Governing Documents

The *Graduate Catalog* of the Graduate School of Computer and Information Sciences 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 supersedes previous web and printed versions. 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. The university’s detailed policy on disabilities is contained in the *NSU Student Handbook*. Student requests for accommodation based on ADA will be considered on an individual basis.

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. NSU has been designated a National Center of Academic Excellence in Information Assurance Education by the U.S. National Security Agency and the Department of Homeland Security. Its curriculum in information security has been certified by NSA for compliance with CNSS standards. The university has been awarded a chapter of Upsilon Pi Epsilon (UPE), the International Honor Society for the Computing and Information Disciplines. Each of the school’s graduate programs has 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.

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## Master's Programs

**Summer 2005** *(Jun 20–Sept 9, 2005)* Term Code: 200605

- **Apr 25–Jun 10, 05** Registration period (no late fees)
- **Jun 11–20, 05** Late registration period (late fees)
- **Jun 20, 05** First day of term
- **Jun 25, 05** Drop/add deadline
- **Jul 4, 05** Holiday
- **Jul 29, 05** Last day to withdraw from a course with a final grade of W
- **Aug 27, 05** Last day to request an Incomplete
- **Sept 5, 05** Holiday
- **Sept 9, 05** Last day of term

**Fall 2005** *(Sept 19–Dec 9, 2005)* Term Code: 200620

- **Jul 25–Sept 9, 05** Registration period (no late fees)
- **Sept 10–19, 05** Late registration period (late fees)
- **Sept 19, 05** First day of term
- **Sept 24, 05** Drop/add deadline
- **Oct 4, 05** Holiday
- **Oct 13, 05** Holiday
- **Oct 28, 05** Last day to withdraw from a course with a final grade of W
- **Nov 24–25, 05** Holiday
- **Nov 26, 05** Last day to request an Incomplete
- **Dec 9, 05** Last day of term

**Winter 2006** *(Jan 9–Mar 31, 2006)* Term Code: 200630

- **Nov 14–Dec 30, 05** Registration period (no late fees)
- **Dec 31 05–Jan 9, 06** Late registration period (late fees)
- **Jan 9, 06** First day of term
- **Jan 14, 06** Drop/add deadline
- **Jan 16, 06** Holiday
- **Feb 17, 06** Last day to withdraw from a course with a final grade of W
- **Mar 18, 06** Last day to request an Incomplete
- **Mar 31, 06** Last day of term

**Spring 2006** *(Apr 3–Jun 23, 2006)* Term Code: 200640

- **Feb 6–Mar 24, 06** Registration period (no late fees)
- **Mar 25–Apr 3, 06** Late registration period (late fees)
- **Apr 3, 06** First day of term
- **Apr 8, 06** Drop/add deadline
- **May 15, 06** Last day to withdraw from a course with a final grade of W
- **May 29, 06** Holiday
- **Jun 10, 06** Last day to request an Incomplete
- **Jun 23, 06** Last day of term

**Summer 2006** *(Jun 26–Sept 15, 2006)* Term Code: 200705

- **May 1–Jun 16, 06** Registration period (no late fees)
- **Jun 17–26, 06** Late registration period (late fees)
- **Jun 26, 06** First day of term
- **Jul 1, 06** Drop/add deadline
- **Jul 4, 06** Holiday
- **Aug 4, 06** Last day to withdraw from a course with a final grade of W
- **Sept 2, 06** Last day to request an Incomplete
- **Sept 4, 06** Holiday
- **Sept 15, 06** Last day of term

**Fall 2006** *(Sept 18–Dec 8, 2006)* Term Code: 200720

- **Jul 24–Sept 8, 06** Registration period (no late fees)
- **Sept 9–18, 06** Late registration period (late fees)
- **Sept 18, 06** First day of term
- **Sept 23, 06** Drop/add deadline
- **Oct 2, 06** Holiday
- **Oct 27, 06** Last day to withdraw from a course with a final grade of W
- **Nov 23–24, 06** Holiday
- **Nov 25, 06** Last day to request an Incomplete
- **Dec 8, 06** Last day of term

## Doctoral Programs, Cluster Format

**Fall 2005** *(Sept 9, 2005 – Feb 8, 2006)* Term Code: 200620

- **Before Aug 26, 05** Registration period (no late fees)
- **Aug 26–Sept 9, 05** Late registration period (late fees)
- **Sept 8, 05** New student orientation
- **Sept 9, 05** First day of term
- **Sept 9–11, 05** First meeting dates
- **Sept 10, 05** Drop/add deadline
- **Nov 23, 06** Last day to withdraw from a course with a final grade of W
- **Dec 2–4, 05** Second meeting dates
- **Jan 26, 06** Last day to request an Incomplete
- **Feb 8, 06** Last day of term

**Spring 2006** *(Mar 3 – Aug 2, 2006)* Term Code: 200640

- **Before Feb 17, 06** Registration period (no late fees)
- **Feb 17–Mar 3, 06** Late registration period (late fees)
- **Mar 2, 06** New student orientation
- **Mar 3, 06** First day of term
- **Mar 3–5, 06** First meeting dates
- **Mar 4, 06** Drop/add deadline
- **May 17, 06** Last day to withdraw from a course with a final grade of W
- **Jun 2–4, 06** Second meeting dates
- **Jul 20, 06** Last day to request an Incomplete
- **Aug 2, 06** Last day of term

**Fall 2006** *(Sept 9, 2006 – Feb 8, 2007)* Term Code: 200720

- **Before Aug 25, 06** Registration period (no late fees)
- **Aug 25–Sept 8, 06** Late registration period (late fees)
- **Sept 7, 06** New student orientation
- **Sept 8, 06** First day of term
- **Sept 8–10, 06** First meeting dates
- **Sept 9, 06** Drop/add deadline
- **Nov 22, 06** Last day to withdraw from a course with a final grade of W
- **Dec 1–3, 06** Second meeting dates
- **Jan 25, 07** Last day to request an Incomplete
- **Feb 7, 07** Last day of term

## Doctoral Programs, Institute Format

**Summer 2005** *(Jul 10 – Dec 9, 2005)* Term Code: 200615

- **Before Jun 24, 05** Registration period (no late fees)
- **Jun 24–Jul 10, 05** Late registration period (late fees)
- **Jul 9, 05** New student orientation
- **Jul 10, 05** First day of term
- **Jul 10–15, 05** Meeting dates
- **Jul 11, 05** Drop/add deadline
- **Sep 23, 05** Last day to withdraw from a course with a final grade of W
- **Nov 26, 05** Last day to request an Incomplete
- **Dec 9, 05** Last day of term

**Winter 2006** *(Jan 8 – Jun 7, 2006)* Term Code: 200630

- **Before Dec 23, 05** Registration period (no late fees)
- **Dec 23, 05–Jan 8, 06** Late registration period (late fees)
- **Jan 7, 06** New student orientation
- **Jan 8, 06** First day of term
- **Jan 8–13, 06** Meeting dates
- **Jan 9, 06** Drop/add deadline
- **Mar 24, 06** Last day to withdraw from a course with a final grade of W
- **May 25, 06** Last day to request an Incomplete
- **Jun 7, 06** Last day of term

**Summer 2006** *(Jul 9 – Dec 8, 2006)* Term Code: 200715

- **Before Jun 23, 06** Registration period (no late fees)
- **Jun 23–Jul 9, 06** Late registration period (late fees)
- **Jul 8, 06** New student orientation
- **Jul 9, 06** First day of term
- **Jul 9–14, 06** Meeting dates
- **Jul 10, 06** Drop/add deadline
- **Sept 22, 06** Last day to withdraw from a course with a final grade of W
- **Nov 25, 06** Last day to request an Incomplete
- **Dec 8, 06** Last day of term
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Nova Southeastern University (NSU)

NSU is a dynamic, not-for-profit independent institution dedicated to providing high-quality educational programs of distinction from preschool through the professional and doctoral levels, as well as service to the community. It prepares students for lifelong learning and leadership roles in business and the professions. It offers academic programs at times convenient to students, employing innovative delivery systems and rich learning resources on campus, at distant sites, and online. The university fosters inquiry, research, and creative professional activity by uniting faculty members and students in acquiring and applying knowledge in clinical, community, and professional settings.

Located on a beautiful 300-acre campus in Fort Lauderdale, Florida, NSU has more than 25,000 students and is the largest independent institution of higher education in the Southeast United States. It is the eighth largest private university in the United States. NSU awards associate’s, bachelor’s, master’s, educational specialist, doctoral, and first-professional degrees in more than 100 disciplines. It has a college of arts and sciences and schools of medicine, dentistry, pharmacy, allied health and nursing, optometry, law, computer and information sciences, psychology, education, business, oceanography, and humanities and social sciences. The institution’s programs offered through the Family Center and University School include innovative parenting, preschool, primary, and secondary education programs. Its programs are offered in Fort Lauderdale as well as in locations throughout Florida, across the nation, and at sites in France, Greece, the United Kingdom, Canada, Mexico, Venezuela, Panama, and the Caribbean. Despite the geographic diversity of sites where classes are offered, 82 percent of the student body attends classes in Florida.

