2004

Graduate School of Computer and Information Sciences Master's Degree Programs 2004

Nova Southeastern University

NSU

Nova Southeastern University

Graduate School of Computer and Information Sciences

Master's Degree Programs

Computer Information Systems

(Optional Specialization in Information Security)

Computer Science

Computing Technology in Education

Information Security

Management Information Systems

(Optional Specializations in Information Security and Electronic Commerce)

Graduate Certificate in Information Security

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Documents and Policies

The catalog of the Graduate School of Computer and Information Sciences (SCIS) is the governing document for all program-related information. Please become familiar with the policies and procedures contained within it. Official versions of the catalog will be posted to the school's website. The catalog posted most recently to the website supercedes previous web and printed versions. In addition, the NSU *Student Handbook* specifies rights, responsibilities, and specific university policies and procedures. It is provided to new students on CD-ROM and may be downloaded from the school's website. Failure to read the catalog and handbook does not excuse students from the rules, policies, and procedures contained therein. If there is any conflict between the information contained in the catalog and handbook and that contained in this or any other document, the information in the catalog and handbook prevails. Policies, regulations, requirements, and fees are necessarily subject to change without notice at any time at the discretion of the Nova Southeastern University administration. The university reserves the right for any reason to cancel or modify any course or program listed herein. In addition, individual course offerings may vary from year to year as circumstances dictate.

Accreditation

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. Eight of the school's graduate programs have been certified for inclusion in the Southern Regional Education Board's Electronic Campus.

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.

Academic Calendar, Master's Programs
(Master's programs have rolling admissions)

Fall 2003 (Sept 22–Dec 12, 2003) Term Code: 200420

Before Sept 12, 03	Registration period (no late fees)
Sept 13–22, 03	Late registration period (late fees)
Sept 22, 03	First day of term
Sept 27, 03	Drop/add deadline
Nov 27–28, 03	Holiday
Nov 22, 03	Last day to withdraw from a course with a final grade of W
Nov 29, 03	Last day to request an Incomplete
Dec 12, 03	Last day of term

Winter 2004 (Jan 5–Mar 26, 2004) Term Code: 200430

Before Dec 26, 03	Registration period (no late fees)
Dec 27 03–Jan 5, 04	Late registration period (late fees)
Jan 5, 04	First day of term
Jan 10, 04	Drop/add deadline
Jan 19, 04	Holiday
Mar 6, 04	Last day to withdraw from a course with a final grade of W
Mar 13, 04	Last day to request an Incomplete
Mar 26, 04	Last day of term

Spring 2004 (Mar 29–Jun 18, 2004) Term Code: 200440

Before Mar 19, 04	Registration period (no late fees)
Mar 20–29, 04	Late registration period (late fees)
Mar 29, 04	First day of term
Apr 9, 04	Holiday
Apr 3, 04	Drop/add deadline
May 31, 04	Holiday
May 29, 04	Last day to withdraw from a course with a final grade of W
Jun 5, 04	Last day to request an Incomplete
Jun 18, 04	Last day of term

Summer 2004 (Jun 21–Sept 10, 2004) Term Code: 200505

Before Jun 11, 04	Registration period (no late fees)
Jun 12–21, 04	Late registration period (late fees)
Jun 21, 04	First day of term
Jun 26, 04	Drop/add deadline
Aug 21, 04	Last day to withdraw from a course with a final grade of W
Aug 28, 04	Last day to request an Incomplete
Sept 6, 04	Holiday
Sept 10, 04	Last day of term

Fall 2004 (Sept 20–Dec 10, 2004) Term Code: 200520

Before Sept 10, 04	Registration period (no late fees)
Sept 11–20, 04	Late registration period (late fees)
Sept 20, 04	First day of term
Sept 16, 04	Holiday
Sept 25, 04	Drop/add deadline
Nov 20, 04	Last day to withdraw from a course with a final grade of W
Nov 25–26, 04	Holiday
Nov 27, 04	Last day to request an Incomplete
Dec 10, 04	Last day of term

Winter 2005 (Jan 3–Mar 25, 2005) Term Code: 200530

Before Dec 24, 04	Registration period (no late fees)
Dec 25 04–Jan 3, 05	Late registration period (late fees)
Jan 3, 05	First day of term
Jan 8, 05	Drop/add deadline
Jan 17, 05	Holiday
Mar 5, 05	Last day to withdraw from a course with a final grade of W
Mar 12, 05	Last day to request an Incomplete
Mar 25, 05	Last day of term

Spring 2005 (Mar 28–Jun 17, 2005) Term Code: 200540

Before Mar 18, 05	Registration period (no late fees)
Mar 19–28, 05	Late registration period (late fees)
Mar 28, 05	First day of term
Apr 2, 05	Drop/add deadline
May 28, 05	Last day to withdraw from a course with a final grade of W
May 30, 05	Holiday
Jun 4, 05	Last day to request an Incomplete
Jun 17, 05	Last day of term

A major force in educational innovation, the Graduate School of Computer and Information Sciences (SCIS) provides educational programs of distinction to prepare students for leadership roles in its disciplines. Its strengths include a distinguished faculty, a cutting edge curriculum, and flexible online and campus-based formats for its five M.S. and five Ph.D. programs (it also has a graduate certificate program in information security). It has approximately 2,000 graduate students. All programs enable working professionals to earn their degrees without interrupting their careers. The school also welcomes full-time students, whether on-campus or online. On-campus evening master's degree programs are tailored to meet the needs of South Florida residents. Online master's degree programs require no campus attendance and are available to part-time or full-time students worldwide. A unique online doctoral program requires only four weekend or two weeklong campus visits each year. The school has online students living in almost every state in the United States and in more than 25 foreign countries.

Ranked by *Forbes* magazine as one of the nation's top 20 cyber-universities, and listed in the Princeton Review's *The Best Distance Learning Graduate Schools,* the school offers more than 300 online classes annually. The school, a pioneer in online graduate education, began offering online programs in 1983 and created the first electronic classroom in 1985.

SCIS has been awarding graduate degrees since 1984. Its research advances knowledge, improves professional practice, and contributes to understanding in the computer and information sciences. In addition to its regional accreditation by the Commission on Colleges of the Southern Association of Colleges and Schools, the school's programs have been certified by the Electronic Campus of the Southern Regional Education Board, and its curriculum in information security has been certified by the U.S. National Security Agency (NSA) for compliance with CNSS standards. The school also participates in several federal and military programs including the DANTES Distance Learning Program and the U.S. Army's online initiative, eArmyU. It has been awarded a chapter of Upsilon Pi Epsilon (UPE), the International Honor Society for the Computing and Information Disciplines, and qualified students are initiated into the society. The school's student chapter of the Institute of Electrical and Electronic Engineers (IEEE) is the largest in Florida.

The M.S. requires 36 credit hours. It may be completed in 12–18 months. Several of the M.S. programs offer specialization options which require additional courses. Terms are 12 weeks long, and there are four terms each year. They start in September, January, March, and June. The school's M.S. students may apply for early admission into the doctoral program which provides the opportunity to earn the Ph.D. or Ed.D. in a shorter time.

Depending on the program, doctoral students may take one of two formats: *cluster* or *institute.* Clusters and institutes bring together students and faculty members 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 and with other students. Cluster students, while taking courses, attend four cluster sessions per year, held quarterly over an extended weekend (Friday, Saturday, and half-day Sunday) at the university. Cluster terms start in September and March. Institute students, while taking courses, attend weeklong sessions at the university twice a year at the start of each term. Institute terms start in January and July. Cluster and institute terms are five months long.

Online students use the web to access course materials, announcements, email, distance library services, the Electronic Library, and other information and for interaction with faculty and fellow students. Online, interactive learning methods are used throughout the instructional sequence based on the use of WebCT as a course management system. Online activities facilitate frequent student-to-faculty and student-to-student interaction. They are supported by threaded discussion boards, white boards, chat rooms, and email. In addition, WebCT enables students to submit assignments online in multimedia formats and to receive their professors' reviews of assignments online in the same formats.

