 620 Information Systems
- MCIS 625 Computer Graphics
- MCIS 630 Database Systems
- MCIS 645 Software Engineering
- MCIS 650 Data Communications Networks
- MCIS 661 Object-Oriented Applications
- MCIS 665 Client-Server Computing
- MCIS 670 Artificial Intelligence and Expert Systems
- MCIS 671 Decision Support Systems
- MCIS 680 Human-Computer Interaction

### **Electives:**

- MCIS 621 Information Systems Project Management
- MCIS 623 Legal and Ethical Aspects of Computing
- MCIS 631 Database Systems Project
- MCIS 651 Project in Data Communications Networks
- MCIS 652 Computer Security
- MCIS 654 Electronic Commerce on the Internet
- MCIS 681 Multimedia Systems
- MCIS 682 Project in Information Systems
- MCIS 691 Special Topics in Computer Information Systems
- MCIS 699 Master's Thesis in Computer Information Systems



## **Master of Science (M.S.) in Computer Science**

This program offers a course of study leading to the master of science (M.S.) in computer science. It is designed to give students a thorough knowledge of the field and to provide an enduring foundation for future professional growth. The program blends theory and practice into a learning experience that develops skills applicable to complex real-world problems. Its formats offer professionals the opportunity to earn the master's degree in 18 months while continuing to work in their current positions. The curriculum is consistent with recommendations for a model curriculum in computer science as outlined by the Association of Computing Machinery (ACM).

### **Program-Specific Admission Requirements** (See pp. 2–3 for general admission requirements.)

The program is designed for students with undergraduate majors in computer science, engineering, mathematics, or physics and who have completed courses or have equivalent experience in data structures and algorithms, assembly language, computer architecture, structured programming in a modern high-level language, systems software (compilers or operating systems), calculus (differential and integral calculus), and discrete mathematics. An applicant who does not have an adequate background may be required to take one or more of the following graduate-level courses during the first year of the student's program. These are in addition to the required 36 credit hours of courses at the 600 level. Courses at the 500 level, when required, must be completed prior to taking courses at the 600 level, however, some exceptions may be permitted by the program office. MCIS 501 is prerequisite to MCIS 503.

MCIS 500 Assembly Language and Architecture	MCIS 502 Mathematics in Computing
MCIS 501 Java Programming Language	MCIS 503 Data Structures and Algorithms

### **The Curriculum for the M.S. in Computer Science**

Core courses and electives are listed below. The student may substitute up to two electives in lieu of two core courses. If the thesis option is elected, two courses may be omitted. (Plans for the thesis option must be made with the program office.)

The student may request permission from the program office to register for CISC 691, Project in Computer Science, and pursue a project under the supervision of a faculty member in lieu of a core course.

Students wishing to take a course as independent study must first appeal to the program office. If the program office agrees, it will attempt to obtain the agreement of a faculty member to supervise the independent study and will then notify the student of its decision.

Students may apply to cross-register for courses offered in other SCIS master's degree programs. Approval for cross-registration must be obtained from the student's program office prior to registration.

#### **Core Courses:**

- CISC 610 Programming Languages
- CISC 615 Design and Analysis of Algorithms
- CISC 630 Compiler Design Theory
- CISC 640 Operating Systems Theory and Design
- CISC 650 Data Communications Networks
- CISC 660 Database Management Systems
- CISC 665 Client–Server Computing
- CISC 670 Artificial Intelligence
- CISC 680 Software Engineering
- CISC 681 Interactive Computer Graphics
- CISC 683 Object-Oriented Design
- CISC 685 Human-Computer Interaction



**Electives:**

- CISC 620 Modeling and Simulation
- CISC 622 Numerical Analysis
- CISC 631 Language Theory and Automata
- CISC 632 Compiler Implementation
- CISC 644 Operating Systems Implementation
- CISC 647 Advanced Computer Architecture
- CISC 651 Project in Data Communications Networks
- CISC 654 Computer Security
- CISC 661 Database Management Systems Implementation
- CISC 663 Object-Oriented Database Systems
- CISC 681 Interactive Computer Graphics
- CISC 682 Software Engineering Implementation
- CISC 690 Special Topics in Computer Science
- CISC 691 Project in Computer Science
- CISC 699 Master's Thesis in Computer Science

### **Master of Science (M.S.) in Computing Technology in Education**

This program offers a course of study leading to the master of science (M.S.) in computing technology in education. It is designed to meet the needs of working professionals such as teachers, educational administrators, and trainers working in either the public or the private sector. The program blends educational theory and practice into a learning experience that develops skills applicable to complex real-world problems. It enhances knowledge of how computers, software, and other forms of high technology can be used to improve learning outcomes. The program's online format offers professionals the opportunity to earn the master's degree in 18 months while continuing to work in their current positions.

Many of the courses in the program have been approved for teacher certification in computer science (grades K–12) or recertification by Florida's Bureau of Teacher Certification. They may be taken as part of the degree program or independently.

#### **Program-Specific Admission Requirements** (See pp. 2–3 for general admission requirements.)

The applicant must have an earned bachelor's degree in a related field from a regionally accredited college or university, extensive experience with computer applications, the Internet, and the World Wide Web.

#### **The Curriculum for the M.S. in Computing Technology in Education**

The core courses for the online format are listed below. If the thesis option is elected, two courses may be omitted. (Plans for the thesis option must be made with the program office.)