The university’s library system is composed of: The Alvin Sherman Library, Research, and Information Technology Center; The Shepard Broad Law School Law Library and Technology Center; The William Richardson Oceanographic Library; and the Health Professions Division Library. The catalogs of all NSU libraries are accessible to students and faculty members, wherever they may be located, via computers for remote searching (as are catalogs of other university libraries) using the Electronic Library. Online and CD-ROM databases complement the paper-based holdings and provide full-text resources. NSU is a member of several cooperative networks and is able to obtain books and periodicals through interlibrary loan quickly and efficiently. NSU students may also use many other libraries. The university continues to expand its library to meet the needs of its growing community. The Alvin Sherman Library, Research, and Information Technology Center is a joint use facility with the Broward County Board of County Commissioners. This recently completed five-story, 325,000 square-foot facility, the largest library building in Florida, has 1,000 user seats, 20 electronic classrooms and a 500-seat auditorium.

Nova Southeastern University has produced more than 76,000 alumni. Since 1971, it has enjoyed full accreditation by the Commission on Colleges of the Southern Association of Colleges and Schools, the regional accrediting body for this region of the United States.

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

- Thirty-nine college presidents and chancellors
- More than 100 college vice presidents, provosts, deans, and department chairs
- Sixty-five school superintendents in 16 states, and nine of the nation’s largest school districts
- Hundreds of college and university faculty members and administrators nationwide
- More than 100 high-ranking United States military officers, including admirals and generals, and presidents, vice presidents, executives, middle managers, and researchers at companies such as American Express, AT&T, BellSouth, Boeing, Cisco, Compaq, Dell, Ford, General Dynamics, Hewlett-Packard, Lockheed Martin, IBM, Microsoft, Motorola, Nokia, Northrop Grumman, Oracle, Pratt & Whitney, Sprint, Sun Microsystems, Texas Instruments, Verizon, and Walt Disney
The Graduate School of Computer and Information Sciences

A major force in educational innovation, the Graduate School of Computer and Information Sciences 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 as well as for its graduate certificate program in information security. All programs enable working professionals to earn 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. A leader in online graduate education, the school began offering online programs in 1983 and created the first electronic classroom in 1985. It has been awarding graduate degrees since 1984.

The school’s 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, NSU has been designated a National Center of Academic Excellence in Information Assurance Education by the U.S. National Security Agency and the Department of Homeland Security. Its curriculum in information security has been certified by NSA for compliance with CNSS standards. Collaborative programs include DANTES, the U.S. Army’s *eArmyU* initiative, and the Southern Regional Education Board’s Electronic Campus. The school has a chapter of Upsilon Pi Epsilon (UPE), the International Honor Society for the Computing and Information Disciplines, and a student chapter of the Institute of Electrical and Electronic Engineers (IEEE), 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. All doctoral 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.
Degrees and Programs of the Graduate School of Computer and Information Sciences

Master of Science (M.S.)

- Computer Information Systems (optional specialization in Information Security)
- Computer Science
- Computing Technology in Education
- Information Security
- Management Information Systems (optional specializations in Electronic Commerce and Information Security)
- Medical Informatics (offered jointly with NSU’s medical school)

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 (see the section Master of Science (M.S.) in Information Security)

Faculty and Research

The school’s faculty members are leaders in their fields and are active in teaching and research over a range of disciplines. The school’s research, conducted by students and faculty, advances knowledge, improves professional practice, and contributes to understanding in the computer and information sciences. Faculty research interests are listed in this catalog and also in individual faculty web pages.

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 GSCIS affiliations include

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

Application for Admission

Requirements and procedures for admission are specified in the section Master’s Degree Programs or the section Doctoral Degree Programs.

Library Resources

The NSU library system (www.nova.edu/library) includes: (1) Alvin Sherman Library, Research, and Information Technology Center; (2) Health Professions Division Library; (3) Shepard Broad Law School 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.

Students may 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. To send questions after hours: refdesk@nova.edu. The university’s website provides instructions on the use of the library: www.nova.edu/library/help/.

The university continues to expand its library system to meet the needs of its growing community. For example, the recently completed Alvin Sherman Library, Research, and Information Technology Center is 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 1,000 user seats, 20 electronic classrooms and a 500-seat auditorium.

Disabilities and ADA

NSU complies with the American with Disabilities Act (ADA). The university’s detailed policy on disabilities is contained in the NSU Student Handbook. Student requests for accommodation based on ADA will be considered on an individual basis. Each student with a disability should discuss his or her needs with the GSCIS disability service representative, Candy Fish (call 954-262-2034, or email fishc@nova.edu) before the commencement of classes if possible.

Financial Information

Tuition and Fees

See the sections Master’s Degree Programs and Doctoral Degree Programs.

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 www.nova.edu/ewis/financial. 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 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.

**Tuition Payment Policy** (Additional information may be found at 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.

**Policies**

There are three types of policies: (1) university-wide policies, which apply to all NSU students, are contained in the university’s *Student Handbook (2005-2006)* (www.nova.edu/cwis/current_student.html) (where appropriate, some of these policies are referenced or repeated in this catalog); (2) school-specific academic policies, which apply to all students of the Graduate School of Computer and Information Sciences, are contained in this following section; and (3) degree-specific policies, which apply to the specific degree program, are contained in the sections Master’s Degree Programs and Doctoral Degree Programs of this catalog.
School-Specific Academic Policies for all Programs

Auditing a Course

To audit a course, students must request permission from the program office. Audited courses will appear on the transcript with the grade of AU. An auditor may attend classes, submit assignments, and take examinations but will receive no credit for auditing a course. Registered students may change from credit to audit status or audit to credit status during the drop/add period. A previously audited course may be taken for credit at a later date. Also, a student may audit a course previously taken and passed. Persons may not attend a class without being properly admitted to the university and registered in the class. Tuition and fees apply to all audited courses.

Student Research Involving Human Subjects

All students must be aware of the university’s policy regarding research involving human subjects. The instruments and protocols of surveys, interviews, tests, or any other types of assessments involving human subjects must be reviewed in advance by the university’s Institutional Review Board (IRB). The purpose of the IRB is to protect the rights of human subjects involved in research and ensure appropriate practices are being carried out at NSU. GSCIS has a representative to the IRB who can help students with the review process. There are three levels of review: exempt, expedited, and full review. The GSCIS representative guides students regarding the level of review required and assists with any paperwork and procedures that might be required. Most research at GSCIS falls into the exempt category, which requires a rather simple process, but it must be logged appropriately. Students should contact the GSCIS IRB representative by the time they start working on their preliminary proposals. Courses also may involve human subject research. In most cases, faculty members secure approval in advance for all students in the course. Students planning to conduct human subject research in a course should raise the matter with their professor. Students may obtain additional information from the program office and from www.nova.edu/cwis/ogc/irb.

Student Participation in Extracurricular Research

Research is a critical component in maintaining the quality of the education programs offered by GSCIS. The research conducted by GSCIS faculty and students often requires the collection of data from human subjects. GSCIS students may be requested by faculty to participate as human subjects in research activities. The NSU Institutional Review Board (IRB) has established procedures to ensure that all research involving human subjects complies with applicable federal laws and regulations. An important consideration in obtaining IRB approval of research is the protection of the privacy of the human subjects participating in the study. While most research studies are designed to offer some level of privacy protection to the participants, the complete anonymity of the participants cannot be guaranteed in all research activities conducted at NSU. However, a primary protection provided by the IRB process is that no researcher may involve individuals as subjects in research without their informed consent. GSCIS students are advised that while their participation in these research activities is extremely valuable to the researchers conducting these investigations, their participation is strictly voluntary. No GSCIS student will be required to participate in any research activity that is conducted outside the scope of established course activities. Students are encouraged to discuss the scope and requirements of any research program with the principal investigator prior to volunteering to participate in the research activity. Any questions regarding the IRB can be directed to the GSCIS IRB representative.
Standards of Academic Integrity

For the university-wide policy on academic standards, see the section Code of Student Conduct and Academic Responsibility in the NSU Student Handbook. Also see the section Student Misconduct in this catalog. Each student is responsible for maintaining academic integrity and intellectual honesty in his or her academic work. It is the policy of the school that each student must:

- Submit his or her own work, not that of another person
- Not falsify data or records (including admission materials)
- Not engage in cheating (e.g., giving or receiving help during examinations; acquiring and/or transmitting test questions prior to an examination; and using unauthorized materials, such as notes, during an examination)
- Not receive or give aid on assigned work that requires independent effort
- Properly credit the words or ideas of others according to accepted standards for professional publications (see Crediting the Words or Ideas of Others)
- Not use term paper writing services or consult such services for the purpose of obtaining assistance in the preparation of materials to be submitted in courses or for theses or dissertations
- Not commit plagiarism (Merriam-Webster’s Collegiate Dictionary (1996) defines plagiarism as “stealing or passing off ideas or words of another as one’s own” and “the use of a created production without crediting the source.”) (see Crediting the Words or Ideas of Others below)

Crediting the Words or Ideas of Others

When using the exact words of another, quotation marks must be used for short quotations (fewer than 40 words), and block quotation style must be used for longer quotations. In either case, a proper citation must also be provided. Publication Manual of the American Psychological Association, Fifth Edition, (2001, pp. 117 and 292) contains standards and examples on quotation methods.