Located on a beautiful 300-acre campus in Fort Lauderdale, Florida, NSU has more than 22,000 students and is the largest independent institution of higher education in the Southeast United States. The 10th largest private university in the United States, it awards associate's, bachelor's, master's, educational specialist, doctoral, and first-professional degrees in more than 90 disciplines. It has a college of arts and sciences and schools of medicine, dentistry, pharmacy, allied health, optometry, law, computer and information sciences, psychology, education, business and entrepreneurship, oceanography, and humanities and social sciences.

The success of NSU's programs is reflected in the accomplishments of its graduates, among whom are
- thirty-nine college presidents and chancellors
- more than 100 college vice presidents, provosts, deans, and department chairs
- sixty-five school superintendents in 16 states, including nine of the nation's largest school districts
- hundreds of college and university faculty members nationwide
- high-ranking U. S. military officers, including admirals and generals, and business presidents, executives, and researchers at companies such as AT&T, Boeing, Cisco, Dell, Ford, General Dynamics, HP, Lockheed Martin, IBM, Microsoft, Motorola, Nokia, Oracle, Pratt &Whitney, Sun Microsystems, TI, Verizon, and Walt Disney

Degrees and Programs of the Graduate School of Computer and Information Sciences (SCIS)

Master of Science (M.S.)
Computer Information Systems
Computer Science
Computing Technology in Education
Information Security
Management Information Systems

Doctor of Philosophy (Ph.D.) or Doctor of Education (Ed.D.)
Computer Information Systems (Ph.D.)
Computer Science (Ph.D.)
Computing Technology in Education (Ph.D. or Ed.D.)
Information Science (Ph.D.)
Information Systems (Ph.D.)

Graduate Certificate
Information Security

Application for Admission to the Master's Degree Programs or the Graduate Certificate Program

Admission is competitive; consequently applicants who meet the minimum requirements specified herein are not assured admission. The school qualitatively and quantitatively evaluates applicants and makes selections based on performance, personal qualifications, and evidence of potential for success. Admission decisions are made on a rolling basis. Applications will be reviewed by the Admissions Committee after the following items have been received by the admissions office: application form, application fee, résumé or GRE scores, and all transcripts (unofficial copies are acceptable pending receipt of official transcripts). Applicants not having an immediate degree objective are welcome to apply for master's-level courses (see section Admission of Non-Degree Students). Newly admitted students must register within two years from the date of their first possible registration. Failure to do so will require a formal petition for readmission. Applicants must meet the requirements specified below and must also satisfy the program-specific admission requirements contained in the individual program sections of this brochure. Instructions for applying are contained in the admission forms, which may be downloaded from the school's website: http://www.scis.nova.edu/NSS/pdf_documents/index.html. For additional information, contact:

Graduate School of Computer and Information Sciences
Nova Southeastern University
3301 College Avenue, DeSantis Building
Fort Lauderdale, Florida 33314-7796

800-986-2247 or 954-262-2000
Email: mailto:scisinfo@nova.edu
Website: http://www.scis.nova.edu

Minimum Admission Requirements for U.S. Citizens or Permanent Residents

1. An earned bachelor's degree with a GPA of at least 2.5 from a regionally accredited institution with an appropriate major (see program-specific admission requirements under individual programs).

2. Application form and application fee.

3. Official transcripts of all undergraduate and graduate education.

4. A résumé, not to exceed three pages, or score report of the Graduate Record Examination (GRE).

5. The school may require additional documentation to support the application.

6. Proficiency in the English language. Grammatical errors, spelling errors, and writing that does not express ideas clearly will affect a student's grades and the completion of his or her degree. The faculty will not provide remedial help concerning grammatical errors or other writing problems. Applicants who are unable to write correctly and clearly are urged to seek remedial help before enrolling in any of the school's programs.

Additional Admission Requirements for International Students

1. The application fee must be in U.S. dollars.

2. International students who apply for the online format do not have to travel to the United States to participate in the degree program.

3. International students who apply for the on-campus format must enter the United States on an F-1 student visa. The Bureau of Citizenship and Immigration Services (BCIS) requires that all students on an F-1 student visa must enroll full time as a degree-seeking student and must attend the main campus only. After being accepted into the master's program, the student will be sent an immigration document called "Form I-20 AB Certificate of Eligibility for F-1 Student Status." This document will be sent to the student's home country. Once the student has received the I-20, he/she must contact the United States embassy or consulate in his/her home country in order to apply for the F-1 visa. Detailed instructions on how to obtain the I-20 Form, how to enter the United States with an F-1 visa, and how to maintain F-1 status are provided on the website of the Office of International Students: http://www.nova.edu/cwis/registrar/isss/ (click on "F-1 Visa"). Applicants may contact the university's Office of International Students by email: mailto:intl@nova.edu; telephone: 954-262-7240 or 800-541-6682, ext. 7240; or fax: 954-262-3256. An I-20 cannot be issued to a non-degree or provisional admission student.

4. Applicants must have a university-level education equivalent to a regionally-accredited United States bachelor's degree in a related field (see program-specific admission requirements in this brochure) with an equivalent GPA of at least 2.5 and an equivalent GPA of 3.0 in the major field. To enable the school to determine equivalencies, the applicant must have his or her degree evaluated by an agency that is a member of the National Association of Credential Evaluation Services (NACES). For current information on evaluation agencies visit http://www.naces.org/members.htm. To apply for transfer of graduate credits from a foreign institution, the applicant must have the courses proposed for transfer evaluated by an agency that is a member of NACES.

5. Applicants whose native language is not English and who have not earned a degree at an English-speaking university must demonstrate proficiency in English by scoring above the minimum requirements for the TOEFL or IELTS exam. The minimum scores for the TOEFL exam are 550 in the paper-based test and 213 in the computer-based test. The minimum score for the IELTS exam is 6.5. Scores must be no more than two years old. Test results must be sent directly to the Graduate School of Computer and Information Sciences from the TOEFL or IELTS Score Reporting Service. For information on TOEFL services visit http://www.toefl.org and for more information on IELTS services visit http://www.ielts.org or http://www.talkinusa.com/.

Admission of Non-Degree Students

Applicants may take one or more courses without having an immediate degree objective. An applicant requesting non-degree status must have an earned bachelor's degree in a related field from a regionally accredited college or university and must submit an application form, official transcripts of relevant undergraduate and graduate education, and an application fee. Instructions for the preparation of admissions materials are contained in the admission forms, which may be downloaded from the school's website as described earlier.

Non-degree students may take up to 18 credits and must maintain a 3.0 GPA to continue enrollment with non-degree status. The non-degree student may apply for degree status at any time by completing the regular graduate admission application process. Satisfactory completion of courses by non-degree students does not guarantee admission to a master's degree program. Courses completed while the student is in a non-degree status will be evaluated as to the suitability of their transfer into the desired master's degree program. Courses applied to a graduate degree or certificate must fall within the time frame specified for the program. An international student on an I-20 cannot be enrolled as a non-degree student. Non-degree students are not eligible for financial aid.

Provisional Admission

Students are provisionally admitted to a degree-seeking program based on a review of unofficial transcripts or other specific program admission requirements. However, this admission includes a condition that final and official documents and requirements must be received within 90 calendar days from the start of the term. If these final and official documents and/or requirements are not received by that time, the student will not be allowed to continue class attendance. Financial aid will not be disbursed to a provisional/conditional student until he or she has been fully admitted as a regular student (all admission requirements have been approved by the school's admissions office).

Transfer Credit Policy

Up to six graduate credits from a regionally accredited institution may be transferred to one of the master's programs. 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 (see instruction on the application form). Copies of catalog course descriptions or course syllabi are required to process requests for transfer credits.

Early Admission into the Doctoral Program (See options in the individual M.S. program sections.)

This option provides the school's M.S. students the opportunity to earn the doctoral degree in a shorter time. Minimum requirements for early admission are the completion of 24 credits in the M.S. program with a GPA of 3.5 or higher and the completion of specific master's courses (see master's program sections for details). If admitted into the doctoral program, students will take the remaining 12 credits for the M.S. degree in the doctoral program. Master's students may apply for early admission no sooner than during the term in which they will be completing 24 credits. Students must submit applications (including an essay and updated résumé) for early admission to the SCIS Office of Admissions. Doctoral admission forms may be downloaded from the SCIS website. An application fee is required. The SCIS Office of Admissions will supply the Admissions Committee with the student's current transcripts. Two evaluation forms must be completed by SCIS faculty members (preferably full-time faculty members). Upon successful completion of 12 credits in the doctoral program, the student may apply for the master's degree (contact the program office for a degree application).