Students wishing to take a course as independent study must first appeal to the program office. If the program office agrees, it will attempt to obtain the agreement of a faculty member to supervise the independent study and will then notify the student of its decision.

Students may apply to cross-register for courses offered in other SCIS master's degree programs. Approval for cross-registration must be obtained from the student's program office prior to registration.

- MCTE 615 The Internet
- MCTE 625 Survey of Courseware
- MCTE 628 Instructional Systems Design
- MCTE 630 Database Systems
- MCTE 645 Integrated Applications
- MCTE 650 Computer Networks
- MCTE 660 Multimedia and Emerging Technologies
- MCTE 661 Instructional Delivery Systems
- MCTE 670 Learning Theory and Computer Applications
- MCTE 680 Human-Computer Interaction
- MCTE 690 Research Methodology
- MCTE 691 Master's Project in Computing Technology in Education



## **Master of Science (M.S.) in Management Information Systems**

This program offers a course of study leading to the master of science (M.S.) in management information systems. It focuses on the application of information system concepts to the collection, retention, and dissemination of information for management planning and decision-making. The program blends theory and practice into a learning experience that develops skills applicable to complex real-world problems. Its formats offer professionals the opportunity to earn the master's degree in 18 months while continuing to work in their current positions.

### **Program-Specific Admission Requirements** (See pp. 2-3 for general admission requirements.)

The program is designed for students with undergraduate majors in management information systems, computer information systems, business administration, or a related field, and having knowledge and significant experience in computer applications. Experience with the Internet is preferred. Students who cannot demonstrate competence in programming in a high-level language such as C, C++, Java, or COBOL are required to take MMIS 501, Introduction to Java Programming.

### **The Curriculum for the M.S. in Management Information Systems**

Core courses and electives are listed below. The student may substitute up to two electives in lieu of two core courses. If the thesis option is elected, two courses may be omitted. (Plans for the thesis option must be made with the program office.)

The student may request permission from the program office to register for MMIS 682, Project in Management Information Systems, to pursue a project under the supervision of a faculty member in lieu of a core course.

Students wishing to take a course as independent study must first appeal to the program office. If the program office agrees, it will attempt to obtain the agreement of a faculty member to supervise the independent study and will then notify the student of its decision.

Students may apply to cross-register for courses offered in other SCIS master's degree programs. Approval for cross-registration must be obtained from the student's program office prior to registration.

#### **Core Courses:**

- MMIS 610 Survey of Computer Languages
- MMIS 620 Management Information Systems
- MMIS 621 Information Systems Project Management
- MMIS 626 Client-Server and Distributed Computing
- MMIS 630 Database Systems
- MMIS 642 Data Warehousing
- MMIS 653 Telecommunications and Computer Networking
- MMIS 654 Electronic Commerce on the Internet
- MMIS 660 Systems Analysis and Design
- MMIS 661 Object-Oriented Applications
- MMIS 671 Decision Support Systems
- MMIS 680 Human-Computer Interaction

#### **Electives:**

- MMIS 611 Computer Structures and Algorithms Using COBOL
- MMIS 615 Quantitative Methods
- MMIS 623 Legal and Ethical Aspects of Computing
- MMIS 625 Computer Graphics
- MMIS 631 Database Systems Project
- MMIS 640 System Test and Evaluation
- MMIS 652 Computer Security
- MMIS 670 Artificial Intelligence and Expert Systems
- MMIS 681 Multimedia Systems
- MMIS 682 Project in Management Information Systems
- MMIS 691 Special Topics in Management Information Systems
- MMIS 699 Master's Thesis in Management Information Systems



## Course Descriptions for Master's Programs

### **CISC 610 Programming Languages** (3 credits)

Formal languages and language hierarchies, syntactic and semantic specification, abstract machines and corresponding languages, context-free languages, abstraction, modularity, and program structure. Fundamental programming language concepts. Analysis of imperative, object-oriented, and declarative language paradigms. Several programming languages will be analyzed.

### **CISC 615 Design and Analysis of Algorithms** (3 credits)

Topics include sorting, algorithms for tree structures, dynamic programming, greedy methods, advanced data structures, divide and conquer, graph algorithms, arithmetic operations, algorithms for parallel computers, matrix operations, string/pattern matching, network problems, approximation algorithms, and NP-completeness.

### **CISC 620 Modeling and Simulation** (3 credits)

Use of logical and mathematical models to represent and simulate events and processes as well as computer, information, and communications systems. Introduction to computer modeling techniques and discrete-event simulation. Model development and testing. Output and problem analysis. Application of techniques to a multiprocessor system model and an Ethernet model. Examination of development programs such as GPSS, SIMULA, and SIMSCRIPT.

### **CISC 622 Numerical Analysis** (3 credits)

Introduction to error analysis, iterative methods, eigenvalue problems, integration and differentiation by computer, interpolation, ill-conditioned problems.

### **CISC 630 Compiler Design Theory** (3 credits)

Language theory will be applied to the design of a compiler for a high-level language. Parsing, syntax analysis, semantic analysis, and code generation. Other areas of the compilation process will be covered, such as storage allocation, symbol table management, searching and sorting, and optimization.

### **CISC 631 Language Theory and Automata** (3 credits)

Introduction to formal grammars, Backus-Naur notation. The formal theory behind the design of a computer language is studied. The corresponding types of automata which may serve as recognizers and generators for a language will be described.