When paraphrasing (summarizing, or rewriting) the words or ideas of another, a proper citation must be provided. (Publication Manual of the American Psychological Association, Fifth Edition (2001) contains standards and examples on citation methods (pp. 207–214) and reference lists (pp. 215–281)). The New Shorter Oxford English Dictionary (1993) defines paraphrase as “An expression in other words, usually fuller and clearer, of the sense of a written or spoken passage or text...Express the meaning (of a word, phrase, passage, or work) in other words, usually with the object of clarification...”. Changing word order, deleting words, or substituting synonyms is not acceptable paraphrasing—it is plagiarism, even when properly cited. Rather than make changes of this nature, the source should be quoted as written.

Original Work

Assignments, exams, projects, papers, theses, dissertations, etc., must be the original work of the student. Original work may include the thoughts and words of another author but such thoughts or words must be identified utilizing quotation marks or indentation and must properly identify the source. At all times, students are expected to comply with the school’s accepted citation practice and policy.

Work is not original when it has been submitted previously by the author or by anyone else for academic credit. Work is not original when it has been copied or partially copied from any other source, including another student, unless such copying is acknowledged by the person submitting the work for the credit at the time the work is being submitted, or unless copying, sharing, or joint authorship is an express part of the assignment. Exams and tests are original work when no unauthorized aid is given, received, or used before or during the course of the examination, reexamination, and/or remediation.
Grading System

Students will be assigned grades for courses and projects according to the following system:

<table>
<thead>
<tr>
<th>Grade</th>
<th>Grade Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>4.0</td>
</tr>
<tr>
<td>A–</td>
<td>3.7</td>
</tr>
<tr>
<td>B+</td>
<td>3.3</td>
</tr>
<tr>
<td>B</td>
<td>3.0</td>
</tr>
<tr>
<td>B–</td>
<td>2.7</td>
</tr>
<tr>
<td>C+</td>
<td>2.3</td>
</tr>
<tr>
<td>C</td>
<td>2.0</td>
</tr>
<tr>
<td>C–</td>
<td>1.7</td>
</tr>
<tr>
<td>F</td>
<td>0.0</td>
</tr>
<tr>
<td>I</td>
<td>A temporary grade assigned for incomplete work. See the section The Temporary Grade of Incomplete (I).</td>
</tr>
<tr>
<td>W</td>
<td>Withdrawn from course. See the section Grade Policy Regarding Withdrawals.</td>
</tr>
<tr>
<td>WU</td>
<td>Withdrawn by the university.</td>
</tr>
<tr>
<td>PR</td>
<td>Progress. May be assigned to thesis or dissertation registrations. Carries credit hours but no grade points. Indicates progress toward completion of a thesis or dissertation.</td>
</tr>
<tr>
<td>NPR</td>
<td>No Progress. May be assigned to thesis or dissertation registrations. Carries credit hours but no grade points. Indicates insufficient progress toward completion of a thesis or dissertation. Repeated NPR grades may result in evaluation for dismissal.</td>
</tr>
<tr>
<td>P</td>
<td>Pass. Thesis and dissertation grades of PR and NPR will be changed to P when the thesis or dissertation report receives final approval.</td>
</tr>
<tr>
<td>AU</td>
<td>Audit. For students who register for a course on an audit basis.</td>
</tr>
</tbody>
</table>

To determine the grade point average (GPA), divide the sum of all the grade points earned in graduate courses taken toward the graduate degree by the number of course credit hours taken toward that degree. Only those courses and projects taken toward the degree that carry grade points, except courses that have been repeated and transfer credits, are included in the computation of the GPA. The grades of I, W, WU, P, PR, and NPR do not affect the GPA. With the exception of the grade of I, once a final grade in a course has been recorded by the Office of the University Registrar it can be changed only in cases of computational error or other justifiable cause approved by the dean (refer to Challenge of Course Grade). A student may not do additional work or repeat an examination to raise a final grade.

The Temporary Grade of Incomplete (I)

The temporary grade of Incomplete (I) will be granted only in cases of extreme hardship. Students do not have a right to an incomplete, which may be granted only when there is evidence of just cause. A student desiring an incomplete must submit a written appeal to the course professor at least two weeks prior to the end of the term. In the appeal, the student must: (1) provide a rationale; (2) demonstrate that he/she has been making a sincere effort to complete the assignments during the term; and (3) explain how all the possibilities to complete the assignments on time have been exhausted. Should the course professor agree, an incomplete contract will be prepared by the student and signed by both student and professor. The incomplete contract must contain a description of the work to be completed and a timetable. The completion period should be the shortest possible. In no case may the completion date extend beyond 30 days from the last day of the term for master’s courses or beyond 60 days from the last day of the term for doctoral courses. The incomplete contract will accompany the submission of the professor’s final grade roster to the program office. The program office will monitor each incomplete contract. If a change-of-grade form is not submitted by the scheduled completion date, the grade will be changed automatically.
from I to F. No student may graduate with an I on his or her record. The grade of I does not apply to master’s thesis or doctoral dissertation registrations.

Grade Policy Regarding Withdrawals

Course withdrawal requests must be submitted to the program office in writing by the student. Requests for withdrawal must be received by the program office by the calendar midpoint of the course (see specific withdrawal deadline dates in the Academic Calendar on p. ii). Withdrawals sent by email must be sent from the student’s assigned NSU email account. Requests for withdrawal received after 11:59 p.m. EST on the withdrawal deadline date will not be accepted. Failure to attend class or participate in course activities will not automatically drop or withdraw a student from the class or the university. Students who have not withdrawn by the withdrawal deadline will receive letter grades that reflect their performance in the course. When a withdrawal request is approved, the transcript will show a grade of W (Withdrawn) for the course. Students with four withdrawals will be dismissed from the program. Depending on the date of withdrawal, the student may be eligible for a partial refund (see the program sections Refund Policy Regarding Withdrawals).

Repeating a Course

A student who has passed a course with a grade of B– or higher is not permitted to repeat it for credit. A student may repeat a course in which a grade of C+ or lower has been earned, but credit toward the degree and the GPA will be granted only once. Permission for repeating a course must be obtained from the program office. The transcript will show both the original and repeat grades; however, only the higher grade will be counted in the computation of the student’s GPA. Students repeating a course must pay course tuition and fees.

Readmission Following Dismissal

A student dismissed for poor academic performance or for violation of academic standards, unless dismissed with no right for readmission, may apply for readmission after six months have elapsed following dismissal. A student dismissed for exceeding the time limitation may apply for readmission at any time. The application for readmission must be submitted to the Office of Admissions and must include the items listed under the Minimum Admission Requirements section for the program (master’s or doctoral). The applicant must present the reasons why academic potential has changed (master’s applicant in a separate letter; doctoral applicant in the essay). The doctoral applicant is encouraged to request evaluation forms from GSCIS professors familiar with his/her capabilities and potential to complete a dissertation. The applicant need only send transcripts not previously submitted. If readmitted, the student must (1) meet all program requirements in effect at the time of readmission; and (2) must meet the degree program time limitations based on the date of his/her first registration in the program unless extensions are granted at the time of readmission. The readmitted student dismissed for exceeding the time limitation will be given a new time limit.

Readmission in Advance of Dismissal for Exceeding the Time Limitation

Students nearing the time limit may petition the Director of Graduate Programs for readmission in advance of dismissal by submitting a letter of justification that describes the reasons why academic potential has changed. The director may request additional documentation and may request evaluations by the faculty. Readmitted students will be given a new time limit.
Unregistered Students

Students who are not registered are not eligible to receive academic services from faculty and staff members and are not eligible to receive computing, library, and other university services. Students who have not graduated and have not been dismissed may register at any time within their program time limits.