Student Organizations

The goal of these organizations is to help students advance in their professions through contact with working professionals, participation in conferences, or recognition of academic excellence. Student membership provides a variety of benefits including technical publications, career development, and financial services. Organizations with active SCIS affiliations include

Association of Computing Machinery (ACM)
Institute of Electrical and Electronics Engineers (IEEE) and IEEE Computer Society
Upsilon Pi Epsilon (UPE) International Honor Society for the Computing and Information Disciplines

Financial Aid

The Office of Student Financial Assistance administers the university's financial aid programs of grants, loans, scholarships, and student employment and provides professional financial advisers to help students plan for the most efficient use of their financial resources for education. In order to participate in financial aid programs, a student must be admitted into a university program and must be a citizen, a national, or a permanent resident of the United States, or be in the United States for other than a temporary purpose. A prospective student who requires financial assistance must apply for financial aid while he or she is a candidate for admission. Applicants and prospective students may apply for financial aid online at http://www.nova.edu/cwis/finaid. Students must work directly with the university's Office of Student Financial Assistance because the school's program office does not administer or manage the financial aid process.

For additional information or application forms (1) call 954-262-3380 or 800-806-3680; or (2) send email to mailto:gabriels@nova.edu or mailto:finaid@nova.edu. 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.

Orientation and Advisement

New students are invited to the campus for a Student Success Workshop and are also provided web-based and CD-ROM-based orientations that include computer/software requirements, online access, tools and methods, and library access. The school's website provides an extensive online help system including downloadable software and documents. Advisement is provided by the program office and the faculty.

Thesis Option

For the thesis option, students must register twice for 699 for a total of six credit hours. These credit hours are in lieu of six credit hours of course work (usually electives). Students who have not completed the thesis by the end of the second thesis registration must register for continuing thesis. Students interested in the thesis option should contact the program office to make arrangements.

Term Dates

Four 12-week terms are offered each year. Terms start in September, January, March, and June. The Academic Calendar for the master's-level programs is contained on the second page of this brochure and is also posted on the school's website at http://www.scis.nova.edu/Masters/index.html.

Program Formats

The 36-credit hour master's programs are designed so they may be completed by full-time students in 12 months or by working professionals in 12–18 months. To earn the degree in 12 months, students must enroll in three courses per term. To earn the degree in 18 months, students must enroll in two courses per term. Terms are 12 weeks long and there are four terms each year. Students select one of two formats: online or on-campus (on-campus is not available for the M.S. in computing technology in education). Degrees with specializations in information security require 42 credit hours. The specialization in electronic commerce requires 39 credit hours. The graduate certificate in information security requires 15 credit hours.

All degree programs include an optional six-credit thesis (the six credits for thesis are in lieu of course credit hours). Students electing the online format may participate in online classes from anywhere in the world where Internet access is available. On-campus classes are held on the main campus in Fort Lauderdale. Each class meets once a week from 6:30 p.m. to 9:30 p.m. for 12 weeks. All of the school's programs are offered online, and all but the M.S. in computing technology in education program are offered on campus.

SCIS students are provided NSU computer accounts but must obtain their own Internet service providers and use their own computer systems. New students are provided an orientation on computer and software requirements, online access, online tools and methods, and library resources. Online students use the web to access course materials, announcements, email, distance library services, the Electronic Library, and other information and for interaction with faculty and fellow students. Online, interactive learning methods are used throughout the instructional sequence based on the use of WebCT as a course management system. Online activities facilitate frequent student-to-faculty and student-to-student interaction. They are supported by threaded discussion boards, white boards, chat rooms, and email. In addition, WebCT enables students to submit assignments online in multimedia formats and to receive their professors' reviews of assignments online in the same formats.

Grade Requirements and Time Limitations (See SCIS catalog for additional information.)

Each student must maintain a cumulative grade point average of at least 3.0 for the duration of his or her program to remain in good academic standing. Failure to do so will result in probation and possible dismissal. Students must complete requirements for the master's degree within five years from the date of their first registration. Students must complete the certificate program within three years from the date of their first registration.

Independent-Study Basis, Directed Independent Study, or Taking a Course in Another Program

Each of these requires the student to submit a request for approval to the Director of Graduate Programs prior to registration. *Independent-study basis* means taking a course that is published in the curriculum of the program under which the student is enrolled but is not currently offered (it would be taken under the supervision of a faculty member). The student would register for the course prefix and number listed in the curriculum. *Directed independent study* means working on a project or study under the supervision of a faculty member in an area not covered by a course in the published curriculum. The student would register for the course <Prefix> *1200 Directed Independent Study* (the prefix would identify the student's program). *Taking a course in another program* means taking a course in one of the school's master's programs in which the student is not enrolled. For each of these cases, the program director will review the student's record to determine the appropriateness of the request. If the request appears to be consistent with the student's program and school policies, the director will consult with the appropriate faculty member for possible approval and will notify the student of the decision and any requirements.

Library Resources

The primary means for on-campus and online students to access learning materials is through the NSU library system (http://www.nova.edu/library/) which includes the following libraries: (1) Alvin Sherman Library, Research, and Information Technology Center; (2) Health Professions Division Library; (3) Shepard Broad Law School Law Library and Technology Center; (4) William S. Richardson Oceanographic Library: (5) Electronic Library; and (6) University Archives. The catalogs of all NSU libraries are accessible online for remote searching (as are catalogs of other university libraries) using the Electronic Library. The Electronic Library also enables searches of more than 200 subscription databases and provides online access to a variety of full-text resources including 28,000 full-text journals, 100,000 dissertations, 70,000 ERIC ED documents, and 20,000 ebooks.

NSU is a member of several cooperative networks. As a member of Florida Library Information Network (FLIN) and Southeast Florida Library Information Network (SEFLIN), NSU is able to obtain books and periodicals through interlibrary loan quickly and efficiently. NSU students may also use other SEFLIN libraries. Students can obtain more than 10 million books through NSU's library agreements with other libraries.

Online students can request delivery of books and other documents to their homes or offices. Requests can be made via online forms or fax. Journal articles can be mailed, faxed, or scanned and accessed digitally from the student's desktop. These services are provided by the library's Office of Distance and Instructional Library Services (DILS) which can be reached by toll-free phone, email or via the web. Students can request up to 25 free documents per week while they are enrolled at NSU. All materials mailed by DILS 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 them. Books are loaned for one month. Periodical copies need not be returned.

Students also may call the Library's Reference Desk at 800.541.6682, ext. 4613 for reference information, advice on research strategies and resources, and suggestions on other library resources that may be of use. The desk is staffed 86 hours per week. Students can email questions after hours to refdesk@nsu.nova.edu. The university's website provides instructions on the use of the library (http://www.nova.edu/library/assistance/assist.htm) which include an online library handbook, one-on-one assistance via telephone or email, tutorials, etc.

The university continues to expand its library system to meet the needs of its growing community. For example, it recently completed construction of the Alvin Sherman Library, Research, and Information Technology Center, a joint use facility with the Broward County Board of County Commissioners. This five story, 325,000 square-foot facility is the largest library building in the State of Florida. It has 1000 user seats, 20 electronic classrooms (one is for children), and a 500-seat auditorium. Half of the construction funds were provided by NSU and half were provided by the Broward County Board of County Commissioners.

Tuition and Fees (Rates are subject to change. Textbooks must be purchased separately.)

Tuition	$425 per credit hour
Application Fee	$50 nonrefundable
Registration Fee	$30 nonrefundable
Late Registration Fee	$100 nonrefundable
Readmission Fee	$50 nonrefundable
Program Change Fee	$50 nonrefundable
Graduation Fee	$75
Fee for Installment Payment	$50

Tuition Payment Policy (Additional information may be found at http://www.nova.edu/cwis/bursar.)

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. The options available for the payment of tuition are:

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 fee.