### **CISC 632 Compiler Implementation** (3 credits)

Design, implementation, and testing of a compiler for a high-level language. The project will utilize state-of-the-art compiler generation tools, including parser generators and code generator generators. Prerequisite: CISC 630.

### **CISC 640 Operating Systems Theory and Design** (3 credits)

Analysis of computer operating systems with emphasis on structured design. Multiprogramming and multiprocessing, real time, time-sharing, networks, job control, scheduling, synchronization, and other forms of resource management, I/O programming, and memory and file system management.

### **CISC 644 Operating Systems Implementation** (3 credits)

Implementation and testing of operating system designs. Prerequisite: CISC 640.

### **CISC 647 Advanced Computer Architecture** (3 credits)

Organizational structures of computer systems and subsystems. Topics include processor organization, memory organization, virtual memory, microarchitecture, I/O controllers and processors, architectures for complex instruction set computers (CISC) and reduced instruction set computers (RISC), performance evaluation, multiprocessors and parallel architectures.

### **CISC 650 Data Communications Networks** (3 credits)

This course covers the detailed technical concepts of data networks, network components, associated network technologies and data communications protocols. Technical specification, design, testing, managing and updating of data networks from legacy systems through terabit networks are discussed. Detailed technical examination of associated network components (modems, multiplexers, hubs, gateways, etc.), guided and unguided media (wire, coax, fiber, terrestrial and satellite microwave, etc.) and routing and high speed switching systems. Network architecture topics include software and conceptual models (OSI, TCP/IP, HDLC and SDLC, SNA, AIX, etc.), error detection and prevention systems, transfer and routing protocols, congestion and flow control, and current and future applications (SNMP2, HTTP, X.400/500, ANS.1, ISDN and B-ISDN, ultra high speed networks, etc.).

### **CISC 651 Project in Data Communications Networks** (3 credits)

Students pursue a project, research study, or implementation in data and computer communications. Prerequisite: CISC 650.



**CISC 654 Computer Security** (3 credits)

Concepts and principles of system and data security. Risks and vulnerabilities, policy formation, controls and protection methods, database security, encryption, authentication technologies, host-based and network-based security issues, personnel and physical security issues, issues of law and privacy. Discussions include firewall design and implementation, secure internet and intranet protocols, and techniques for responding to security breaches.

**CISC 660 Database Management Systems** (3 credits)

Principles of database management systems. Topics include concepts of database architectures such as three schema architectures, logical and physical data organizations, data models for database systems (network model, hierarchical model, relational model and object-oriented model), relational algebra and calculus, query languages, design theory for relational databases, functional dependencies and normal forms, null values and partial information, semantic data modeling, transaction management and concurrency control, index schema, file structures and access methods, query systems and query optimization, view management, client/server database architectures, distributed databases, object-oriented databases, logic-based databases, and the current research and development trends of database systems.

**CISC 661 Database Management Systems Implementation** (3 credits)

Techniques of database management will be applied to practical projects. Prerequisite: CISC 660.

**CISC 663 Object-Oriented Database Systems** (3 credits)

Object-oriented data models and other data models with semantic extensions such as functional data models, object oriented database query model and languages, object-oriented database schema evolution and modification, version management and control, object data storage structure (clustering and indexing), query processing and transaction management, authorization mechanism and security, integrating object-oriented programming and databases, and applications of object-oriented databases. Prerequisite: CISC 660 or equivalent.

**CISC 665 Client-Server Computing** (3 credits)

Concepts and principles of client/server architecture, security, networks, and distributed computing. Topics include IPC, RPC, sockets, the role of the GUI and front-end development tools, middleware, 2-tier and 3-tier architectures, operating systems, and database interaction. The role of standards in client/server development is discussed including DCE, CORBA, ODBC, COM, and OLE, along with object-oriented aspects of client/server and distributed computing. Discussions include the various relationships between client/server computing and business process reengineering, workflow automation, and groupware. Migration from legacy systems is considered along with concerns for meeting customer requirements.

**CISC 670 Artificial Intelligence** (3 credits)

Basic principles and techniques of artificial intelligence will be covered. Concepts of knowledge representation including formalized symbolic logic, inconsistency and uncertainty, probabilistic reasoning, and structured knowledge will be presented. Other areas are (1) knowledge organization and manipulation including search and control strategies, matching techniques, and knowledge management, (2) perception and communication including natural language processing and pattern recognition, and (3) the architecture of expert systems.

**CISC 680 Software Engineering** (3 credits)

The development of software-intensive systems; software quality factors; software engineering principles; system life cycle models; requirements definition and analysis; behavioral specification; software design; implementation; software testing techniques; verification and validation; system evolution; software project management.

**CISC 681 Interactive Computer Graphics** (3 credits)

Principles of interactive computer graphics. Concepts include fundamental raster operations such as scan conversion, fill methods, and anti-aliasing; transformations; graphic languages such as PHIGS and Open GL; projection; hidden surface removal methods; 3D modeling techniques; ray tracing; animation; and graphical user interfaces.

**CISC 682 Software Engineering Implementation** (3 credits)

Techniques of software engineering will be applied in projects. Prerequisite: CISC 680.

**CISC 683 Object-Oriented Design** (3 credits)

The concepts and principles of the object-oriented paradigm. Approaches to analyzing and modeling a system using object-oriented techniques. Techniques for the design of objects, classes, and modules. The use of inheritance to enhance reusability. Object-oriented analysis and object-oriented programming.