Student Records and Transcripts

The university maintains a system of record keeping and provides students with official grade reports and transcripts reflecting their academic progress. This system documents all official information from the time of application for admission to graduation. Official hard copies of records are maintained by the registrar’s office. Records are secured via the computerized student information system in addition to back-up hard copy files. Computer files are secure and kept up to date. The registrar’s office follows the American Association of Collegiate Registrars and Admissions Officers (AACRAO) guidelines for the retention and disposal of records. After the appropriate time period, hard copy files are retired to storage. Computer files are moved to historical files and permanent records are microfilmed for later reference.

To obtain an official transcript, students or graduates may: (1) complete a Transcript Request Form at the registrar’s office; (2) mail the request form to the Office of the University Registrar, 3301 College Avenue, Fort Lauderdale, FL 33314-7796; or (3) fax the request form to 954-262-4862. Additional information and downloadable request forms may be obtained at www.nova.edu/cwis/registrar. Official transcript of a student’s academic record cannot be released until after all of his or her accounts, academic or nonacademic, are paid. Upon completion of a degree program at the university, students receive one transcript without charge. Any other transcripts, before or after graduation, must be specifically requested. For these, there is a $5 fee for each official transcript requested.

Challenge of Course Grade

A student who wishes to challenge a grade assigned for an entire course must communicate with the course professor, in writing, within ten days of receipt of the grade. In this communication, the student must state the reasons for requesting a change in the grade. A decision will be made by the course professor following his or her review of the appeal. The student will not be permitted further appeal. If, however, evidence of discrimination or a violation of the student’s rights is presented, then the Student Grievance Procedure shall be followed. A student may neither do additional work nor repeat an examination to raise a final grade.

Student Misconduct

Students are expected to deport themselves as respectable and respectful members of the academic community. The school will not tolerate acts of academic dishonesty, or behavior that is clearly unethical, unprofessional, flagrantly disruptive, or that violates the general understanding of the proper conduct of graduate students. Committing an act of misconduct will subject the student to dismissal from the university.

Procedures for Resolving Allegations of Student Misconduct

Violations of academic standards will be examined by the Academic Review Committee, which will present its findings to the dean for adjudication. Violations of conduct or supplementary standards will be handled by the Office of the Dean of Student Affairs or by the Graduate School of Computer and Information Sciences. Allegations of student misconduct must be made in writing to the program office by a faculty member, staff member, or student. All pertinent factors, witnesses, events, and evidence related to the alleged misconduct should be included. If the allegations constitute probable cause to proceed, the accused will be notified in writing that an inquiry will be conducted. As part of the inquiry, all pertinent documentary evidence and statements from witnesses will be assembled. The accused will be given an opportunity to provide a written response to the allegations. When misconduct is indicated
beyond reasonable doubt, an appropriate sanction will be chosen (see the NSU Student Handbook). A report of the findings and penalty will be provided to the accused who may acquiesce in the penalty or may contest and ask for a hearing. Failure of the accused to respond within 20 days shall be construed as acquiescence in the report of the inquiry. If a hearing is requested, it will be conducted by the Academic Review Committee in the case of academic violations or by the Office of the Dean of Student Affairs in the case of non-academic violations. If, after the hearing, the accused is found guilty of misconduct, the dean of the school or the dean of student affairs will decide on the final action to be taken.

**Student Grievance Procedure**

This section describes the procedure for student grievances regarding academic matters other than grades. If the issue concerns the fairness of a grade the procedure described in the section Challenge of Course Grade must be followed. Grievance procedures for nonacademic disputes are contained in NSU’s Student Handbook. First, the student should attempt to resolve the matter at the level at which it occurred, e.g., the appropriate faculty member or staff member. This attempt must be in writing. The student may wish to use certified mail to verify receipt of correspondence. In the correspondence, the student must present a rationale for his or her position based on factual information. The student will receive a reply from the recipient, in writing, that addresses the complaint. If the reply is not acceptable, the student is encouraged to submit the complaint, in writing, to the next higher level, usually the program director. If the program director is unable to resolve the complaint, he or she will notify the student and the dean of this in writing. The student may then appeal in writing to the dean of the Graduate School of Computer and Information Sciences who will attempt resolution. If appropriate, the dean may assign the matter to the Academic Review Committee. The committee will meet, carefully review the case, hold a hearing if necessary, and make a written recommendation, including rationale, to the dean to either accept or reject the appeal, or may propose an approach to resolve the complaint. The dean will review the Academic Review Committee’s findings and recommendation, and will notify the student in writing of his or her decision. The dean’s decision is final and cannot be appealed.

**Communication by Email**

Students must use their NSU email accounts when sending email to faculty and staff and must clearly identify their names and other appropriate information, e.g., course or program. When communicating with students via email, faculty and staff members will send mail only to NSU email accounts using NSU-recognized usernames. Students who forward their NSU-generated email to other email accounts do so at their own risk. GSCIS uses various course management tools that use private internal email systems. Students enrolled in courses using these tools should check both the private internal email system and NSU’s regular email system. NSU offers students web-based email access. Students are encouraged to check their NSU email accounts and their course management email accounts daily.

**Student Services** (For additional services see the NSU website and the Student Handbook.)

**NSU Cards**

The NSU Card is the official Nova Southeastern University identification card and each registered student is issued one. Students are required to carry and display the NSU Card for identification purposes when at the university. Cards are required to check out books from the library and for many other purposes (visit [http://www.nova.edu/nsucard](http://www.nova.edu/nsucard)). A number of businesses in the community will give students discounted rates on a variety of services ranging from movies to dinner if an NSU card is shown. If an NSU card is lost or destroyed, a new one may be requested at the registrar’s office. There is a fee to replace a lost card.
Textbooks

Book information can be found on the GSCIS website. Click on Master’s Programs or Doctoral Programs and then on Book Information. Barnes & Noble College Bookstores, the university’s official bookstore, offers comprehensive services to local and online students. While students have the option to purchase textbooks from other online and local sources, there may be benefits from purchasing from the university’s bookstore (on-campus or online). The university’s bookstore provides a wide range of shipping options.

The school posts book titles on its website at least one month prior to the start of each term. Students should order their books early enough to ensure delivery prior to the start of the term. There may be occasions when books are not available for the start of the term because they are out of stock or temporarily out of print. In such cases, faculty members will ensure that courses progress according to their schedules.

It is recommended that students order each book by its ISBN number in order to be assured of obtaining the edition required for the course.

Student Housing on the Main Campus

One-bedroom and two-bedroom furnished and unfurnished apartments are available for graduate and married students without children. Utilities, basic cable TV, and central air conditioning are included in the housing rates. For further information contact the university’s Office of Residential Life and Housing at 954-262-7052 or 800-541-6682, ext. 7052.

Travel Services

Nova Southeastern University has a full-service travel agency that can make reservations, issue airline tickets, and reserve rental cars. In addition, travel agents can also help make arrangements for trips and vacations. NSU’s travel agency accepts money orders and major credit cards. The travel agency can be reached at www.nova.edu/cwis/bsv/travel or via email: travel@nova.edu.

Alumni Association

Nova Southeastern University has an active alumni association. It is organized on three levels—local, state, and national—to provide special programs and other services that promote the professional and intellectual growth of graduates and maintain communications between graduates and the university. For information contact the Office of Alumni Relations at www.nova.edu/alumni.

Graduation

Graduation Requirements

Students must complete the minimum number of credit hours designated for the chosen program, and must meet the following requirements:

• Admission as a degree-seeking candidate in one of the programs
• Satisfy program requirements including completion of courses, master’s thesis where appropriate and, for the doctorate, an approved dissertation as specified in program documentation
• Doctoral students: Attendance at all required cluster or institute meetings
• Attainment of a cumulative grade point average of at least 3.0

• Completion of the form Application for Degree and payment of graduation fee. The Application for Degree form may be downloaded from the school’s website or obtained from the program office or the University Registrar. Master’s students should complete the form at the time of registration for their final term. Doctoral students should complete the form upon written notification of acceptance of their dissertation report.

• Payment of all tuition and fees and fulfillment of all obligations to the library, the student’s program, and the office of student financial services

Commencement

A commencement ceremony is held in June or July for Nova Southeastern University graduate students. All graduating students are encouraged to participate in this important ceremony. In order for a student to participate, the program director must expect the completion of all the student’s graduation requirements within six weeks following the date of the commencement ceremony.

Students expecting to graduate must complete an application for graduation and submit it to the program office at least six weeks prior to the date of the commencement ceremony. The program office will advise the university registrar of eligible students, who will distribute commencement procedures to these students.

