1997

School of Computer and Information Sciences Master of Science Degree Programs

Nova Southeastern University

NOVA SOUTHEASTERN UNIVERSITY
The School of Computer and Information Sciences

Master of Science Degree Programs

Computer Information Systems

Computer Science

Computing Technology in Education

Management Information Systems

The School of Computer and Information Sciences (SCIS)
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In Brief:

The School of Computer and Information Sciences and Nova Southeastern University

A major force in educational innovation, the School of Computer and Information Sciences is distinguished by its ability to offer both traditional and nontraditional choices in educational programs and formats that enable professionals to pursue advanced degrees without career interruption. Programs are timely yet provide the student with an enduring foundation for professional growth. The School has over 900 students from across the U.S. and other countries. It has been awarding graduate degrees since 1980.

The School offers programs leading to: the M.S. in computer information systems, computer science, computing technology in education, and management information systems; the Ed.S. in computing technology in education; the Ph.D. in computer information systems, computer science, information systems, and information science; and the Ph.D. or Ed.D. in computing technology in education. Combined master's–doctoral and Ed.S.–doctoral degree programs are available.

The School offers master's degree programs in the evening on the campus or online via the Internet. Master's programs require 36 credit-hours for graduation and may be completed in 18 months. To earn the degree in 18 months, the student must enroll in two courses per term. Terms are 12 weeks long and there are four terms each year. Master's terms start in September, January, April, and July.

The Ed.S. program requires 37 credit-hours beyond the master's for graduation. Doctoral programs require 64 credit-hours beyond the master's degree for graduation. Ed.S. and doctoral students (depending on the program) may take one of two formats: *cluster* or *institute*. Cluster students attend four cluster meetings per year, held quarterly over an extended weekend (Friday, Saturday, and half-day Sunday) at the University. Cluster terms start in March and September. Cluster weekends take place in March, June, September, and December. Institute students attend weeklong institutes in January and July at the University at the start of each five-month term. Clusters and institutes bring together students and faculty for participation in courses, workshops, seminars, and dissertation counseling. Between meetings, students work on assignments and projects, and participate in online activities.

The School of Computer and Information Sciences pioneered online graduate education and has been offering programs with an online component since 1983. Online activities require use of a computer and modem from home or office, or while traveling. Students may participate in online activities or online courses from anywhere in the U.S. or outside the U.S. where Internet access is available. Online interactive learning methods, used throughout the instructional sequence, facilitate frequent interaction with faculty, classmates, and colleagues. Online instruction and interaction include a wide variety of sophisticated techniques such as the real-time electronic classroom, online forums, online submission of assignments for review by faculty, electronic mail, the electronic library, World Wide Web pages to access course material, announcements, etc., and use of the Internet and the World Wide Web for research.

Located on a beautiful 232 acre campus in Fort Lauderdale, Nova Southeastern University (NSU) has approximately 16,000 students and is the largest private, independent institution of higher education in Florida. It ranks twenty-fifth in the size of its post baccalaureate programs among the 1,560 public and private universities in the U.S. with graduate and professional 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 50,000 alumni. NSU has enjoyed full accreditation by the Commission on Colleges of the Southern Association of Colleges and Schools (SACS) since 1971. SACS is recognized by the U.S. Department of Education as 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:

- 37 college presidents and chancellors
- 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
- over 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

Master of Science (M.S.)

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

Educational Specialist (Ed.S.)

Computing Technology in Education

Doctor of Philosophy (Ph.D.)

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

Doctor of Education (Ed.D.)

Computing Technology in Education

Graduate Certificate Program in Information Resources Management (IRM)

Florida Teacher Certification/Recertification Courses in Computer Science

Application for Admission

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
E-mail: 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 (G.R.E.) 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 6151, Princeton, NJ, 08541-7100, USA; phone: (609) 771-7100; fax: (609) 771-7500.

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 and connections, software tools that enhance the educational process, UNIX and the Internet, and library services available to on-campus and online students. Advisement is conducted regularly by the student's program office with the assistance of the faculty.