**CISC 685 Human-Computer Interaction** (3 credits)

Focuses on the dynamics of human-computer interaction (HCI). Provides a broad overview of HCI as a sub-area of computer science and explores user-centered design approaches in information systems applications. Addresses the user interface and software design strategies, user experience levels, interaction styles, usability engineering, and collaborative systems technology. Students will perform formal software evaluations and usability tests.

**CISC 690 Special Topics in Computer Science** (3 credits)

This seminar focuses on the professor's current research interests. Requires consent of instructor and program director.



**CISC 691 Project in Computer Science** (3 credits)

Students pursue a project, research study, or implementation under the supervision of a faculty member.

**MCIS 500 Assembly Language and Architecture** (3 credits)

A comprehensive examination of the fundamental concepts and architectural structures of contemporary computers. Complex instruction set architectures (CISC) and reduced instruction set architectures (RISC) will be studied from programming and structural viewpoints.

**MCIS 501 Java Programming Language** (3 credits)

An in-depth study of the Java programming language. Principles of the object-oriented paradigm. Object-oriented programming theory and practice.

**MCIS 502 Mathematics in Computing** (3 credits)

Graph theory, lattices and boolean algebras, state models and abstract algebraic structures, logical systems, production systems, computability theory, recursive function theory.

**MCIS 503 Data Structures and Algorithms** (3 credits)

Sorting and searching, algorithms for tree structures, advanced data structures, graph algorithms, complexity, dynamic programming, optimization problems. Prerequisite: MCIS 501 or equivalent.

**MCIS 611 Survey of Programming Languages** (3 credits)

Organization and types of programming languages. Analysis of imperative, object-oriented, and declarative language paradigms. Higher-level languages. Comparative analysis of programming languages used in the development of computer information systems.

**MCIS 615 Operating Systems Concepts** (3 credits)

Objectives of managing computer system resources. Memory management, process management, file system management, scheduling, synchronization, interrupt processing, distributed processing, and parallel systems. An analysis of the role of operating systems in computer information systems development, operation, and evolution.

**MCIS 620 Information Systems** (3 credits)

Covers major concepts and architecture of computer information systems including information concepts; information flow; types of information systems; the role of information in planning operations, control, and decision-making; integrated information systems across a range of functional elements. Computer information systems in organizations.

**MCIS 621 Information Systems Project Management** (3 credits)

Life-cycle models/paradigms. Project planning and risk analysis. Project control including work breakdown structures, project scheduling, activities and milestones. Software cost estimation techniques/models. Software quality assurance and metrics for software productivity and quality. Inspections, walkthroughs, and reviews. Approaches to team organization. Configuration management. Automated project management tools. Software maintenance. Information system security. Procurement of software services and systems. Management of operational systems. Legal/ethical issues associated with CIS and software.

**MCIS 623 Legal and Ethical Aspects of Computing** (3 credits)

Focuses on issues that involve computer impact on society and related concerns. Transitional data flow; copyright protection; information as a source of economic power; rights to access computer systems; computer crime; data privacy; establishing national priorities in the technical and social aspects of computing; current and anticipated uses of computer prediction; and protection of personal ethical concerns. National computer policies of Japan, France, Great Britain, and the European Economic Community. The status of regulation and emerging standards.

**MCIS 625 Computer Graphics** (3 credits)

Presents computer graphics as an aid to information managers who need a clear means of presenting the analysis of information. Topics include basic graphic techniques (e.g. histograms, bar charts, pie charts), the theory of graphic presentation of information, desktop publishing software, presentation software, graphics monitors (EGA, CGA, VGA, RGB, composite), laser printers, computer screen projection systems, and standards.

**MCIS 630 Database Systems** (3 credits)

Methodologies and principles of database analysis and design are presented. Conceptual modeling and specifications of databases, database design process and tools, functional analysis and methodologies for database design, entity relationship model and advanced semantic modeling methods. Auxiliary concepts and theories of database systems including the architectures of database systems, logical and physical database organizations, data models for database systems (network, hierarchical, relational and object-oriented model), relational algebra and calculus, query languages, normal forms, null values and partial information, relational database design utilizing dependencies, view design and integration, concurrency control, query optimization, client/server database applications, distributed databases, object oriented databases, and the current research and development trends of database analysis, design, modeling, and applications.



**MCIS 631 Database Systems Project (3 credits)**

The techniques of database management systems are applied to practical projects. Prerequisite: MCIS 630.

**MCIS 632 Distributed Database Management Systems (3 credits)**

Information storage and retrieval in a distributed environment. Distributed processing networks; degrees of distribution; approaches to distribution – multiple unduplicated/duplicated and centralization/decentralization issues; management concerns and criteria; and technical developments in office systems (digital voice communications, LANS, electronic mail, decision support systems, etc.). Alternatives to distributed processing. Prerequisite: MCIS 630.

**MCIS 645 Software Engineering (3 credits)**

The development of software-intensive systems; software quality factors; software engineering principles; system life cycle models and paradigms; requirements definition and analysis; behavioral specification; software design; implementation; software testing techniques; verification and validation; system evolution; software project management.