Master’s Degree and Certificate Programs

Full-time on-campus and online students may complete the degree in 12 months and, in some cases, as few as nine months. Part-time on-campus and online students may complete the degree in 12–18 months. On-campus programs are offered in the evening—each class meets one night a week. The degree requires 36 credit hours (12 courses or 10 courses and a thesis). Master’s terms are 12 weeks long and there are four terms each year. They start in September, January, March, and June. To earn the M.S. in 12 months, students must enroll in three courses each term. (Students who wish to take four courses per term must obtain permission from the program office.) To earn the degree in 18 months, students must enroll in two courses each term. On-campus students are permitted to take online courses, and online students are permitted to take on-campus courses. All students must have a computer and an Internet service provider. Students can participate in online courses from almost anywhere in the world where Internet access is available. The school’s master’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.

Application for Admission

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 catalog. Instructions for applying are contained in the admission forms which may be downloaded from the school’s website: www.scis.nova.edu/NSS/pdf_documents/admission_forms.html. For additional information, contact:

Graduate School of Computer and Information Sciences 800-986-2247 or 954-262-2000  
Nova Southeastern University Email: scisinfo@nova.edu  
3301 College Avenue, DeSantis Building Website: www.scis.nova.edu  
Fort Lauderdale, Florida 33314-9918

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 and 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. Applicants 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 U.S. Citizenship and Immigration Service (USCIS) 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: www.nova.edu/cwis/registrar/iss (click on “F-1 Visa”). Applicants may contact the university’s Office of International Students by email: 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 catalog) with an equivalent GPA of at least 2.5. 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). A course-by-course evaluation is required. For current information on evaluation agencies visit www.naces.org/members.htm.

5. Applicants whose native language is not English are required to demonstrate English proficiency. The following standardized tests satisfy the university’s English requirement for nonnative English speakers: (1) Test of English as a Foreign Language (TOEFL) (www.ets.org/toefl): 213 on the computer-based test; 550 on the paper-based test; (2) International English Language Testing System (IELTS) (www.ielts.org): 6.0 on the test module; (3) GMAT: score of 450; GRE: score of 1,000; and (4) Scholastic Assessment Test (SAT): score of at least 480 on the verbal section; or the American College Test (ACT): score of at least 20 on the verbal section. Test results must be sent directly from the testing agency to the Graduate School of Computer and Information Sciences. Proof of English language competency can also be in the form of successful completion of a degree at an approved U.S. institution of higher education. For more information, visit the university’s Office of International Students web site at www.nova.edu/cwis/registrar/isss/index.html.

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 Office of Admissions).

Transfer Credit Policy

Up to six graduate credits from a regionally accredited institution may be transferred to one of the master’s degree 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. This policy does not apply to certificate programs nor to non-degree students.

**Early Admission into the Doctoral Program** (See options in 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. The application for early admission must be submitted to the Office of Admissions and must include the items listed under the Minimum Admission Requirements section for the doctoral program (the Office of Admissions will supply the Admissions Committee with the student’s current transcripts). The applicant is encouraged to request evaluation forms from GSCIS professors familiar with his/her academic capabilities and potential. 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).

**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 master’s-level programs is contained on page ii of this catalog and is also posted on the school’s website at [www.scis.nova.edu/Masters/index.html](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 a preferred format (online or on-campus) in their admission applications, but once admitted may take courses in either format (except for the courses in the M.S. in computing technology in education program, which are offered only online). 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.

GSCIS 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 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, email, and multimedia presentations. 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**

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.

**Tuition and Fees for Master’s Programs** (See sections Tuition Payment Policy and Financial Aid.)

Academic, program, and online services are provided only to GSCIS students who are currently registered. Students who are not registered are not entitled to receive services. Textbooks are not included in tuition and fees and must be purchased by the student. Students are responsible for their own lodging and travel expenses. Students must be registered to gain access to NSU’s computing services. Rates are subject to change.

- Application Fee ......................... $50 nonrefundable
- Tuition ...................................... $425 per credit hour
- Student Services Fee (per term) .... $93.75 (3 credit hours); $187.50 (6 or more credit hours)
- 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

**Registration**

The registration process begins when the Director of Graduate Programs sends an email to students’ NSU email accounts informing them of registration for the upcoming term. Registration materials are also posted on the master’s website: [www.scis.nova.edu/Masters/Director/index.html](http://www.scis.nova.edu/Masters/Director/index.html). Students can confirm their registration status by accessing NSU WebSTAR ([http://webstar.nova.edu](http://webstar.nova.edu)). Students are expected to register during the published registration period. Registration after the close of the published registration period, when permitted, will require the payment of a late fee.
Drop/Add Period

Failure to attend or participate in a class does not automatically drop or withdraw a student from the class. Registered master’s students may drop/add a course prior to the first day of the term and up to and including the sixth calendar day of the term (the drop/add period) without penalty. If a course is dropped between the first day of the term and the end of the drop/add period and another course is not added in its place, the withdrawal policy applies.

Refund Policy Regarding Withdrawals (See the section Grade Policy Regarding Withdrawals.)

A student withdrawing from a course may be eligible for a refund (full or partial) of tuition paid (not including fees) depending on the date of withdrawal. Course withdrawal requests must be submitted to the program office in writing (via postal mail or email) by the student. Withdrawals sent by email must be sent from the student’s assigned NSU email account and must clearly identify the student. Requests for withdrawal must be received by the program office at least three weeks prior to the last day of the term. Failure to attend class or participate in class activities will not automatically withdraw a student from the class. Students withdrawing between the first and the seventh calendar day of the term will receive a 90 percent refund of tuition paid. Students withdrawing between the eighth and the 18th calendar day of the term will receive a 50 percent refund of tuition paid. Students withdrawing between the 19th and the 30th calendar day of the term will receive a 25 percent refund of tuition paid. Students withdrawing after the 30th calendar day of the term will receive no refund. If a student is using one of the payment plans (see section Tuition Payment Policy) the tuition due or the amount refunded will be adjusted accordingly.

Form and Style Requirements for Student Work

For an individual course, the course professor will specify form and style requirements in the course syllabus. There are several books that provide general guidelines for form, style, and general writing principles in the preparation of papers, assignments, and reports. On Writing Well (Zinsser, 2001) is an excellent guide to clear, logical, and organized writing. Bugs in Writing (Dupré, 1998) contains valuable guidance on professional writing and is oriented to the computer and information sciences. The Publication Manual of the American Psychological Association, Fifth Edition (2001) addresses editorial style, grammar, and organization, and its use is often required by course professors. Master’s students may find the school’s Dissertation Guide (2004) helpful in the preparation of theses.

Attendance Policy

Master’s degree students are expected to be present at each meeting of their classes on campus. Exceptions to this rule may be made in the case of illness and possibly in other instances when approved by the course professor. Students should advise their course professors in advance of any anticipated absences. Additional work may be required by a course professor for any absence. Excessive absences will result in a failing grade. For online master’s courses, participation/attendance policies will be covered in the syllabus of each course.

Academic Progress, Grade Requirements, and Academic Standing

Failure to achieve academic progress in two continuous terms of registration will subject the student to review by the Academic Review Committee and possible dismissal. Each student must maintain a cumulative grade point average (GPA) of at least 3.0 to remain in good academic standing. When the cumulative GPA falls below 3.0 the student is automatically placed on academic probation and will not be permitted to graduate. (Academic probation may adversely affect financial aid.) If the cumulative GPA is not raised to 3.0 within two terms the student may be dismissed from the program. Upon achieving a cumulative GPA of 3.0, the student will be removed from academic probation. If the cumulative GPA could not possibly be raised to 3.0 within the required period the student will be dismissed immediately.
Students with four withdrawals will be dismissed immediately. Students who receive two course grades of F will be dismissed immediately.

**Time Limitations**

Students must complete requirements for the 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. Students desiring an extension of time must petition the program office in writing at least one month before the time limit is reached. Extensions may be granted only if the petition presents justifiable cause and an acceptable plan for program completion. In the absence of a petition for extension, the student will be automatically dismissed from the program. (Also see the sections Readmission Following Dismissal and Readmission in Advance of Dismissal for Exceeding the Time Limitation.)

**Independent-Study Basis and 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. *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.

**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.

**Program-Specific Admission Requirements** (See Application for Admission for general 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, programming in a modern high-level language, 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 501  Java Programming Language
- MCIS 502  Mathematics in Computing
- MCIS 503  Data Structures and Algorithms
Option for Early Admission into the Doctoral Program

This option provides the opportunity for master’s students in computer information systems to earn the Ph.D. in computer information systems or information systems in a shorter time. In addition to the requirements specified in the section Early Admission into the Doctoral Program, 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 and electives 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. Plans for the thesis option must be made with the program office. Courses constituting the degree program with specialization in information security are listed following the electives.