2. *Installment payment by the student* (foreign students attending on a visa may not be eligible for this option): This plan 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 60 days from the beginning of the term, shall equal 25 percent of the tuition. The third payment, due 90 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 on 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:* Students who have applied for financial aid and have submitted all the required paperwork to the Office of Student Financial Assistance may register without payment.

Additional Information on Policies and Procedures

Consult the school's catalog: http://www.scis.nova.edu/NSS/pdf_documents/Catalog.pdf

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

This 36 credit-hour 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, information 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 full-time students the opportunity to earn the degree in 12 months and working professionals the opportunity to earn the degree in 12–18 months. In addition, students have the option to pursue the M.S. in CIS with *specialization in information security,* which requires a total of 42 credit hours. The curriculum is consistent with recommendations for a model curriculum in computer information systems as outlined by the Association of Computing Machinery (ACM).

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. Applicants who do not have an adequate background may be required to take one or more of the following 500-level graduate courses during the first two terms of the student's program. These are in addition to the required 36 credit hours 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 director. 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

Early Admission into the Doctoral Program

In addition to the requirements specified on p. 4, the student must have completed MCIS 611 Survey of Programming Languages, MCIS 615 Operating Systems Concepts, MCIS 620 Information Systems, MCIS 630 Database Systems, and MCIS 645 Software Engineering (see Graduate Catalog for additional information).

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

Core courses, electives, and courses constituting the degree program with specialization in information security are listed below. Students may substitute up to two electives for two core courses. Students who wish to take an additional elective must request approval from the program office prior to registration. If the thesis option is elected, two courses may be omitted.

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   Information Security
MCIS 654   Electronic Commerce on the Internet
MCIS 681   Multimedia Systems
MCIS 683   Secure Computer Systems
MCIS 684   Applied Cryptography
MCIS 685   Database Security
MCIS 686   Advanced Network Security
MCIS 687   Information Security Project
MCIS 691   Special Topics in Computer Information Systems

The M.S. in CIS with Specialization in Information Security (Required Courses):
MCIS 611   Survey of Programming Languages
MCIS 615   Operating System Concepts
MCIS 630   Database Systems
MCIS 645   Software Engineering
MCIS 650   Data Communications Networks
MCIS 665   Client-Server Computing
MCIS 670   Artificial Intelligence and Expert Systems
MCIS 671   Decision Support Systems
MCIS 680   Human-Computer Interaction
MCIS 683   Secure Computer Systems
MCIS 684   Applied Cryptography
MCIS 685   Database Security
MCIS 686   Advanced Network Security
MCIS 687   Information Security Project

Course Descriptions for the M.S. in Computer Information Systems

MCIS 500 Assembly Language and Architecture (3 credits)
A comprehensive examination of the fundamental concepts and architectural structures of contemporary computers. Assembly language programming and the influence of low-level computer architecture on modern computer applications.

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. 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)
Building on a foundation in classical ethics, we examine the impact of the computer and the Internet on our society. Topics covered include ethical decision making; professional codes; whistle-blowing; computer crime; copyrights, patents and intellectual property; privacy; and risk management. Students will analyze case studies and write a research paper.

MCIS 625 Computer Graphics (3 credits)
Principles and concepts of computer graphics useful to information managers. Topics include an introduction to raster graphics, concepts of 2-D and 3-D graphics, modeling, rendering, graphic file formats, color, graphical user interfaces, virtual reality, and the graphical presentation of information.

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, the entity relationship model, and advanced semantic modeling methods are discussed. Topics include 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 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. This course is only for students in the CIS master's program.

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 high-speed networks are discussed. Network components, guided and unguided media, as well as routing and high-speed switching systems are studied. This course examines the relationship of computer applications to network architecture and subsystems. Current network and data communication topics are presented, as well as future trends.

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 Information Security (3 credits)

Concepts and applications of system and data security. Topics include 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. Areas of particular focus include secure network design, implementation and transition issues, and techniques for responding to security breaches.

MCIS 654 Electronic Commerce on the Internet (3 credits)

The combination of the computer and the Internet have created an incredible "market space". We will examine the foundation, operation and implications of the Internet economy. Topics include Internet technologies, online market mechanisms, interactive customers, knowledge-based products, smart physical products and services, pricing in the internet economy, online auctions and e-marketplaces, digital governance, policies for the internet economy and an outlook for the new economy. Students will participate in an Internet shopping experience, analyze a company that focuses on eCommerce and write a research paper.

MCIS 661 Object-Oriented Applications (3 credits)

Principles and concepts of the object-oriented paradigm and object-oriented programming languages. Notation and techniques for the analysis, design, and implementation of object-oriented systems. Mechanisms for reuse, including composition, inheritance, design patterns, and application frameworks. The use of object-oriented methods in common applications.

MCIS 665 Client-Server Computing (3 credits)

Concepts and principles of client-server architecture, protocols, networks, and distributed computing are presented. The focus of this course is on distributed application design and implementation. Topics include inter-process communication, the role of the GUI and front-end development tools, middleware, multi-tier architectures, distributed objects, and database interaction. Discussions include the various relationships between client-server computing and business processes. Migration from legacy systems is considered along with concerns for meeting customer requirements.

MCIS 670 Artificial Intelligence and Expert Systems (3 credits)

Covers the theory and practice of artificial intelligence and knowledge-based expert systems. Topics discussed include knowledge representation and inference, heuristic and adversary search, genetic algorithms, machine learning, neural computing, reasoning under uncertainty, symbolic programming using Lisp, logic programming using Prolog, and expert systems. Examples from current application areas such as robotics, planning, machine vision, natural language processing, and intelligent agents are used to reinforce the concepts.

MCIS 671 Decision Support Systems (3 credits)

This course examines concepts of decision support in both automated and non-automated environments. The focus is on application of decision theory, analytical modeling, and simulation techniques to solve organizational problems. Group Decision Support Systems, Executive Information Systems, and Expert Systems are also discussed. Case studies of existing systems are used to reinforce concepts discussed in class. A major component of the course is a project entailing the design, implementation, and evaluation of a Decision Support System. Emphasis is placed on the technical aspects of decision support systems.

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)

Introduction to multimedia systems. Definition of terms and concepts related to multimedia. Trends in the development and the use of multimedia. Tools, techniques, and guidelines facilitating the planning, design, production, and implementation of multimedia products.

MCIS 683 Secure Computer Systems (3 credits)
This course will focus on design principles of trusted computing bases (TCB). Issues regarding authentication, access control and authorization, discretionary and mandatory security policies, secure kernel design, secure operating systems, and secure databases will be covered from a systems architecture perspective. Emphasis will be on the design of security measures for critical information infrastructures. Prerequisites: MCIS 615, 630, 650.

MCIS 684 Applied Cryptography (3 credits)
Analysis of cryptographic algorithms, cryptanalysis, symmetric cryptography, public key cryptography, DES, AES, RSA, hash and MAC functions, digital signatures, pseudo random generators, cryptographic protocols, SSL//TLS, SET. Prerequisites: MCIS 502 (or equivalent), 615, 650.

MCIS 685 Database Security (3 credits)
This course will focus on issues related to the design and implementation of secure data stores. Emphasis will be placed on multilevel security in database systems, covert channels, and security measures for relational and object-oriented database systems. Prerequisites: MCIS 615, 630.

MCIS 686 Advanced Network Security (3 credits)
Fundamental concepts, principles, and practical networking and internetworking issues relevant to the design, analysis, and implementation of enterprise-level trusted networked information systems. Topics include networking and security architectures, techniques, and protocols at the various layers of the Internet model. Security problems in distributed application environments will be analyzed and solutions discussed and implemented. Prerequisites: MCIS 615, 650.

MCIS 687 Information Security Project (3 credits)
This project course integrates all of the knowledge accumulated through the previous courses and serves as a capstone for the Specialization in Information Security. The class focuses on techniques for protecting critical information infrastructures through case studies, application development, and systems assessment. Students may enroll in this class only after completing all of the information security specialization courses. Prerequisites: All other MCIS security specialization courses.