**MCIS 650 Data Communications Networks (3 credits)**

This course covers the technical concepts of data networks, network components, associated network technologies and data communications protocols. Specification, design, testing, managing and updating of data networks from legacy systems through terabit networks is discussed. Examination of associated network components (modems, multiplexers, hub, gateways, etc.), guided and unguided media (wire, coax, fiber, terrestrial and satellite microwave, etc.) and routing and high speed switching systems. Network architecture topics include software and conceptual models (OSI, TCP/IP, HDLC and SDLC, SNA, AIX, etc.), error detection and prevention systems, transfer and routing protocols, congestion and flow control, and current and future applications (SNMP2, HTTP, X.400/500, ANS.1, ISDN and B-ISDN, ultra high speed networks, etc.).

**MCIS 651 Project in Data Communications Networks (3 credits)**

Students pursue a project, research study, or implementation in data communications networks. Prerequisite: MCIS 650.

**MCIS 652 Computer Security (3 credits)**

Concepts and principles of system and data security. Risks and vulnerabilities, policy formation, controls and protection methods, database security, encryption, authentication technologies, host-based and network-based security issues, personnel and physical security issues, issues of law and privacy. Discussions include firewall design and implementation, secure internet and intranet protocols, and techniques for responding to security breaches.

**MCIS 654 Electronic Commerce on the Internet (3 credits)**

Electronic commerce has grown at an incredible rate, and experts forecast extraordinary growth over the near-term and long-term. It will be examined from three perspectives: (1) customer–business, (2) business–business, and (3) intra–organization. The Internet, intranets and extranets, electronic data interchange (EDI), security, electronic payment systems, tax issues and global policy will be investigated. The student will participate in an Internet shopping experience and create or enhance a web page.

**MCIS 661 Object-Oriented Applications (3 credits)**

Principles of the object-oriented paradigm. Application of object-oriented methods in computer information systems. Object-oriented languages and design methods for class creation. Study of the use of object-oriented techniques in applications such as user interfaces, graphics, database systems, visual programming, hypermedia, office automation systems, and decision support systems. Techniques for software reuse.

**MCIS 665 Client-Server Computing (3 credits)**

Concepts and principles of client/server architecture, security, networks, and distributed computing. Topics include IPC, RPC, sockets, the role of the GUI and front-end development tools, middleware, 2-tier and 3-tier architectures, operating systems, and database interaction. The role of standards in client/server development is discussed including DCE, CORBA, ODBC, COM, and OLE, along with object-oriented aspects of client/server and distributed computing. Discussions include the various relationships between client/server computing and business process reengineering, workflow automation, and groupware. Migration from legacy systems is considered along with concerns for meeting customer requirements.

**MCIS 670 Artificial Intelligence and Expert Systems (3 credits)**

Includes an introduction to artificial intelligence as well as historical and current trends and characterization of knowledge-based systems. Search, logic and deduction, knowledge representation, production systems, and expert systems will be examined. Additional areas include architecture of expert systems and criteria for selecting expert system shells, such as end-user interface, developer interface, system interface, inference engine, knowledge base, and data interface. The student will use a commercial shell to build a working expert system.



**MCIS 671 Decision Support Systems (3 credits)**

Examines concepts of decision support in both non-automated and automated environments. Emphasis on structures, modeling, and the application of various decision support systems in today's corporate environment. Additional emphasis is placed on the use of executive information and expert system applications. Case studies examine applications of each of these types of technology.

**MCIS 680 Human-Computer Interaction (3 credits)**

Focuses on the dynamics of human-computer interaction (HCI). Provides a broad overview of HCI as a sub-area of computer science and explores user-centered design approaches in information systems applications. Addresses the user interface and software design strategies, user experience levels, interaction styles, usability engineering, and collaborative systems technology. Students will perform formal software evaluations and usability tests.

**MCIS 681 Multimedia Systems (3 credits)**

Recent advances in high-performance computing and computer networks and their impact on network-based applications and work-group productivity are examined. New developments in optical storage technologies, imaging systems, computer architectures, communications services, and graphical user interfaces are delineated. Trends in the development and the use of multimedia. Tools, techniques, and guidelines facilitating the planning, design, production, and implementation of multimedia products.

**MCIS 682 Project in Information Systems (3 credits)**

Students pursue a project, research study, or implementation under the supervision of a faculty member.

**MCIS 691 Special Topics in Computer Information Systems (3 credits)**

This seminar focuses on the professor's current research interests. Requires consent of instructor and program director.

**MCTE 615 The Internet (3 credits)**

The Internet and other online information systems associated with the evolving information superhighway will soon have a dominant role in how information is organized and retrieved. This course emphasizes the development of effective online skills so that bibliographic, full-text, graphical, and numerical information can be accessed in an efficient manner. It also addresses skills and approaches required to teach the Internet.

**MCTE 625 Survey of Courseware (3 credits)**

State-of-the-art, content-rich courseware, across the grades, subjects, and platforms, will be explored and evaluated for educational value. Methods for integrating these programs into the curriculum will be discussed. Tutorials, drill and practice, instructional games, simulations, tests, and reference programs are included.

**MCTE 628 Instructional Systems Design (3 credits)**

This course develops practical instructional systems design competencies appropriate for the development of computer-assisted instruction applications. Students will experience both theory and best practices from the areas of education and training, as they develop and acquire instructional systems design skills and knowledge.

**MCTE 630 Database Systems (3 credits)**

This course covers fundamentals of database architecture, database management systems, and database systems. Principles and methodologies of database design, and techniques for database application development.