Core Courses (three credits each):
- 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 (three credits each)
- 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, three credits each)
- 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)

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)
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)
This course examines 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.
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. Prerequisites: MCIS 683, 684, 685, and 686.

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.

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.

Program-Specific Admission Requirements (See Application for Admission for general 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, 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

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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.

**Option for 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 in the section Early Admission into the Doctoral Program, 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. Plans for the thesis option must be made with the program office.

**Core Courses** (three credits each)

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** (three credits each)

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 multiprocessoring, 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) 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 at the 600-level.

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 Application for Admission for general 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.

Option for Early Admission into the Doctoral Program

This option provides the opportunity for master’s students in computing technology in education to earn the Ph.D. or Ed.D. in computing technology in education in a shorter time. See detailed requirements specified in the section Early Admission into the Doctoral Program.
The Curriculum for the M.S. in Computing Technology in Education

Core courses (three credits each) 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 knowledge of instructional system design competencies appropriate for use in the development of computer-assisted instruction applications. Students will experience both theory and best practices from the areas of education and training. Students will explore and acquire instructional design skills and knowledge associated with problem identification methodologies, learner analysis, task analysis, instructional objectives, teaching strategies, instructional messages and evaluation.

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 distributions, the identification of variables, sampling methods, research designs, hypothesis testing, and descriptive data presentation techniques. Students are introduced to both parametric and nonparametric data analysis procedures including t-tests, chi-square analysis, and simple analysis of variance.

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 at the 600-level.
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 programs 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 school’s 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 Application for Admission for general 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, 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.

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<tr>
<th>Course Code</th>
<th>Course Name</th>
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<tbody>
<tr>
<td>MCIS 500</td>
<td>Assembly Language and Architecture</td>
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<tr>
<td>MCIS 501</td>
<td>Java Programming Language</td>
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<tr>
<td>MCIS 502</td>
<td>Mathematics in Computing</td>
</tr>
<tr>
<td>MCIS 503</td>
<td>Data Structures and Algorithms</td>
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Option for Early Admission into the Doctoral Program

This option provides the opportunity for master’s students in information security to earn the Ph.D. in computer information systems in a shorter time. In addition to the requirements specified in the section Early Admission into the Doctoral Program, the student must complete all five security-related courses (MCIS 683, 684, 685, 686, and 687) and their prerequisites (MCIS 615, 630, and 650) (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)
This course examines 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.

**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. 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.

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 and data warehousing, 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.
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. See the curriculum section below for details on the specializations.

**Program-Specific Admission Requirements** (See Application for Admission for general 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.

**Option for 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 in the section Early Admission into the Doctoral Program, the student must have completed MMIS 610 Survey of Computer Languages; MMIS 620 Management Information Systems; MMIS 626 Client-Server and Distributed Computing or MMIS 627 Enterprise Information Systems, Technologies, and Infrastructures; MMIS 630 Database Systems; and MMIS 660 Systems Analysis and Design.

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

Core courses and electives 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. Plans for the thesis option must be made with the program office. Courses constituting the degree program with specialization in electronic commerce or with specialization in information security are listed below following the electives.

**Core Courses** (three credits each)

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<tr>
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<tbody>
<tr>
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<td>Survey of Computer Languages</td>
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<td>MMIS 621</td>
<td>Information Systems Project Management</td>
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<tr>
<td>MMIS 627</td>
<td>Enterprise Information Systems, Technologies, and Infrastructures</td>
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<td>MMIS 630</td>
<td>Database Systems</td>
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<tr>
<td>MMIS 642</td>
<td>Data Warehousing</td>
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<td>MMIS 653</td>
<td>Telecommunications and Computer Networking</td>
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<td>MMIS 654</td>
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<td>Object-Oriented Applications</td>
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<td>Decision Support Systems</td>
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<tr>
<td>MMIS 680</td>
<td>Human-Computer Interaction</td>
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</table>
Electives (three credits each)
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, three credits each)
MMIS 620    Management Information Systems
MMIS 623    Legal and Ethical Aspects of Computing
MMIS 627    Enterprise Information Systems, Technologies, and Infrastructures
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, three credits each)
MMIS 610    Survey of Computer Languages
MMIS 620    Management Information Systems
MMIS 621    Information Systems Project Management
MMIS 627    Enterprise Information Systems, Technologies, and Infrastructures
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.

**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 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 627 Enterprise Information Systems, Technologies, and Infrastructures** (3 credits)
This course focuses on enterprise-level information systems, technologies, and infrastructures that are emerging as the first generation 21st century application integration design strategies and tools. Included are: managing Web-based client/server and distributed environments, evaluation of vendor strategies, legacy system migration issues, performance, interoperability, scalability, and security concerns, Web services foundations, types of middleware, vendor architectures, distributed applications, the context for integration, service-oriented application integration, multi-enterprise portals, mobile devices, business process integration, Java-based middleware standards, Web services APIs, and emerging standards. Cases involving enterprise systems and architectures are used throughout the course.
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)
This course examines 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.

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 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)
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 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)

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. 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 systems.

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: MMIS 683, 686, 685, and 686.

**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 at the 600-level.

**Doctoral Degree Programs**

The school offers a unique doctoral program that requires only four weekend or two weeklong visits to the campus each year. The former is called the *cluster format*, and the latter is called the *institute format*. Both formats include a blend of on-campus and online activities. Students choosing the cluster format attend four cluster sessions each year, held quarterly over an extended weekend at the university while taking courses (usually during the first two years of their programs). Cluster terms are five months long. They start in September and March. Students choosing the institute format attend weeklong sessions twice a year at the university while taking courses (usually during the first two years of their programs). Institute terms are five months long. They start in January and July.

Clusters and institutes bring together students and faculty for participation in courses, dissertation counseling (individual and group), special lectures, and ample opportunity for student-faculty and student-student interaction. Between sessions students work on assignments and projects, and participate
in online activities that facilitate frequent interaction with the faculty and with other students. Interactive learning methods, consistent communication between faculty and students and accessible learning resources provide a powerful and supportive learning environment that can be accessed anywhere around the globe. Online activities may include forums using threaded discussion boards, chat rooms, white boards, email, and multimedia presentations. Students are able to submit assignments online in multimedia formats and to receive their professor’s reviews of assignments online in the same formats. All students must have a computer and an Internet service provider (see the section Computer Requirements).

Application for Admission

Application for Admission to the Doctoral Degree 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, essay, résumé, three evaluation forms, and all transcripts (unofficial copies are acceptable pending receipt of official transcripts). To ensure evaluation for the desired starting term applications must be received at least one month prior to the start of that term. Late applications that cannot be processed in time for the desired starting term will be considered for the next term. 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 catalog. Instructions for applying are contained in the admission forms which may be downloaded from: www.scis.nova.edu/NSS/pdf_documents/admission_forms.html

For additional information, contact:

Graduate School of Computer and Information Sciences
Nova Southeastern University
3301 College Avenue, DeSantis Building
Fort Lauderdale, Florida 33314-9918

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

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

1. An earned master’s degree with a GPA of at least 3.25 from a regionally accredited institution and with an appropriate major (see program-specific admission requirements under individual programs). Alternatively, GSCIS master’s degree students may apply for early admission into the doctoral program with the same major (see GSCIS master’s section of this catalog for requirements).

2. Application form, application fee, and essay.

3. Official transcripts of all graduate and undergraduate education.

4. Evaluation forms from three people who are familiar with your academic and/or professional capabilities and able to assess your intellectual abilities, maturity, and motivation. Forms from your professors are preferred. Forms are unacceptable if they are from family members, friends, those without experience in the research-based doctorate, or from those unable to evaluate your academic potential to succeed in the program to which you are applying.
5. A résumé (short account of your career and qualifications).

6. Proficiency in the English language. Doctoral students are expected to write numerous papers and a dissertation. 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 Doctoral Students**

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

2. The applicant must have a university-level education equivalent to a regionally-accredited United States master’s degree in a related field (see program-specific admission requirements in this catalog) with an equivalent GPA of at least 3.25. A course-by-course evaluation is required. To enable GSCIS 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 [www.naces.org/members.htm](http://www.naces.org/members.htm).

3. Applicants whose native language is not English are required to demonstrate English proficiency. The following standardized tests satisfy the university’s English requirement for nonnative English speakers: (1) Test of English as a Foreign Language (TOEFL) ([www.ets.org/toefl](http://www.ets.org/toefl)): 213 on the computer-based test; 550 on the paper-based test; (2) International English Language Testing System (IELTS) ([www.ielts.org](http://www.ielts.org)): 6.0 on the test module; (3) GMAT: score of 450; GRE: score of 1,000; and (4) Scholastic Assessment Test (SAT): score of at least 480 on the verbal section; or the American College Test (ACT): score of at least 20 on the verbal section. Test results must be sent directly from the testing agency to the Graduate School of Computer and Information Sciences. Proof of English language competency can also be in the form of successful completion of a degree at an approved U.S. institution of higher education. For more information, please visit the university’s Office of International Students website: [www.nova.edu/cwis/registrar/isss/index.html](http://www.nova.edu/cwis/registrar/isss/index.html).