MCIS 688 Continuing Thesis in Computer Information Systems (1.5 credits)
Students who have not completed the thesis by the end of the second thesis registration must register for continuing thesis. This allows the student to receive faculty and administrative advice and support related to the thesis. Prerequisite: Completion of second thesis registration.

MCIS 691 Special Topics in Computer Information Systems (3 credits)
This seminar focuses on the professor's current research interests. Requires consent of course professor and program director.

MCIS 699 Master's Thesis in Computer Information Systems (3 credits)
The student develops a framework within which research will be conducted and offers evidence of qualifications to pursue the research. Concepts and theories underlying the student's thesis research are articulated, the problem is clearly stated, specific, measurable goals are specified, a literature review is presented, the methods of conducting research are delineated, and strategy to achieve the goal is given. Registration for MCIS 699 must be repeated for three more credits, for a total of six thesis credits. Prerequisite: Completion of eight courses at the 600-level.

MCIS 1200 Directed Independent Study (3 credits)
Students pursue a project, research study, or implementation under the supervision of a faculty member.

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

This 36 credit-hour 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 full-time students the opportunity to earn the master's degree in 12 months and working professionals the opportunity to earn the degree in 12–18 months. 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.)

This 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.

Applicants who do not have adequate backgrounds may be required to take one or more of the following 500-level graduate courses during the first two terms of the student's program:

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

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 director. MCIS 501 is a prerequisite to MCIS 503.

Early Admission into the Doctoral Program

This option provides the opportunity for master's students in computer science to earn the Ph.D. in computer science or computer information systems in a shorter time. In addition to the requirements specified on p. 4, the student must have completed CISC 610 Programming Languages, CISC 615 Design and Analysis of Algorithms, CISC 630 Compiler Design Theory, and CISC 640 Operating Systems Theory and Design.

The Curriculum for the M.S. in Computer Science

The student may substitute up to two electives for two core courses. Students who wish to take an additional elective must request approval from the program office prior to registration. If the thesis option is elected, two courses may be omitted.

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   Information Security
CISC 661   Database Management Systems Implementation
CISC 663   Object-Oriented Database Systems
CISC 682   Software Engineering Implementation
CISC 690   Special Topics in Computer Science

Course Descriptions for the M.S. in Computer Science

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, and 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 that 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)
The concepts of communication protocols, network and protocol architectures, switching techniques, topology, internetworking, network design and analysis methods are covered from the computer science perspective. Detailed technical examination of network components, guided and unguided media, switching, and routing are conducted. Network architectural topics include software and conceptual models, error detection and prevention systems, transfer and routing protocols, congestion and flow control, and current and future applications.

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 Information Security (3 credits)
Theory and principles of information security and data protection. Topics include formal models for computer security, secure operating systems, mechanisms for mandatory and discretionary access controls, distributed secure system architectures, encryption and authentication, integrity models and mechanisms, secure protocols and vulnerability analysis.

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)
This course presents the concepts and design of client-server and distributed systems. Protocols, inter-process communication principles, language issues, system architecture, concurrency, distributed resource management are among the topics discussed. The role of standards in client-server development and distributed systems is discussed, along with middleware, distributed objects, and applications.

CISC 670 Artificial Intelligence (3 credits)
Covers the theory and practice of artificial intelligence and knowledge-based expert systems. Topics discussed include knowledge representation and inference using predicate calculus, heuristic and adversary search, genetic algorithms, machine learning, neural computing, reasoning under uncertainty, symbolic programming using Lisp, logic programming using Prolog, and expert systems. Development and implementation of algorithms for intelligent systems is emphasized. Examples from current application areas such as robotics, planning, machine vision, natural language processing, and intelligent agents are used to reinforce the concepts.

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. This course is only for students in the computer science master's program.

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)
Principles and concepts of the object-oriented paradigm. Notation and techniques for the analysis, design, and implementation of object-oriented systems. Mechanisms for reuse, including composition, inheritance, design patterns, and application frameworks. Object-oriented programming.

CISC 685 Human-Computer Interaction (3 credits)
Provides a broad overview of human-computer interaction (HCI) as a sub-area of computer science and explores user-centered design approaches in computer systems applications. Focuses on the dynamics of HCI including addressing user interface and software design strategies, user experience levels, interaction styles, usability engineering, web design principles, innovative interfaces including collaborative systems technology. Working model prototypes may be designed and tested. Students will perform formal software evaluations and usability tests.

CISC 688 Continuing Thesis in Computer Science (1.5 credits)
Students who have not completed the thesis by the end of the second thesis registration must register for continuing thesis. This allows the student to receive faculty and administrative advice and support related to the thesis. Prerequisite: Completion of second thesis registration.

CISC 690 Special Topics in Computer Science (3 credits)
This seminar focuses on the professor's current research interests. Requires consent of course professor and program director.

CISC 699 Master's Thesis in Computer Science (3 credits)
The student develops a framework within which research will be conducted and offers evidence of qualifications to pursue the research. Concepts and theories underlying the student's thesis research are articulated, the problem is clearly stated, specific, measurable goals are specified, a literature review is presented, the methods of conducting research are delineated, and strategy to achieve the goal is given. Registration for CISC 699 must be repeated for three more credits, for a total of six thesis credits. Prerequisite: Completion of eight courses.

CISC 1200 Directed Independent Study (3 credits)
Students pursue a project, research study, or implementation under the supervision of a faculty member.

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

This 36 credit-hour program 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 full-time students the opportunity to earn the master's degree in 12 months and working professionals the opportunity to earn the degree in 12–18 months. 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. (Satisfactory completion of the master's degree program does not guarantee that students will meet certificate requirements for their states.)

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 institution and extensive experience with computer applications and the World Wide Web.

Early Admission into the Doctoral Program

This option provides the opportunity to earn the Ph.D. or Ed.D. in computing technology in education in a shorter time. See detailed requirements on p. 4.

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

Core courses are listed below. If the thesis option is elected, two courses may be omitted.

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 Systems
MCTE 661	Online Learning Environments
MCTE 670	Learning Theory and Computer Applications
MCTE 680	Human-Computer Interaction
MCTE 690	Research Methodology
MCTE 691	Master's Project in CTE

Course Descriptions for the M.S. in Computing Technology in Education

MCTE 615 The Internet (3 credits)
The Internet and online information systems associated with the evolving information superhighway. 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 about 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)
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. Recent advances in standardization, internetworking, and deployment of LANs (local area networks), MANs (metropolitan area networks), and WANs (wide area networks).

MCTE 660 Multimedia Systems (3 credits)
Introduction to multimedia systems. Recent advances and future trends in learning technology and educational computing are examined. Definition of terms and concepts related to multimedia. Trends in the development and the use of multimedia. Tools, techniques, and guidelines facilitating the planning, design, production, and implementation of multimedia products.

MCTE 661 Online Learning Environments (3 credits)
The course explores research trends in the area of online learning. Students will explore the requirements needed for successful online learning and teaching. Topics investigated may include the process of teaching and learning in an OLE, evaluating effective courseware and online communications technologies, integration of technology into OLEs, working with online classroom dynamics, addressing the needs of the online student, making the transition to online teaching, promoting the development of an online learning community, comparing Learning Management Systems (LMSs), and investigating emerging trends in e-learning and e-training in industry settings.

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 field of human-computer interaction (HCI). Investigates the design and usability of educational-related technology. Explores how design practices are integrated with human factors, principles, and methods. Other issues explored may include user experience levels, interaction styles, usability engineering, web design, and future research. Students will perform formal software evaluations and usability tests.

MCTE 688 Continuing Thesis in Computing Technology in Education (1.5 credits)
Students who have not completed the thesis by the end of the second thesis registration must register for continuing thesis. This allows the student to receive faculty and administrative advice and support related to the thesis. Prerequisite: Thesis registrations.

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 nonparametric 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 course professor and program director.

MCTE 699 Master's Thesis in Computing Technology in Education (3 credits)
The student develops a framework within which research will be conducted and offers evidence of qualifications to pursue the research. Concepts and theories underlying the student's thesis research are articulated, the problem is clearly stated, specific, measurable goals are specified, a literature review is presented, the methods of conducting research are delineated, and strategy to achieve the goal is given. Registration for MCTE 699 must be repeated for three more credits, for a total of six thesis credits. Prerequisite: Completion of eight courses.