**MCTE 645 Integrated Applications (3 credits)**

This course provides experience with the multiple roles of electronic spreadsheets, databases, and graphs in teaching, learning, and the management of instruction. Using an integrated software package, these tools will be used to develop and reinforce skills in organizing, problem solving, generalizing, predicting, decision-making, and hypothesizing.

**MCTE 650 Computer Networks (3 credits)**

This course provides a framework for understanding computer network functionality, characteristics, and configurations. Topics include network topologies, protocols, and architectures; emerging trends in network technologies and services; and the role of ISDN (Integrated Services Digital Network) and ATM (Asynchronous Transfer Mode) in the educational environment. Strategies for network planning, implementation, management, and security are introduced. Recent advances in standardization, internetworking and deployment of LANs (local area networks), MANs (metropolitan area networks), and WANs (wide area networks) are examined.

**MCTE 660 Multimedia and Emerging Technologies (3 credits)**

Recent advances and future trends in learning technology and educational computing are examined. Innovations in teacher and student workstation technology are reviewed. Emphasis is placed on an examination of audio/video and computer-based tools currently in use in schools and training centers. Special attention is given to CD-ROM technology and laser disk technology. Guidelines for selection and implementation of multimedia projects are presented.



**MCTE 661 Instructional Delivery Systems (3 credits)**

An investigation of the expansion and applications of instructional delivery systems such as electronic delivery via telecommunications (email, electronic bulletin boards, conferencing systems), electronic classrooms or electronic whiteboards, audioconferencing, compressed video, World Wide Web (including HTML interfaces), group support systems, computer-aided instruction, broadcast via satellite, and multimedia. Comparative evaluation of instructional delivery systems.

**MCTE 670 Learning Theory and Computer Applications (3 credits)**

Students will explore learning theories and how learning is achieved when instruction is presented from a computer-based paradigm. The course will emphasize the computer as a learning device that can be used in an effective manner to model learning theories associated with behaviorism, cognitivism, and human information processing.

**MCTE 680 Human-Computer Interaction (3 credits)**

Explores the emerging field of human-computer interaction. Emphasis is placed on how software design practices are integrated with human factors principles and methods. Other issues covered include user experience levels, interaction styles, usability engineering, interaction devices and strategies, user-centered design, human information processing, social aspects of computing, and computer-supported cooperative work.

**MCTE 690 Research Methodology (3 credits)**

This course is an introduction to research, statistical analysis and decision-making. Close attention is paid to data types, data contributions, the identification of variables and descriptive data presentation techniques. Students are introduced to both parametric and non-parametric data analysis procedures including independent and dependent sample t-tests, chi-square analysis, and simple analysis of variance. Hypothesis testing and the use of statistical software packages are emphasized.

**MCTE 691 Master's Project in Computing Technology in Education (3 credits)**

This course is the capstone of the program. Each student will develop a comprehensive technology-based project using an environment of choice. Its purpose is to allow students the opportunity to further pursue topics or areas in which they have considerable interest. Each project will be closely mentored by faculty.

**MCTE 695 Special Topics in Computing Technology in Education (3 credits)**

This seminar focuses on the professor's current research interests. Requires consent of instructor and program director.

**MMIS 501 Introduction to Java Programming (3 credits)**

This course is an introduction to the Java programming language. The course will include an introduction to the concepts of object-oriented programming and will show how Java supports this programming paradigm. You will learn about the Java environment and will write both applets (programs that execute in a Web browser) and applications (stand alone program). In addition to learning about basic language statements, you will also learn how Java provides support for such diverse applications as web pages, multimedia, educational, etc.

**MMIS 610 Survey of Computer Languages (3 credits)**

A study of high-level languages, fourth-generation languages, and command languages used in the development of software for management information systems. The logical and physical structure of programs and data. Concepts of structured programming. Data structures, file management, and their use in problem solving. Students will complete a variety of high-level language computer programs.

**MMIS 611 Computer Structures and Algorithms Using COBOL (3 credits)**

Data and file structure concepts, data record format and file organization, sequential vs. random file access methods, tree-based file structure and search techniques, indexing and data clustering, multiway sort/merge and sort algorithms, input/output blocking and buffering. The student will design and implement programs in COBOL.

**MMIS 615 Quantitative Methods (3 credits)**

An introduction to the basic quantitative tools needed to support problem solving and decision-making in the information systems environment. Heavy emphasis is placed on the application of these tools in a case-based, real world environment.

**MMIS 620 Management Information Systems (3 credits)**

The application of information system concepts to the collection, retention, and dissemination of information for management planning and decision-making. Issues such as personnel selection, budgeting, policy development, and organizational interfacing are discussed. Conceptual foundations and planning and development of management information systems. The role of MIS in an organization and the fit between the system and the organization.



**MMIS 621 Information Systems Project Management** (3 credits)

Practical examination of how projects can be managed from start to finish. Life-cycle models and paradigms. Life-cycle phases. Project planning and risk analysis. Project control including work breakdown structures, project scheduling, activities, and milestones. Software cost estimations techniques/models. Software quality assurance and metrics for software productivity and quality. Inspections, walkthroughs, and reviews. Approaches to team organization. Documentation and configuration management. Automated project management tools. Software maintenance. Procurement of software services and systems.