4. After admission, the student may choose to reside in the U.S. or travel to the U.S. only to attend four cluster weekends a year or two institute weeks a year at the university (see below for details).

5. Those who choose to reside in the U.S. will qualify for the issuance of an I-20. The U.S. Citizenship and Immigration Service (USCIS) requires that all students on an F-1 student visa enroll full time and reside in Florida. An I-20 will be issued for a period of time that will allow completion of all degree requirements. Non-degree or provisional-admission status is not considered a basis for the issuance of an I-20.

6. Those who travel to the U.S. only to attend clusters or institutes at the university will be able to enter the country on a B-1 (Visitor) or B-2 (Tourist) visa because the on-campus instruction, in each instance, would be for a period less than three weeks in duration. Students from countries participating in the Visa Waiver Program may also seek admission to the U.S. under its provisions. (This program enables citizens of certain countries to travel to the U.S. for tourism or business for 90 days or less without obtaining a visa. Currently, 27 countries participate in this program.) When the student begins the dissertation phase of the program, he/she will have the following options: (1) when required by the faculty or program director to visit the campus for a short period, students may enter the U.S. on a B-1 (Visitor) or B-2 (Tourist) visa; or (2) students may be permitted to reside in the U.S. on an F-1 visa for the purpose of research on their dissertations. This is determined on a case-by-case basis. To qualify, the student must (1) have completed the required 40 credits of coursework; (2) be in good academic
standing, and (3) submit a letter to the Office of International Students written by his/her committee chairperson stating that it is necessary for the student to do research in the U.S. Students permitted to reside in the U.S. must reside in Florida.

7. For additional information regarding United States immigration rules and regulations as they apply to international students, contact the university’s Office of International Students: intl@nova.edu; telephone: 954-262-7240 or 800-541-6682 ext. 7240; or fax: 954-262-3256. Detailed instructions on how to enter the United States with the visa and how to maintain visa status are provided on the website of the Office of International Students: www.nova.edu/cwis/Registrar/isss/index.html.

**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 Office of Admissions).

**Early Admission into the Doctoral Program** (see requirements under Master’s Degree Programs)

This option provides the school’s master’s degree students the opportunity to earn the doctorate in a shorter time.

**Orientation and Advisement**

New doctoral students must attend an orientation day on the main campus in Fort Lauderdale at their first cluster or institute meeting. The orientation includes introductions to the program office staff, computer requirements, online access, software tools that enhance the educational process, library services, financial aid, and academic integrity. The school’s website provides an extensive online “help” system including downloadable software and documents. Students are offered dissertation counseling throughout the program. Advisement is provided by the program office and the faculty.

**Program Formats and Term Dates**

Terms for the doctoral program are five months long. The academic calendar for the program is contained on page ii of this catalog and is also posted at www.seis.nova.edu/Doctoral/index2.html. During the first two years of the program, most students complete two three-credit core or elective courses and one four-credit project course each term. After the completion of all courses and 40 credit hours with a GPA of at least 3.0, the student registers for the dissertation at 12 credits per term for two terms. Students who have not completed the dissertation after registrations for Dissertation I and Dissertation II must register for Continuing Dissertation until they have satisfied the dissertation requirement. Doctoral residence is defined as continuous enrollment for two consecutive terms at a minimum of 10 credit hours per term.

Students may select one of two formats: cluster or institute. with the exception of computer information systems and computer science which are offered in cluster format only. Cluster students, while taking courses, attend four cluster meetings per year, held quarterly over an extended weekend (Friday, Saturday, and half-day Sunday) at the university. Cluster terms start in March and September. Cluster weekends are held in March, June, September, and December. Institute students, while taking courses, attend a weeklong institute twice a year at the university. Institutes are held in January and July at the start of each
five-month term. Clusters and institutes bring together students, faculty, and staff members for participation in courses, dissertation counseling (individual and group), special lectures, and ample opportunity for student-faculty and student-student interaction. Students are required to attend all of their scheduled cluster or institute class sessions.

Between on-campus meetings, students work on assignments and projects and participate in online activities that facilitate frequent interaction with the faculty and with other students. The online component involves use of the web to access course materials, announcements, email, distance library services, the Electronic Library; and for interaction with faculty and fellow students. Online, interactive learning methods are based on the use of WebCT as a course management system which includes threaded discussion boards, white boards, chat rooms, email, and multimedia presentations. 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. Students are provided NSU computer accounts but must obtain their own Internet service providers and use their own computer systems.

Registration

The registration process begins when the program director sends an email to students’ NSU email accounts informing them of registration for the upcoming term. Registration materials are also posted on the doctoral website: www.scis.nova.edu/Doctoral/index2.html. Students can confirm their registration status by accessing NSU WebSTAR (http://webstar.nova.edu). Students are expected to register during the published registration period. Registration after the close of the published registration period, when permitted, will require the payment of a late fee.

Drop/Add Period

Failure to attend or participate in a class does not automatically drop or withdraw a student from the class. Registered doctoral students may drop/add a course prior to the first day of the term and up to and including the second day of classes (the drop/add period) without penalty. If a course is dropped between the first day of the term and the end of the drop/add period and another course is not added in its place, the withdrawal policy applies.

Refund Policy Regarding Withdrawals (Also see the section Grade Policy Regarding Withdrawals.)

A student withdrawing from a course may be eligible for a refund (full or partial) of tuition paid (not including fees) depending on the date of withdrawal. Course withdrawal requests must be submitted to the program office in writing (via postal mail or email) by the student. Withdrawals sent by email must be sent from the student's assigned NSU email account and must clearly identify the student. Requests for withdrawal must be received by the program office at least three weeks prior to the last day of the term. Failure to attend class or participate in class activities will not automatically withdraw a student from the class. Students withdrawing on the first day of the term will receive an 80 percent refund of tuition paid. Students withdrawing on the second day of the term will receive a 70 percent refund of tuition paid. Students withdrawing on the third day of the term will receive a 60 percent refund of tuition paid. Students withdrawing between the fourth and the 14th calendar day of the term will receive a 30 percent refund of tuition paid. Students withdrawing between the 15th and the 25th calendar day of the term will receive a 15 percent refund of tuition paid. Students withdrawing after the 25th calendar day of the term will receive no refund. If a student is using one of the tuition payment plans described earlier, the tuition due or the amount refunded will be adjusted accordingly.
Form and Style Requirements for Student Work

Doctoral students must follow the policies, procedures, and formatting requirements contained in the school’s Dissertation Guide (www.scis.nova.edu/pdf_documents/Diss_Guide.pdf) for the planning and preparation of the doctoral dissertation. For reference citations and reference lists students must follow the instructions given in the Dissertation Guide. Doctoral students may find the Dissertation Guide helpful in the preparation of other work. For an individual course, the course professor will specify form and style requirements in the course syllabus. There are several books that provide general guidelines for form, style, and general writing principles in the preparation of papers, assignments, and reports. On Writing Well (Zinsser, 2001) is an excellent guide to clear, logical, and organized writing. Bugs in Writing (Dupré, 1998) contains valuable guidance on professional writing and is oriented to the computer and information sciences. The Publication Manual of the American Psychological Association, Fifth Edition (2001) addresses editorial style, grammar, and organization, and its use is often required by course professors.

Attendance Policy

Doctoral degree students are required to attend all of their scheduled clusters or institutes and must attend all of their class sessions. Failure to attend may result in withdrawal from courses and suspension or dismissal from the doctoral program. Exceptions to this rule may be made in the case of illness and possibly in other hardship situations. Such exceptions must be approved first by the course professor and then by the program director. Absence from individual class sessions must be approved by the course professor. Students are required to advise the program office and their course professor in advance of any anticipated absences. Participation/attendance policies regarding the online components of doctoral courses will be covered in the syllabus of each course.

Academic Progress, Grade Requirements, and Academic Standing

Failure to achieve academic progress in two continuous terms of registration will subject the student to review by the Academic Review Committee and possible dismissal. Each student must maintain a cumulative grade point average (GPA) of at least 3.0 to remain in good academic standing. When the cumulative GPA falls below 3.0 the student is automatically placed on academic probation and will not be permitted to graduate. (Academic probation may adversely affect financial aid.) If the cumulative GPA is not raised to 3.0 within one term the student may be dismissed from the program. Upon achieving a cumulative GPA of 3.0, the student will be removed from academic probation. If the cumulative GPA could not be raised to 3.0 within the required period the student will be dismissed immediately. Students with four withdrawals will be dismissed immediately. Students who receive two grades of F will be dismissed immediately. Students who do not make progress toward the completion of a dissertation will be evaluated for probation or dismissal (see the section Evaluation of Dissertation Progress). Students who do not have a cumulative GPA of 3.0 at the end of their course work will not be admitted to candidacy and will not be permitted to register for dissertation.