MCTE 1200 Directed Independent Study (3 credits)
Students pursue a project, research study, or implementation under the supervision of a faculty member.

Master of Science (M.S.) in Information Security
Graduate Certificate in Information Security

These programs were developed to address the rapidly growing global problems of maintaining and securing computer information. Important areas addressed by the program include threats and vulnerabilities, cryptography, authentication and access control, security models, network security, trusted computer systems, distributed systems security, World Wide Web security, applications security, and security management and policies. The curriculum in information security has been certified by the U.S. National Security Agency (NSA) for compliance with the requirements of the Committee on National Security Systems (CNSS) standards. As a result of this certification, Federal civilian and military personnel will be permitted to take the school's certified graduate courses under government sponsorship, and the school is authorized to issue certificates to students who complete such courses. Individuals may apply to take one or more certified information security courses as non-degree students. These programs are available online or on-campus.

The M.S. in Information Security is a 36 credit-hour program. It requires the completion of 12 courses or 10 courses and a six-credit thesis. To earn the degree in 12 months, students must enroll in three courses per term. To earn the degree in 18 months, students must enroll in two courses per term. Most working professionals take two courses per term.

The Graduate Certificate in Information Security is a 15 credit-hour program that requires the completion of five courses.

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. Applicants who do not have an adequate background may be required to take one or more of the following 500-level graduate courses during the first two terms of the student's program. These are in addition to the required credit hours 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 director. 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

Early Admission into the Doctoral Program

In addition to the requirements specified on p. 4, the student must have completed MCIS 611 Survey of Programming Languages, MCIS 615 Operating Systems Concepts, MCIS 620 Information Systems, MCIS 630 Database Systems, and MCIS 645 Software Engineering (see Graduate Catalog for additional information).

The Curriculum for the M.S. in Information Security

Core courses and electives, are listed below. Students must take all the core courses and must select two electives. If the thesis option is elected, thesis credits will be substituted for the two electives.

Core Courses (three-credits each):
MCIS 615 Operating Systems Concepts
MCIS 630 Database Systems
MCIS 645 Software Engineering
MCIS 650 Data Communications Networks
MCIS 665 Client-Server Computing
MCIS 683 Secure Computer Systems
MCIS 684 Applied Cryptography
MCIS 685 Database Security
MCIS 686 Advanced Network Security
MCIS 687 Information Security Project

Electives (three-credits each):
MCIS 611 Survey of Programming Languages
MCIS 623   Legal and Ethical Aspects of Computing
MCIS 654   Electronic Commerce on the Internet
MCIS 670 Artificial Intelligence and Expert Systems
MCIS 671 Decision Support Systems
MCIS 680 Human-Computer Interaction

The Curriculum for the Graduate Certificate in Information Security

Students must take the five courses listed below. Each of these courses has prerequisite requirements which may be satisfied by taking the prerequisite courses listed in the course descriptions or by demonstrating equivalent experience or the completion of equivalent courses taken elsewhere.

MCIS 683   Secure Computer Systems
MCIS 684   Applied Cryptography
MCIS 685   Database Security
MCIS 686   Advanced Network Security
MCIS 687   Information Security Project

Course Descriptions for the M.S. Degree and the Graduate Certificate in Information Security

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 623 Legal and Ethical Aspects of Computing (3 credits)
Building on a foundation in classical ethics, we examine the impact of the computer and the Internet on our society. Topics covered include ethical decision making; professional codes; whistle-blowing; computer crime; copyrights, patents and intellectual property; privacy; and risk management. Students will analyze case studies and write a research paper.

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, the entity-relationship model, and advanced semantic modeling methods are discussed. Topics include 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 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. This course is only for students in the CIS master's program.

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 high-speed networks are discussed. Network components, guided and unguided media, as well as routing and high-speed switching systems are studied. This course examines the relationship of computer applications to network architecture and subsystems. Current network and data communication topics are presented, as well as future trends.

MCIS 654 Electronic Commerce on the Internet (3 credits)

The combination of the computer and the Internet have created an incredible "market space". We will examine the foundation, operation and implications of the Internet economy. Topics include Internet technologies, online market mechanisms, interactive customers, knowledge-based products, smart physical products and services, pricing in the internet economy, online auctions and e-marketplaces, digital governance, policies for the internet economy and an outlook for the new economy. Students will participate in an Internet shopping experience, analyze a company that focuses on eCommerce and write a research paper.

MCIS 665 Client-Server Computing (3 credits)

Concepts and principles of client-server architecture, protocols, networks, and distributed computing are presented. The focus of this course is on distributed application design and implementation. Topics include inter-process communication, the role of the GUI and front-end development tools, middleware, multi-tier architectures, distributed objects, and database interaction. Discussions include the various relationships between client-server computing and business processes. Migration from legacy systems is considered along with concerns for meeting customer requirements.

MCIS 670 Artificial Intelligence and Expert Systems (3 credits)

Covers the theory and practice of artificial intelligence and knowledge-based expert systems. Topics discussed include knowledge representation and inference, heuristic and adversary search, genetic algorithms, machine learning, neural computing, reasoning under uncertainty, symbolic programming using Lisp, logic programming using Prolog, and expert systems. Examples from current application areas such as robotics, planning, machine vision, natural language processing, and intelligent agents are used to reinforce the concepts.

MCIS 671 Decision Support Systems (3 credits)

This course examines concepts of decision support in both automated and non-automated environments. The focus is on application of decision theory, analytical modeling, and simulation techniques to solve organizational problems. Group Decision Support Systems, Executive Information Systems, and Expert Systems are also discussed. Case studies of existing systems are used to reinforce concepts discussed in class. A major component of the course is a project entailing the design, implementation, and evaluation of a Decision Support System. Emphasis is placed on the technical aspects of decision support systems.

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 683 Secure Computer Systems (3 credits)

This course will focus on design principles of trusted computing bases (TCB). Issues regarding authentication, access control and authorization, discretionary and mandatory security policies, secure kernel design, secure operating systems, and secure databases will be covered from a systems architecture perspective. Emphasis will be on the design of security measures for critical information infrastructures. Prerequisites: MCIS 615, 630, 650.

MCIS 684 Applied Cryptography (3 credits)

Analysis of cryptographic algorithms, cryptanalysis, symmetric cryptography, public key cryptography, DES, AES, RSA, hash and MAC functions, digital signatures, pseudo-random generators, cryptographic protocols, SSL/TLS, SET. Prerequisites: MCIS 502 (or equivalent), 615, 650.

MCIS 685 Database Security (3 credits)

This course will focus on issues related to the design and implementation of secure data stores. Emphasis will be placed on multilevel security in database systems, covert channels, and security measures for relational and object-oriented database systems. Prerequisites: MCIS 615, 630.

MCIS 686 Advanced Network Security (3 credits)

Fundamental concepts, principles, and practical networking and internetworking issues relevant to the design, analysis, and implementation of enterprise-level trusted networked information systems. Topics include networking and security architectures, techniques, and protocols at the various layers of the Internet model. Security problems in distributed application environments will be analyzed and solutions discussed and implemented. Prerequisites: MCIS 615, 650.

MCIS 687 Information Security Project (3 credits)
This project course integrates all of the knowledge accumulated through the previous courses and serves as a capstone for the Specialization in Information Security. The class focuses on techniques for protecting critical information infrastructures through case studies, application development, and systems assessment. Students may enroll in this class only after completing all of the information security specialization courses. Prerequisites: MCIS 683, 684, 685, and 686.

MCIS 699 Master's Thesis (3 credits)
The student develops a framework within which research will be conducted and offers evidence of qualifications to pursue the research. Concepts and theories underlying the student's thesis research are articulated; the problem is clearly stated; specific, measurable goals are specified; a literature review is presented; the methods of conducting research are delineated; and strategy to achieve the goal is given. Registration for MCIS 699 must be repeated for three more credits, for a total of six thesis credits. Prerequisite: Completion of eight courses at the 600-level.

MCIS 1200 Directed Independent Study (3 credits)
Students pursue a project, research study, or implementation under the supervision of a faculty member.