Combined Master's and Doctoral Degree Option

This option provides the opportunity to earn the Ph.D. or Ed.D in a shorter time. Students must first be accepted in the master's program. Once eight courses (24 credits) are completed in the master's program with a G.P.A. 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

The two options leading to the master's degree are the thesis option and the non-thesis option. For the thesis option, 30 credit hours of course work and six credit hours for the thesis are required. For the non-thesis option, 36 credit hours of course work are required.

Online Computing Resources

SCIS students are given computer accounts and are required to use NSU's computing resources. SCIS graduate students must have an Internet Service Provider (specific requirements are provided by the program office). Students may gain access to the University's computing resources from computer laboratories on the campus and from off–campus locations such as homes, offices, or on–the–road while traveling using either an IBM–compatible PC or an Apple/Macintosh computer and a modem. The student may participate in online activities from anywhere in the U.S. or outside the U.S. where Internet access is available. All students will be given an orientation on computer requirements and online access. Students must be registered in order to use the University's computing facilities.

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. With the permission of the program office, a student in one format may take a course in another format. Formats for the master's programs are described below:

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 involve a range of online activities that facilitate frequent interaction with faculty, classmates, and colleagues. Online instruction and interaction include a wide variety of sophisticated techniques such as the real-time electronic classroom, online forums, online submission of assignments for review by faculty, electronic mail, the electronic library, World Wide Web pages to access course material, announcements, and other information, and use of the Internet and the World Wide Web for research.

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 eight core courses and four elective courses. Each course meets three hours per week for twelve weeks. Courses are held on the campus in Fort Lauderdale one evening per week during the twelve–week term.

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. 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 e-mail, 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, 1997. Rates are subject to change.)

Tuition	$350 per credit hour
Application Fee	$50 non-refundable
Orientation Fee	$60 non-refundable
Registration Fee	$30 non-refundable
Late Registration Fee	$75 non-refundable
Reinstatement Fee	$50 non-refundable
Graduation Fee	$65
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 U.S. immigrant, 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 sixty days of the term. The first payment, due at registration, includes all fees, 50% of the tuition, plus a $50 deferment fee. The second payment, due thirty days from the beginning of the term, shall equal 25% of the tuition. The third payment, due sixty days from the beginning of the term, shall equal 25% of the tuition. The first payment must be made by check, money order, or credit card. At the time of registration, the student must submit post-dated checks or credit card authorizations for the second and third installments.

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% of the tuition, plus a $50 deferment fee. The second payment, due five weeks after the end of the term, shall equal 50% of the tuition. To secure this plan, the student must provide, at registration, a post-dated 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 described 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 Registrar. All post-dated 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, system test and evaluation, 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.)

The program is designed for students with undergraduate majors in computer science, information systems, engineering, mathematics, or physics. Applicants must have knowledge of data structures, computer hardware and architecture, structured programming, college algebra, and discrete mathematics.

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

To ensure that students have an adequate background in mathematical methods and computer technology, the program requires the four graduate-level foundation courses listed below. Students who demonstrate competence in these subject areas may request waiver of these courses.

MCIS 500 Assembly Language and Architecture
MCIS 501 C++ Programming Language
MCIS 502 Mathematics in Computing
MCIS 503 Data Structures and Algorithms for CIS

Required courses for the online format are listed below. If the thesis option is elected, two of these courses will not be required. 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 required course).