**MMIS 623 Legal and Ethical Aspects of Computing** (3 credits)

Focuses on issues that involve computer impact and related societal concerns. Topics include transitional data flow; copyright protection; information as a source of economic power; rights to access to computer systems; computer crime; data privacy; establishing national priorities in the technical and social aspects of computing; current and anticipated uses of computer prediction; and protection of personal ethical concerns. National computer policies of Japan, France, Great Britain, and the EEC, and the status of regulation and emerging standards.

**MMIS 625 Computer Graphics** (3 credits)

Presents computer graphics as an aid to information managers who need a clear means of presenting the analysis of information. Topics include basic graphic techniques (e.g. histograms, bar charts, pie charts), the theory of graphic presentation of information, desktop publishing software, presentation software, graphics monitors (EGA, CGA, VGA, RGB, composite), laser printers, computer screen projection systems, and standards.

**MMIS 626 Client-Server and Distributed Computing** (3 credits)

Included in this course are a wide range of issues, methods, techniques, and case examples for developing and managing client/server and distributed systems. These include client/server development using RAD methodologies, transaction process monitors, types of aboveware and middleware, middleware standards (DCE, RPC, and CORBA), managing client/server environments, software installation and distribution, electronic mail architectures in C/S systems, evaluation of vendor strategies, issues in selecting C/S products, legacy system migration issues, interoperability, scalability, network and security concerns, the emerging desktop standards, the role of network computers and thin clients, and the emergence of the WWW as an extension of the client/server environment.

**MMIS 630 Database Systems** (3 credits)

The application of database concepts to management information systems. Design objectives, methods, costs, and benefits associated with the use of a database management system. Tools and techniques for the management of large amounts of data. Database design, performance and administration. File organization and access methods. The architectures of database systems, data models for database systems (network, hierarchical, relational, and object oriented model), client/server database applications, distributed databases, and object-oriented databases.

**MMIS 631 Database Systems Project** (3 credits)

The techniques of database management systems will be applied to practical projects. Prerequisite: MMIS 630.

**MMIS 640 System Test and Evaluation** (3 credits)

An analysis of the verification and validation process. Methods, procedures, and techniques for integration and acceptance testing. Reliability measurement. Goals for testing. Testing in the small and testing in the large. Allocation of testing resources. When to stop testing. Test case design methods. Black box software testing techniques including equivalence partitioning, boundary-value analysis, cause-effect graphing, and error guessing. White box software testing techniques including statement coverage criterion, edge coverage criterion, condition coverage criterion, and path coverage criterion. Test of concurrent and real-time systems.

**MMIS 642 Data Warehousing** (3 credits)

This course includes the various factors involved in developing data warehouses and data marts: planning, design, implementation, and evaluation; review of vendor data warehouse products; cases involving contemporary implementations in business, government, and industry; techniques for maximizing effectiveness through OLAP and data mining.

**MMIS 652 Computer Security** (3 credits)

Concepts and principles of system and data security. Risks and vulnerabilities, policy formation, controls and protection methods, database security, encryption, authentication technologies, host-based and network-based security issues, personnel and physical security issues, issues of law and privacy. Discussions include firewall design and implementation, secure internet and intranet protocols, and techniques for responding to security breaches.



**MMIS 653 Telecommunications and Computer Networking** (3 credits)

This course provides a framework for understanding telecommunications fundamentals and computer network functionality, characteristics, and configurations. Topics include wirefree and wire-based communications; network topologies, protocols, and architectures; emerging trends in network technologies and services; and the role of ISDN (Integrated Services Digital Network) and ATM (Asynchronous Transfer Mode) in the corporate environment. Strategies for network planning, implementation, and management are introduced. Recent advances in standardization, internetworking, and deployment of LANs (local area networks), MANs (metropolitan area networks), and WANs (wide area networks) are examined.

**MMIS 654 Electronic Commerce on the Internet** (3 credits)

Electronic commerce has grown at an incredible rate, and experts forecast extraordinary growth over the near-term and long-term. It will be examined from three perspectives: (1) customer-business, (2) business-business, and (3) intra-organization. The Internet, intranets and extranets, electronic data interchange (EDI), security, electronic payment systems, tax issues, and global policy will be investigated. The student will participate in an Internet shopping experience and create or enhance a web page.

**MMIS 660 Systems Analysis and Design** (3 credits)

Analysis of requirements for information systems. Elicitation/fact-finding, problem analysis, decomposition, and the requirements document. Concepts, methods, techniques, and tools for systems analysis, modeling and simulation, and prototyping. Structured and object-oriented analysis. Role of the systems analyst in the organization. Gaining user commitment and fulfilling user needs. Concepts, tools, and techniques for systems design. Design principles, quality factors, decomposition of complex systems, and modularization techniques. Design methods such as object-oriented and function-oriented design. Comparison of analysis and design techniques.

**MMIS 661 Object-Oriented Applications** (3 credits)

Principles of the object-oriented paradigm. Application of object-oriented methods in management information systems. Object-oriented languages and design methods for class creation. Study of the use of object-oriented techniques in applications such as user interfaces, graphics, database systems, visual programming, hypermedia, office automation systems, and decision support systems. Techniques for software reuse.

**MMIS 670 Artificial Intelligence and Expert Systems** (3 credits)

This course will include an introduction to artificial intelligence as well as historical and current trends and characterization of knowledge-based systems. Search, logic and deduction, knowledge representation, production systems, and expert systems will be examined. Additional areas include architecture of expert systems and criteria for selecting expert system shells, such as end-user interface, developer interface, system interface, inference engine, knowledge base, and data interface. The student will use a commercial shell to build a working expert system.