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

This 36 credit-hour program offers a course of study leading to the master of science (M.S.) in management information systems. It focuses on the application of technological concepts of information systems to the collection, retention, and dissemination of information for management planning and decision making. The program concentrates on areas such as project management, decision support systems, computer languages, client-server and distributed computing, database systems, telecommunications, system analysis and design, human-computer interaction, electronic commerce, information security, computer graphics, and multimedia.

The program blends theory and practice into a learning experience that develops skills applicable to complex real-world problems. It is designed to give students a thorough knowledge of the field and to provide an enduring foundation for future professional growth.

The program's formats offer full-time students the opportunity to earn the master's degree in 12 months and working professionals the opportunity to earn the degree in 12–18 months. In addition, students have the option to pursue the M.S. in MIS with specializations in *electronic commerce* or *information security*. The M.S. in MIS with a specialization in electronic commerce requires 39 credit hours. The M.S. in MIS with a specialization in information security requires 42 credit hours.

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

This 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++, or Java must take MMIS 501 Introduction to Java Programming. This course is in addition to the required 36 credit hours at the 600 level. MMIS 501 must be completed prior to taking courses at the 600 level; however, some exceptions may be permitted by the program director.

Early Admission into the Doctoral Program

This option provides the opportunity for master's students in management information systems to earn the Ph.D. in information systems in a shorter time. In addition to the requirements specified on p. 4, the student must have completed MMIS 610 Survey of Computer Languages, MMIS 620 Management Information Systems, MMIS 626 Client-Server and Distributed Computing, MMIS 630 Database Systems, and MMIS 660 Systems Analysis and Design.

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

The student may substitute up to two electives for two core courses. Students who wish to take an additional elective must request approval from the program office prior to registration. If the thesis option is elected, two courses may be omitted.

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 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	Information Security
MMIS 655	Server-Side Development of eCommerce Applications
MMIS 656	Web Design Technologies
MMIS 657	Analysis and Design of eCommerce Application Software
MMIS 658	Electronic Commerce Project
MMIS 670	Artificial Intelligence and Expert Systems
MMIS 681	Multimedia Systems
MMIS 683	Fundamentals of Security Technologies
MMIS 684	Information Security Management
MMIS 685	Information Security Policy, Privacy, and Ethics
MMIS 686	Information System Auditing and Secure Operations
MMIS 687	Information Security Project
MMIS 691	Special Topics in MIS

The M.S. in MIS with Specialization in Electronic Commerce (Required Courses):

MMIS 620	Management Information Systems
MMIS 623	Legal and Ethical Aspects of Computing
MMIS 626	Client-Server and Distributed Computing
MMIS 630	Database Systems
MMIS 652	Information Security
MMIS 653	Telecommunications and Computer Networking
MMIS 654	Electronic Commerce and the Internet
MMIS 655	Server-Side Development of eCommerce Applications
MMIS 656	Web Design Technologies
MMIS 657	Analysis and Design of eCommerce Application Software
MMIS 658	Electronic Commerce Project
MMIS 660	Systems Analysis and Design
MMIS 680	Human-Computer Interaction

The M.S. in MIS with Specialization in Information Security (Required 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 653   Telecommunications and Computer Networking
MMIS 660   Systems Analysis and Design
MMIS 671   Decision Support Systems
MMIS 680   Human-Computer Interaction
MMIS 683   Fundamentals of Security Technologies
MMIS 684   Information Security Management
MMIS 685   Information Security Policy, Privacy, and Ethics
MMIS 686   Information System Auditing and Secure Operations
MMIS 687   Information Security Project

Course Descriptions for the M.S. in Management Information Systems

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 programs). In addition to learning about basic language statements, you will also learn how Java provides support for such diverse applications as web pages, multimedia, education, 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 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/paradigms. Life-cycle phases. Project planning and risk analysis. Project control including work breakdown structures, project scheduling, activities and milestones. Software cost estimation techniques and models. Software quality assurance and metrics for software productivity and quality. Inspections, walkthroughs, and reviews. Documentation and configuration management. Automated project management tools. Software maintenance. Procurement of software services and systems and development of IS project specifications. Project management skills including leadership, team building, planning, time management, resource allocation, conflict management, and using IS project management in strategic planning. Ethics in project management. Case studies are used throughout the course to support concepts, principles, and problem solving.

MMIS 623 Legal and Ethical Aspects of Computing (3 credits)
Building on a foundation in classical ethics, we examine the impact of the computer and the Internet on our society. Topics include: ethical decision making; professional codes; whistle-blowing; computer crime; copyrights, patents and intellectual property; privacy; and risk management. Students will analyze case studies and write a research paper.

MMIS 625 Computer Graphics (3 credits)
Principles and concepts of computer graphics useful to information managers. Topics include an introduction to raster graphics, concepts of 2-D and 3-D graphics, modeling, rendering, graphic file formats, color, graphical user interfaces and virtual reality, and the graphical presentation of information.

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 client-server systems, evaluation of vendor strategies, issues in selecting client-server 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 web 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 Information Security (3 credits)
Concepts and principles of system and data security. Risk assessment, evaluation of vulnerabilities, policy formation, control and protection methods. Review and evaluation of security models. Issues in physical, system, network, database and application security. Protection methods of encryption, authentication technologies, and access control are used to examine host-based and network-based security issues. Management of security, policy formulation, security personnel and issues of law and legal protection of privacy. System design and network design for security and techniques for combating 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 wire-free 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)
The combination of the computer and the Internet have created an incredible "market space". We will examine the foundation, operation and implications of the Internet economy. Topics include Internet technologies, online market mechanisms, interactive customers, knowledge-based products, smart physical products and services, pricing in the internet economy, online auctions and e-marketplaces, digital governance, policies for the internet economy and an outlook for the new economy. Students will participate in an Internet shopping experience, analyze a company that focuses on eCommerce and write a research paper.

MMIS 655 Server-Side Development of eCommerce Applications (3 credits)
A variety of web applications such as storefronts, electronic communities, electronic markets, and on-line auction systems are studied. Topics covered include server-side scripting using a scripting language, introductory systems analysis and design for electronic commerce applications, and web-database integration. Prerequisites: MMIS 630, 656.

MMIS 656 Web Design Technologies (3 credits)
A hands-on introduction to a variety of technologies involved in the design of web sites. Topics include aligning electronic business models with web site design, planning a web site, understanding the principles and elements of effective web site design, using web development and design tools, and evaluating web site effectiveness.

MMIS 657 Analysis and Design of eCommerce Application Software (3 credits)
This course focuses on the analysis, design and implementation of B2C and B2B eCommerce applications. Studied are several building blocks for eCommerce application development including XML, web services and specific web application frameworks. Prerequisite: MMIS 655.

MMIS 658 Electronic Commerce Project (3 credits)
This course integrates the knowledge accumulated through the previous courses in the eCommerce specialization. It focuses on best practices in analysis, design and implementation of eCommerce applications and uses case studies. The principal component of this course is the course project. Working either individually or in teams, students work on the course project, which requires a comprehensive analysis, design and implementation of an eCommerce application. Prerequisites: MMIS 655, 656, 657.

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 and concepts of the object-oriented paradigm and object-oriented programming languages. Notation and techniques for the analysis, design, and implementation of object-oriented systems. Mechanisms for reuse, including composition, inheritance, design patterns, and application frameworks. The use of object-oriented methods in common applications.

MMIS 670 Artificial Intelligence and Expert Systems (3 credits)
Theory and practice of artificial intelligence and knowledge-based expert systems. Topics include knowledge representation and inference, heuristic search, genetic algorithms, machine learning, neural computing, reasoning under uncertainty, and expert systems. Symbolic programming using Lisp and logic programming using Prolog. Examples from current application areas such as robotics, planning, machine vision, natural language processing, and intelligent agents are used to reinforce the concepts.

MMIS 671 Decision Support Systems (3 credits)
This course examines concepts of decision support in both automated and non-automated environments. The focus is on application of decision theory, analytical modeling, and simulation techniques to solve organizational problems. Group Decision Support Systems, Executive Information Systems, and Expert Systems are also discussed. Case studies of existing systems are used to reinforce concepts discussed in class. A major component of the course is a project entailing the design, implementation, and evaluation of a Decision Support System.