MCIS 610 Data and File Structures
MCIS 615 Computer Operating Systems
MCIS 620 Computer Information Systems
MCIS 625 Computer Graphics for Information Managers
MCIS 630 Database Systems
MCIS 640 System Test and Evaluation
MCIS 650 Data and Computer Communications I
MCIS 660 Systems Analysis and Design
MCIS 661 Object-Oriented Applications for CIS
MCIS 670 Artificial Intelligence and Expert Systems
MCIS 671 Decision Support Systems
MCIS 680 Human-Computer Interaction

Core courses for the on-campus format are listed below:

MCIS 610 Data and File Structures
MCIS 620 Computer Information Systems
MCIS 630 Database Systems
MCIS 640 System Test and Evaluation
MCIS 650 Data and Computer Communications I
MCIS 660 Systems Analysis and Design
MCIS 661 Object-Oriented Applications for CIS
MCIS 680 Human-Computer Interaction

Electives for the on-campus format are listed below. The student can select four of these courses. If the thesis option is elected, then only two of these courses will be required. Plans for the thesis option must be made with the program office.

MCIS 611 Survey of Programming Languages
MCIS 615 Computer Operating Systems
MCIS 621 Information Systems Project Management
MCIS 622 Office Automation Systems
MCIS 623 Legal and Ethical Aspects of Computing
MCIS 624 Computer Integrated Manufacturing
MCIS 625 Computer Graphics for Information Managers
MCIS 631 Database Systems Practicum
MCIS 632 Distributed Database Management Systems
MCIS 651 Data and Computer Communications II
MCIS 652 Computer Security
MCIS 654 Applications of the Internet
MCIS 670 Artificial Intelligence and Expert Systems
MCIS 671 Decision Support Systems
MCIS 672 Computer-Aided Software Engineering
MCIS 681 Multimedia and Emerging Technologies
MCIS 682 Project in Information Systems
MCIS 683 Data Center Management
MCIS 691 Special Topics 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, computer architecture, structured programming, systems software (compilers or operating systems), calculus (differential and integral calculus), and discrete mathematics.

The Curriculum for the M.S. in Computer Science

The twelve courses for the online format are listed below. If the thesis option is elected, then two of these courses will not be required. 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. With approval, CISC 691 may be taken in lieu of a required course.

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 and Computer Communications I
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

Core courses for the on-campus format are listed below:

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 and Computer Communications I
CISC 660 Database Management Systems
CISC 670 Artificial Intelligence
CISC 680 Software Engineering

Electives for the on-campus format are listed below. The student can select four of these courses. If the thesis option is elected, then only two of these courses will be required. Plans for the thesis option must be made with the program office.

CISC 612 Concurrent Programming Languages
CISC 620 Modeling and Simulation
CISC 622 Numerical Analysis
CISC 631 Language Theory and Automata
CISC 632 Compiler Implementation
CISC 634 Complexity Theory
CISC 643 Array Processors and Supercomputers
CISC 644 Operating Systems Implementation
CISC 645 Microprogramming and Microprocessors
CISC 646 Distributed Computing Systems
CISC 647 Advanced Computer Architecture
CISC 651 Data and Computer Communications II
CISC 661 Database Management Systems Practicum
CISC 662 Distributed Databases
CISC 663 Object-Oriented Database Systems
CISC 665 Client/Server Computing
CISC 671 Robotics and Automated Processing
CISC 681 Interactive Computer Graphics
CISC 682 Software Engineering Implementation
CISC 683 Object-Oriented Design
CISC 685 Human-Computer Interaction
CISC 690 Special Topics
CISC 691 Project 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 will enhance 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.

Most 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 and significant experience using computer applications. Experience with the Internet is preferred.

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

The twelve courses for the online format are listed below. If the thesis option is elected, then two of these courses will not be required. Plans for the thesis option must be made with the program office.

MCTE 615 The Internet
MCTE 625 Survey of Courseware
MCTE 626 Authoring Systems Design
MCTE 630 Database Systems
MCTE 645 Spreadsheet, Database, and Graphing Applications
MCTE 650 Computer Networks
MCTE 660 Multimedia and Emerging Technologies
MCTE 661 Advanced 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 are required to take *MCIS 501, C++ Programming Language.*

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

Required courses for the online format are listed below. If the thesis option is elected, two of these courses will not be required. 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. With approval, MMIS 682 may be taken in lieu of a required course.