**MMIS 671 Decision Support Systems** (3 credits)

Examines concepts of decision support in both non-automated and automated environments. Emphasis will be placed on structures, modeling, and the application of various decision support systems in today's corporate environment. Additional emphasis will be placed on the use of executive information and expert system applications. Case studies will be used to look at existent applications of each of these types of technology.

**MMIS 680 Human-Computer Interaction** (3 credits)

The dynamics of human-computer interaction (HCI). Provides a broad overview and offers specific background relating to user-centered design approaches in information systems applications. Areas to be addressed include the user interface and software design strategies, user experience levels, interaction styles, usability engineering, and collaborative systems technology. Students will perform formal software evaluations and usability tests.

**MMIS 681 Multimedia Systems** (3 credits)

Recent advances in high performance computing and computer networks and their impact on network-based applications and work-group productivity are examined. New developments in optical storage technologies, imaging systems, computer architectures, communications services, and graphical user interfaces are delineated. Trends in the development and the use of multimedia. Tools, techniques, and guidelines facilitating the planning, design, production, and implementation of multimedia products.

**MMIS 682 Project in Management Information Systems** (3 credits)

Students are assigned a project that involves part or all of the system development cycle and gain experience in analyzing, designing, implementing, and evaluating information systems. Prerequisite: prior consent of instructor.

**MMIS 691 Special Topics in Management Information Systems** (3 credits)

This seminar focuses on the professor's current research interests. Requires consent of instructor and program director.

**Additional Information**

For information on policies and procedures consult the graduate catalog of the School of Computer and Information Sciences.



## **Faculty and Staff of The School of Computer and Information Sciences**

### **The Faculty**

Gertrude W. Abramson, Ed.D., Columbia University. Professor. Computer-supported education, hypermedia/multimedia, instructional systems design and development, distance learning.

Maxine S. Cohen, Ph.D., State University of New York. Associate Professor. Human-computer interaction, usability engineering, multimedia, database systems, computer science education.

Laurie P. Dringus, Ph.D., Nova Southeastern University. Associate Professor. Human-computer interaction, group support systems, usability engineering, learning theory, distance learning.

George K. Fornshell, Ph.D., Nova Southeastern University. Associate Professor. Instructional systems development, multimedia, authoring systems, human factors, distance education.

William L. Hafner, M.S.E.E., University of Pennsylvania. Lecturer. Human-computer interaction, data warehousing, information storage and retrieval, computer security, artificial intelligence.

William M. Hartman, Ph.D., Nova Southeastern University. Lecturer. Software engineering, data communications, computer networks, decision support systems, mathematics in computing.

Michael J. Laszlo, Ph.D., Princeton University. Associate Professor. Data structures and algorithms, software engineering, programming, computer graphics.

Jacques Levin, Ph.D., University of Grenoble. Professor. Database management, modeling, distance education, decision support systems, numerical analysis.

Edward Lieblein, Ph.D., University of Pennsylvania. Professor and Dean. Software engineering, object-oriented design, programming languages, automata theory.

Marlyn Kemper Littman, Ph.D., Nova Southeastern University. Professor. Computer networks, ATM, wirefree and wire-based communications, network security, distance learning.

Frank Mitropoulos, M.S., Nova Southeastern University. Instructor. Programming languages, data structures, software engineering, object-oriented design, C, C++.

Sumitra Mukherjee, Ph.D., Carnegie Mellon University. Associate Professor. Database, decision support systems, information systems, network security, artificial intelligence, telecommunications.

John Scigliano, Ed.D., University of Florida. Professor. Online information systems, information systems management, distance education.

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Raisa Szabo, M.S., Budapest Technical Institute. Instructor. Computer architecture, artificial intelligence, neural networks, robotics, operations research, concurrent languages.

Steven R. Terrell, Ed.D., Florida International University. Associate Professor. Research methodology and statistics, learning theory, distance education, computer-managed instruction.

### **Visiting and Adjunct Faculty**

Susan Dorchak, Ph.D.	Lee Leitner, Ph.D.	Ronald McFarland, Ph.D.	Michael Moody, Ph.D.
Andres Folleco, Ph.D.	Robert Lipton, Ph.D.	Terry McQueen, D.B.A.	Elena Schultz, M.S.
Rollins Guild, Ph.D.	Richard Manning, Ph.D.	David Metcalf II, Ph.D.	Steven Zink, Ph.D.

### **Teaching Assistants**

Mohamed Foustok, M.S.      Jueen Lee, M.S.      Takaaki Tomizawa, M.S.



## **The Administrative and Technical Staff**

Roberta Arnold, Director, Undergraduate Programs.

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Phyllis Boyd, Advisor, Undergraduate Programs.

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Kimberley Driscoll, Advisor, Master's Programs.

Barbara J. Edge, Director, Finance and Administration.

Sunnie Ewing, Admissions Representative.

Diane King, Director, Doctoral Programs.

Cynthia Jackson, Administrative Secretary, Master's Programs.

Andre Lee-Fook, Administrative Secretary, Admissions.

Rose Lemos, Director, Admissions.

Edward Lieblein, Dean.

Toni Phillips, Coordinator, Doctoral Programs.

Mark Powell, Coordinator, Network and Software Services.

Kevin Richardson, Coordinator, Network and Software Services.

Bellarmin Selvaraj, Director, Master's Programs.

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