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)
Introduction to multimedia systems. Definitions of terms and concepts related to multimedia. Trends in the development and the use of multimedia. Tools, techniques, and guidelines facilitating the planning, design, production, and implementation of multimedia products.

MMIS 683 Fundamentals of Security Technologies (3 credits)
This course investigates fundamental assurance technologies that can be applied to interface specifications, architectures, and implementations of information security mechanisms. Principles of testing are discussed and applied to demonstrative and vulnerability testing. The selection of appropriate security applications, security lifecycles, and interoperability issues will also be covered. Prerequisites: MMIS 610, 626.

MMIS 684 Information Security Management (3 credits)
This course will integrate concepts and techniques from management and organizational behavior in order to identify, understand, and propose solutions to the problems of computer security and security administration. Particular focus will be on the role of managers in the security process and the development of effective policies and procedures. Prerequisites: MMIS 620, 621.

MMIS 685 Information Security Policy, Privacy, and Ethics (3 credits)
This course will cover the development and need for information security policies, issues regarding privacy, and the application of computer ethics. The course will also focus on legal issues and legislation that impacts the design, implementation, and administration of secure infrastructures. Prerequisite: MMIS 620.

MMIS 686 Information Systems Auditing and Secure Operations (3 credits)
Information security ultimately depends upon correct usage of available security features. This course covers principles and practice related to secure operation of existing information technology. Topics related to security auditing and accountability will also be discussed. Prerequisites: MMIS 620, 621.

MMIS 687 Information Security Project (3 credits)
This project course integrates all of the knowledge accumulated through the previous courses and serves as a capstone for the Specialization in Information Security. The class focuses on best practices demonstrated through case studies and systems assessment. Students may enroll in this class only after completing all of the information security specialization courses. Prerequisites: All other MMIS security specialization courses.

MMIS 688 Continuing Thesis in Management Information Systems (1.5 credits)
Students who have not completed the thesis by the end of the second thesis registration must register for continuing thesis. This allows the student to receive faculty and administrative advice and support related to the thesis. Prerequisite: Completion of second thesis registration.

MMIS 691 Special Topics in Management Information Systems (3 credits)
This seminar focuses on the professor's current research interests. Requires consent of course professor and program director.

MMIS 699 Master's Thesis in Management Information Systems (3 credits)
The student develops a framework within which research will be conducted and offers evidence of qualifications to pursue the research. Concepts and theories underlying the student's thesis research are articulated, the problem is clearly stated, specific, measurable goals are specified, a literature review is presented, the methods of conducting research are delineated, and strategy to achieve the goal is given. Registration for MMIS 699 must be repeated for three more credits, for a total of six thesis credits. Prerequisite: Completion of eight courses.

MMIS 1200 Directed Independent Study (3 credits)
Students pursue a project, research study, or implementation under the supervision of a faculty member.

Faculty and Staff of the Graduate School of Computer and Information Sciences

The Faculty

Gertrude W. Abramson, Ed.D., Columbia University. Professor. Online teaching and learning, distance learning programs and communications, instructional systems design, development, delivery and evaluation.

James Cannady, Ph.D., Nova Southeastern University. Assistant Professor. Network intrusion prevention, detection, and response; complexity theory and complex adaptive systems; machine learning; information assurance.

Maxine S. Cohen, Ph.D., State University of New York at Binghamton. Professor. Human-computer interaction, multimedia, usability engineering, human factors, database systems, distance education.

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

Timothy J. Ellis, Ph.D., Nova Southeastern University. Associate Professor. Multimedia design and application, application of database technology to education, online learning environments, adult education.

George K. Fornshell, Ph.D., Nova Southeastern University. Associate Professor. Instructional design, instructional technology, instructional video, streaming media, distance learning, multimedia, authoring tools, human factors.

William L. Hafner, Ph.D., Nova Southeastern University. Assistant Professor. Information storage and retrieval, privacy and information security, data warehousing, knowledge management.

Michael J. Laszlo, Ph.D., Princeton University. Professor. Computer graphics, data structures and algorithms, software engineering, programming.

Yair Levy, Ph.D., Florida International University. Assistant Professor. Online learning systems effectiveness, value of information systems, eCommerce, telecommunications and networking.

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, Ph.D., Nova Southeastern University. Assistant Professor. Programming languages, data structures, software engineering, object-oriented design, C, C++, Java.

Sumitra Mukherjee, Ph.D., Carnegie Mellon University. Professor. Artificial intelligence, decision support systems, knowledge-based expert systems, database security, database management, economics of information systems.

Easwar Nyshadham, Ph.D., University of Mississippi. Assistant Professor. Electronic commerce, decision support systems, security, privacy and trust in online environments, economics of information systems.

Amon Seagull, Ph.D., University of Rochester. Assistant Professor. Natural language processing, computational linguistics, statistical modeling, programming languages, artificial intelligence, institutional research.

John Scigliano, Ed.D., University of Florida. Professor. Management information systems, client-server computing, project management, instruction delivery systems.

Greg Simco, Ph.D., Nova Southeastern University. Associate Professor. Operating systems, data communications, computer networks, client-server computing, distributed systems, systems performance evaluation.

Junping Sun, Ph.D., Wayne State University. Professor. Database management systems, data warehousing, knowledge discovery and data mining.

Steven R. Terrell, Ed.D., Florida International University. Professor. Research methodology and statistics, learning theory, distance education.

Ling Wang, Ph.D., Purdue University. Assistant Professor. Research methodology and statistics, instructional design, motivation in education, learning theory.

Visiting and Adjunct Faculty

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Andre Folleco, Ph.D.	Stephen Hansen, Ph.D.	William Hartman, Ph.D.	Raghu Korrapati, Ph.D.
Lee Leitner, Ph.D.	Robert Lipton, Ph.D.	Richard Manning, Ph.D.	Ronald McFarland, Ph.D.
Terry McQueen, D.B.A.	David Metcalf II, Ph.D.	Alan Peslak, Ph.D.	Jerry Smith, Ph.D.
William Smith, Ph.D.	Helen St. Aubin, Ph.D.	John Sullivan, Ph.D.	Meg Williams, Ph.D.
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The Administrative and Technical Staff

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Nova Southeastern University

Graduate School of Computer and Information Sciences

What are my computer requirements?

You must have an active account with an Internet service provider (ISP). Students may use either an IBM-compatible PC or Apple/Macintosh computer for their online studies. Students will be provided SCIS accounts that will allow access to certain databases, WebCT, and other programs. The following are minimum requirements. Individual professors may have additional software and hardware requirements, depending on the course. Such additional requirements will be posted well before the start of the term.

IBM-compatible PC
- Pentium II/233 MHz processor or higher, Pentium III/4 processor recommended
- 64 Megabytes of RAM (128MB or higher preferred)
- CD-ROM
- 20GB hard drive (30GB or higher preferred)
- SVGA (1024 x 768) or higher display
- Full Duplex Sound card with speakers/headphones and microphone
- Windows Operating System
- 56 kb Modem (or faster)
- Internet connection through an account on an ISP, or a network connection to the Internet

Macintosh
- PowerPC 120Mhz processor or higher, G4 processor recommended
- 64 Megabytes of RAM (128MB or higher preferred)
- CD-ROM
- 20GB hard drive (30GB or higher preferred)
- 1024 x 768 or higher display resolution, thousands of colors
- Full Duplex Sound with a microphone
- System 8.0 or higher operating system
- 56 kb Modem (or faster)
- Internet connection through an account on an ISP, or a network connection to the Internet

Software
- Netscape 4.75 or higher, or Microsoft Internet Explorer 5.0 or higher
- Adobe Acrobat Reader 5.0 or higher
- Microsoft Office 2000 (or higher)
- Proprietary browser versions (those not downloaded directly from Netscape or Microsoft) may not work reliably with SCIS online systems. If you use other office type programs, please note that some professors may require you to convert your files to a MS-Office compatible format for online submission.
- Your connection to the internet may initiate behind a firewall, however the firewall settings may have to be adjusted in order to allow for proper functioning of our web based tools.
- Any other operating system may be used (e.g., Linux) but must support the software specified above