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 Databases in MIS
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 for MIS
MMIS 671 Decision Support Systems
MMIS 680 Human-Computer Interaction

Core courses for the on-campus format are listed below:

MMIS 620 Management Information Systems
MMIS 621 Information Systems Project Management
MMIS 630 Databases in MIS
MMIS 653 Telecommunications and Computer Networking
MMIS 654 Electronic Commerce on the Internet
MMIS 660 Systems Analysis and Design
MMIS 661 Object-Oriented Applications for MIS
MMIS 671 Decision Support Systems

Electives for the on-campus format are listed below. The student can select four of these courses. If the thesis option is elected, then only two of these courses will be required. Plans for the thesis option must be made with the program office.

MMIS 610 Survey of Computer Languages
MMIS 611 Computer Structures and Algorithms Using COBOL
MMIS 615 Quantitative Methods
MMIS 622 Office Automation Systems
MMIS 623 Legal and Ethical Aspects of Computing
MMIS 624 Computer Integrated Manufacturing
MMIS 625 Computer Graphics for Information Managers
MMIS 626 Client/Server and Distributed Computing
MMIS 631 Databases in MIS Practicum
MMIS 632 Distributed Database Management
MMIS 640 System Test and Evaluation
MMIS 642 Data Warehousing
MMIS 652 Computer Security
MMIS 670 Artificial Intelligence and Expert Systems
MMIS 672 Computer-Aided Software Engineering
MMIS 680 Human-Computer Interaction
MMIS 681 Multimedia and Emerging Technologies
MMIS 682 Project in Management Information Systems
MMIS 683 Data Center Management
MMIS 691 Special Topics 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 612 Concurrent Programming Languages (3 credits)
An introduction to concurrent programming languages. Modules and class structures, packages and concurrent tasks in Ada. Processes, statements, and transaction calls in C. Generic procedures. Concurrent programming, mailbox tasks, signals and semaphores. Abstract data types, operations on abstract objectives, hiding of the representation of objectives of a given type, and private data types.

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 634 Complexity Theory (3 credits)
The general theory of computation and complexity. Theory of algorithms, automata theory and formal grammars, unsolvable problems, exponential difficulty, and NP-Completeness.

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 643 Array Processors and Supercomputers (3 credits)
An introduction to supercomputers. Parallel computer organization. Pipeline, associative and array computer architectures. Examples: Texas Instruments ASC, Control Data STARAN, CRAY-I, Burroughs BSP. Control and parallel processors. Stream of microinstructions. Conflict-free memory, algorithmic detection of recurrent relations, and control flow graphs.

CISC 644 Operating Systems Implementation (3 credits)
Implementation and testing of operating system designs. Prerequisite: CISC 640.

CISC 645 Microprogramming and Microprocessors (3 credits)
The state of the art of microprogramming will be discussed in detail with particular attention to processor technology. An in-depth survey of commercially available microprogrammable microprocessors will be presented as well as monolithic microprogrammed devices. Students will implement a processor instruction set in both vertical and horizontal microcode utilizing a Simulator, Microassembler, and Register Transfer language.

CISC 646 Distributed Computing Systems (3 credits)
Concepts and design of distributed computing systems and the state of the art of distributed computing application programming. Included are the basic concepts of distributed systems: transparency, heterogeneity, network process communication, distributed client-server and other distributed computer system models, network file systems (NFS), communication protocols (TCP/IP), synchronization, naming, and process and resource management. The state-of the-art portion concentrates on developing distributed applications by both low-level and high-level remote procedure (RPC) programming, socket-based interprocess communication and implementation. Network programming projects will be on the UNIX-based platforms. Prerequisites: C Programming Language, Data Structures, Operating Systems and UNIX. Prerequisite: CISC 650.

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 and Computer Communications I (3 credits)
A course on the fundamentals of data communications and data communication networking. Topics include data transmission and encoding, digital data communication techniques, data link control, multiplexing, switched communications networks, circuit-switched networks, packet-switching techniques and systems (ARPANET/DDN, TYMNET, SNA, X.25 standard), local area networks, metropolitan area networks, optical fiber bus and ring topologies, the Fiber Distributed Data Interface (FDDI) standard, and LAN/MAN standards such as IEEE 802.

CISC 651 Data and Computer Communications II (3 credits)
Communications protocol concepts, the open systems interconnection (OSI) model, the TCP/IP protocol suite, systems network architecture (SNA), internetworking, transport protocols, ISO transport standards, XTP transfer protocol, OSI

session services and protocol, presentation concepts, Abstract Syntax Notation One (ASN.1), encryption, virtual terminal protocols, distributed applications including network management (SNMPv2), file transfer (FTAM), and electronic mail (X.400). The integrated services digital network (ISDN) architecture and services, broadband ISDN, and the impact of frame relay and cell relay technologies on network design. Prerequisite: CISC 650.

CISC 660 Database Management Systems (3 credits)
The principles of database management systems are presented. 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 Practicum (3 credits)
Techniques of database management will be applied to practical projects. Prerequisite: CISC 660.

CISC 662 Distributed Databases (3 credits)
The study of information storage and retrieval in a distributed environment and distributed processing networks. 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)
Topics include the components of client/server architecture, security, networking aspects, interprocess communication (RPC), role of the GUI and front-end development tools (from screen scrapers to ICASE), middleware (2-tier and 3 tier) and back-end concerns. 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. Also included are 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 (TQM, QFD, etc.). Several client/server case studies are used as a basis for discussion.

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 671 Robotics and Automated Processing (3 credits)
Principles and concepts of modern robots and automation. Concepts of algorithmic and non-algorithmic control plus the details of sensor and device I/O. Experiments with simulated and real robots will be performed to reinforce the basic concepts presented.

CISC 680 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.

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 will focus on the professor's current research interests. Prerequisite: prior 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 C++ Programming Language (3 credits)
An in-depth study of the C++ 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 for CIS (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 610 Data and File Structures (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, and advanced secondary storage technology for multimedia binary large objects.

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 Computer Operating Systems (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 Computer 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 622 Office Automation Systems (3 credits)
Focuses on strategies for utilizing technology to handle the information used in the office to improve the quantity, content, and format of work performed. Topics include the design and implementation of an office automation system; strategies for successful end-user computing; OA applications including electronic mail and voice mail; windowing; multitasking; computer conferencing; computer supported cooperative work; project management software; and decision support programs. The impact of ISDN on the office environment will also be examined.

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 624 Computer Integrated Manufacturing (3 credits)
Provides a framework for understanding how functional organization structure impacts the design of a management information system in a manufacturing setting. Special emphasis will be on marketing, manufacturing, and financial information systems. Topics covered include the product life cycle; production scheduling and capacity requirements planning; techniques for using MIS in inventory management decisions, quality control, internal accounting, and funds management. Planning strategies for forecasting services, developing requirements and specifications, writing requests for proposals, and project management will be examined within the context of functional information systems.

MCIS 625 Computer Graphics for Information Managers (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 Practicum (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 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.

MCIS 650 Data and Computer Communications I (3 credits)
The fundamentals of data communications and data communication networking. Topics include data transmission and encoding, digital data communication techniques, data link control, multiplexing, switched communications networks, circuit-switched networks, packet-switching techniques and systems (ARPANET/DDN, TYMNET, SNA, X.25 standard), local area networks, metropolitan area networks, optical fiber bus and ring topologies, the Fiber Distributed Data Interface (FDDI) standard, and LAN/MAN standards such as IEEE 802.

MCIS 651 Data and Computer Communications II (3 credits)
Communications protocol concepts, the open systems interconnection (OSI) model, the TCP/IP protocol suite, systems network architecture (SNA), internetworking, transport protocols, ISO transport standards, XTP transfer protocol, OSI session services and protocol, presentation concepts, Abstract Syntax Notation One (ASN.1), encryption, virtual terminal protocols, distributed applications including network management (SNMPv2), file transfer (FTAM), and electronic mail (X.400). The integrated services digital network (ISDN) architecture and services, broadband ISDN, and the impact of frame relay and cell relay technologies on network design. Prerequisite: MCIS 650.

MCIS 652 Computer Security (3 credits)
Provides a foundation for understanding computer and communications security issues and a framework for creating and implementing a viable security program. Topics include hardware, software, and network security; the regulatory environment; personnel considerations; cryptography; protective controls against potential threats including hackers, disgruntled insiders, and software viruses; and techniques for responding to security breaches.

MCIS 654 Applications of the Internet (3 credits)
Enterprises thrive on information, and telecommunications is now viewed as an efficient and effective means of disseminating and receiving information. The Internet has emerged as the dominant server for national and international data communications between commercial, government, military, and academic organizations and network hosts. This course will study the structure, organization, and use of the Internet. Internet technologies and their potential application are examined including electronic commerce, database connectivity, and security. An emphasis will be placed on evaluating, organizing, and developing efficient models of electronic tranactions.

MCIS 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/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.

MCIS 661 Object-Oriented Applications for CIS (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 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 672 Computer-Aided Software Engineering (3 credits)
Computer-Aided Software Engineering (CASE) is a technique in which the path between initial systems analysis and the final coding of programs can be at least partly automated. Topics include a critical comparison between CASE and 4GLs (Fourth-Generation Languages), upper CASE (analysis/design), lower CASE (code generation and testing), tool kits, workbenches, methodology companions, platforms, completeness and consistency checking.

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 and Emerging Technologies (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 683 Data Center Management (3 credits)
Examines information center methods for building systems between users and analysts. The traditional life-cycle development will be reviewed. The role and services of the information center will be discussed within the context of these issues: user support, goals in terms of user education and training, promoting systems support and development services, and promulgating and monitoring use of standards for software and for protection of data resources. Other topics in this course include principles of application generators, prototyping, user and provider roles in an information center. Students identify strengths and limitations of the information center approach.

MCIS 691 Special Topics in 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 626 Authoring Systems Design (3 credits)
Functionality and characteristics of PC and Macintosh authoring systems, frame-based, multimedia, and hypertext are explored in this course. Instructional systems design methodology in conjunction with authoring tools is examined and critiqued.

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 Spreadsheet, Database, and Graphing 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 is focused on the following areas: fundamental concepts of computer network architecture and topologies, open system interconnection models and standards, analysis of transport protocol specification, network program interface, network management, and emerging computer network applications. An area that is covered in detail includes network standards that determine how data are transferred: Ethernet, token ring, and Fiber Distributed Data Interface. Attention will also be directed toward issues affecting operating peripherals, including CD-ROM drives and printers.

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 Advanced Instructional Delivery Systems (3 credits)
An investigation of the expansion and applications of instructional delivery systems such as electronic delivery via telecommunications (e-mail, 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.

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 622 Office Automation Systems (3 credits)
This course focuses on strategies for utilizing technology to handle the information used in the office to improve the quantity, content, and format of work performed. Topics include the design and implementation of an office automation system; strategies for successful end-user computing; OA applications including electronic mail and voice mail; windowing; multitasking; computer conferencing; computer supported cooperative work; project management software; and decision support programs. The impact of ISDN on the office environment.

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 624 Computer Integrated Manufacturing (3 credits)
Provides a framework for understanding how functional organization structure impacts the design of a management information system in a manufacturing setting. Special emphasis will be on marketing, manufacturing, and financial information systems. Topics covered include the product life cycle; production scheduling and capacity requirements planning; techniques for using MIS in inventory management decisions, quality control, internal accounting, and funds management. Planning strategies for forecasting services, developing requirements and specifications, writing requests for proposals, and project management will be examined within the context of functional information systems.

MMIS 625 Computer Graphics for Information Managers (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 Databases in MIS (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 Databases in MIS Practicum (3 credits)
The techniques of database management systems will be applied to practical projects. Prerequisite: MMIS 630.

MMIS 632 Distributed Database Management (3 credits)
Students will study information storage and retrieval in a distributed environment. Topics include 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.), and alternatives for distributed processing. 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)
Provides a foundation for understanding computer and communications security issues and a framework for creating and implementing a viable security program. Topics include hardware, software, and network security; the regulatory environment; personnel considerations; cryptography; protective controls against potential threats including hackers, disgruntled insiders, and software viruses; and techniques for responding to security breaches.

MMIS 653 Telecommunications and Computer Networking (3 credits)
The role of telecommunications and computer networks in management information systems. Technical fundamentals and design of telecommunications and computer networks. Strategies, tools, and techniques for network planning, implementation, management, maintenance, and security. Topics include ISDN and B-ISDN, the OSI Model, transmission media, network operating systems, topologies, configurations, protocols, and performance characteristics. Trends in standardization, internetworking, downsizing, and the development of local area networks (LANs), wide area networks (WANs), metropolitan area networks (MANs), and enterprise-wide networks are examined.

MMIS 654 Electronic Commerce on the Internet (3 credits)
Enterprises thrive on information, and telecommunications is now viewed as an efficient and effective means of disseminating and receiving information. The Internet has emerged as the dominant server for national and international data communications between commercial, government, military, and academic organizations and network hosts. This course will study the structure, organization, and use of the Internet. Internet technologies and their potential application are examined including electronic commerce, database connectivity, and security. An emphasis will be placed on evaluating, organizing, and developing efficient models of electronic tranactions.

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 for MIS (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 672 Computer-Aided Software Engineering (3 credits)
Computer-Aided Software Engineering (CASE) is a technique in which the path between initial systems analysis and the final coding of programs can be at least partly automated. Topics include a critical comparison between CASE and 4GLs (Fourth-Generation Languages), upper CASE (analysis/design), lower CASE (code generation and testing), tool kits, workbenches, methodology companions, platforms, completeness and consistency checking.

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 and Emerging Technologies (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 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 683 Data Center Management (3 credits)
Information center methods for building systems. The traditional life-cycle development will be reviewed. The role and services of the information center will be discussed within the context of these issues: user support, goals in terms of user education and training, promoting systems support and development services, and promulgating and monitoring use of standards for software and for protection of data resources. Other topics include principles of application generators, prototyping, user and provider roles in an information center. Students will learn to identify strengths and limitations of the information center approach.

MMIS 691 Special Topics in Management Information Systems (3 credits)
This seminar will focus on the professor's current research interests. Prerequisite: prior 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.

W. Shane Bruce, Ph.D., Nova Southeastern University. Assistant Professor. Artificial intelligence and machine learning, genetic algorithms, operating systems.

Maxine S. Cohen, Ph.D., State University of New York. Assistant 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.

S. Rollins Guild, Ph.D., Nova Southeastern University. Assistant Professor. Mathematical modeling, computer graphics, programming languages, artificial intelligence.

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, broadband communications, multimedia, telecommunications, emerging technologies.

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. Assistant Professor. Database, decision support systems, information systems, network security, artificial intelligence, telecommunications.

Raul Salazar, Ph.D., Nova Southeastern University. Assistant Professor. Multimedia, computer networks, programming languages, computer systems, computer graphics.

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

Junping Sun, Ph.D., Wayne State University. Associate Professor. Database management systems, object–oriented database systems, artificial neural networks.

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.

***Adjunct Faculty:** Dr. Alfred Adler, Dr. Michael Chen, Dr. Andres Folleco, Dr. Susan Dorchak, Dr. Michael Gunter, Dr. Lee Leitner, Dr. Richard Manning, Dr. Ronald McFarland, Dr. Terry McQueen, Dr. Rhonda Mizrahi, Dr. Michael Moody, Dr. Maria Petrie, Dr. Mohammad Shakil, Dr. Greg Simco, Dr. Angela Trujillo, and Dr. Steven Zink.

The Administrative and Technical Staff

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