Time Limitations

Students must complete requirements for the degree within seven years from the date of their first registration. Students desiring an extension of time must petition the program office in writing at least one month before the time limit is reached. In the absence of a petition for extension, the student will be automatically dismissed from the program. Only the dean can grant an extension. Extensions are granted reluctantly and only when it is believed that the student is very close to finishing the dissertation and when the knowledge the student gains from the program will be contemporary.

For a petition to be considered the following conditions must be met: (1) The student must be in the final report stage of the dissertation; (2) the dissertation advisor, committee members, and program director
must support the petition; and (3) there must be a high probability that the student will complete the final dissertation report within three to six months of the date of the petition for extension. Students close to reaching the seven year time limit but who do not meet the above conditions may petition the program office in writing for readmission. Such petitions must be received at least one month before the time limit is reached. Readmission is a process whereby exceptional doctoral students may be granted a new time limit to complete the degree. A student who applies for readmission will be reviewed by a faculty committee that will present a recommendation to the dean. A petition for readmission will be considered when the following conditions are met: (1) The student has an approved idea paper and a dissertation advisor; and (2) the dissertation advisor and the program director support the petition. The faculty committee will decide if the student has the potential to complete a dissertation. Recommendations to the dean that are favorable will include a new time limit and may contain other requirements such as taking additional courses to ensure that the knowledge the student gains from the program will be contemporary. (Also see the sections Readmission Following Dismissal and Readmission in Advance of Dismissal for Exceeding the Time Limitation.)

**Independent-Study Basis and 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. *Taking a course in another program* means taking a course in one of the school’s doctoral 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.

**The Dissertation**

Students will be permitted to register for the dissertation after they have completed their required course work with a minimum cumulative GPA of 3.0. Both Dissertation I and Dissertation II are required. They are usually taken over two consecutive terms. The dissertation is the most important requirement for the doctoral degree. Each student is expected, with the approval of a faculty advisor, to select an appropriate topic of sufficient scope to satisfy the requirements for the dissertation. Although registration for dissertation credits typically occurs at or near the end of completion of the course requirements, students are encouraged to learn about the dissertation process as early as possible and to begin talking with faculty members about potential research topics early in the program. The dissertation must be an original work and must represent a significant extrapolation from a base of solid experience or knowledge in the student’s area of concentration. Dissertation results must, in a significant way, advance knowledge, improve professional practice, or contribute to understanding in the field of study. Results must be of sufficient strength to distill from the work a paper worthy of publication in a journal or conference proceedings, or to use the work as the basis of a textbook or monograph. Although publication is not a requirement for completing the doctoral degree, students are encouraged to submit their dissertation research for publication. Doctoral students must follow the policies, procedures, and formatting requirements contained in the *Dissertation Guide* ([www.scis.nova.edu/pdf_documents/Diss_Guide.pdf](http://www.scis.nova.edu/pdf_documents/Diss_Guide.pdf)). It is recommended that students attend cluster and institute presentations on the dissertation process, research methodology, and writing for publication.

**Evaluation of Dissertation Progress**

Each student is evaluated on a number of occasions regarding his or her dissertation progress. The purpose of such evaluations is to provide students with relevant and timely feedback concerning their
overall performance in the dissertation process and to serve as a screening procedure. Failure to demonstrate the ability to complete a dissertation or to maintain satisfactory progress on the dissertation may result in review by the Academic Review Committee and possible probation, suspension, or dismissal from the doctoral program. Each student must demonstrate proficiency in the use of the English language in all work submitted during the dissertation process. Grammatical errors, spelling errors, and writing that does not express ideas clearly will not be tolerated and may result in the rejection of dissertation work and review by the Academic Review Committee. The faculty will not provide remedial help concerning grammatical errors or other writing problems that students might have. Students who are unable to write clearly and correctly are urged to obtain remedial help.

**Tuition and Fees for Doctoral Programs** (See sections Tuition Payment Policy and Financial Aid.)

Academic, program, and online services are provided only to GSCIS students who are currently registered. Students who are not registered are not entitled to receive services. Textbooks are not included in tuition and fees and must be purchased by the student. Students are responsible for their own lodging and travel expenses. Students must be registered to gain access to NSU’s computing services. Doctoral students must be registered for courses, projects, dissertation, or continuing dissertation to receive the support of the faculty on the dissertation process. Rates are subject to change.

- Application Fee ........................................$50 nonrefundable
- Course Work ..............................................$500 per credit hour
- Dissertation I or II ......................................$5,400 per term ($450 per credit hour)
- Continuing Dissertation ..............................$2,700 per term ($450 per credit hour)
- Student Services Fee (per term) .................$125 (3 credit hours); $250 (4 or more credit hours)
- 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

**Ph.D. in Computer Information Systems**

This program offers a course of study leading to the degree of doctor of philosophy (Ph.D.) in computer information systems. It is offered in the cluster format, which combines traditional and online instruction to provide professionals the opportunity to pursue graduate study while continuing to work in their current positions. The program is especially well suited to professionals in business, government, industry, or education who are involved with research, design, implementation, management, evaluation, utilization, or teaching of computer information systems. It provides technology-oriented professionals with the knowledge and ability to develop creative solutions to substantive real-world problems. Each student must complete eight courses, four projects, and a dissertation.

**Program-Specific Admission Requirements** (See Application for Admission for general requirements.)

This program is designed for the student with a master's degree in computer information systems, computer science, or a closely related field. The applicant should satisfy graduate prerequisites or have equivalent experience in information systems, programming languages, database systems, systems analysis and design, data communications and networks, and computer architecture. Alternatively, GSCIS master's students in computer science or computer information systems may apply for early admission into the Ph.D. program. (For requirements, see the master’s section of this catalog.)
The Curriculum for the Ph.D. in Computer Information Systems

The program requires 64 credit hours, of which 40 are for courses and 24 are for the dissertation. Most students take two core courses and one project course per term during the first two years and register for the dissertation in the third year. Courses and dissertation registrations are listed below:

**Core Courses** (three credits each) (Select eight of these.)
- DCIS 710 Decision Support Systems
- DCIS 720 Human-Computer Interaction
- DCIS 730 Information Security
- DCIS 735 Knowledge Management
- DCIS 740 Data Communications and Computer Networking
- DCIS 750 Database Systems
- DCIS 760 Artificial Intelligence and Expert Systems
- DCIS 770 Software Engineering
- DCIS 791 Distributed Systems
- DCIS 799 Special Topics in Computer Information Systems (offered on various subjects)

**Project Courses** (four credits each) (Select four of these. Must be taken concurrent with, or following completion of, the corresponding core course.)
- DCIS 810 Project in Decision Support Systems
- DCIS 820 Project in Human-Computer Interaction
- DCIS 830 Project in Information Security
- DCIS 835 Project in Knowledge Management
- DCIS 840 Project in Data Communications and Computer Networking
- DCIS 850 Project in Database Systems
- DCIS 860 Project in Artificial Intelligence and Expert Systems
- DCIS 870 Project in Software Engineering
- DCIS 891 Project in Distributed Systems
- DCIS 899 Project in Special Topics in Computer Information Systems

**Dissertation Registrations**
- DCIS 910 Dissertation I (12 credits)
- DCIS 915 Dissertation II (12 credits)
- DCIS 920 Continuing Dissertation (6 credits)

**Course Descriptions for the Ph.D. in Computer Information Systems**

**DCIS 710 Decision Support Systems** (3 credits)
Principles and techniques relating to automated support for decision making and organizational problem solving. Topics include decision theory, modeling and simulation, decision support system architecture, group decision support systems, knowledge-based expert systems, and intelligent systems.

**DCIS 720 Human-Computer Interaction** (3 credits)
Issues relating to effective human-computer interaction are presented. Basic elements, procedures, tools, and environments contributing to the development of successful user interfaces are explored. User interface design principles, guidelines, and methodologies are reviewed. Other topics include multidisciplinary dynamics of human-computer interaction as a field of study, current and projected developments in HCI research, and usability engineering.

**DCIS 730 Information Security** (3 credits)
Study of the theory, mechanisms, and implementation of information security and data protection. Topics include formal models for computer security, secure operating systems, mechanisms for mandatory and discretionary
controls, distributed secure system architectures, encryption and authentication, access control, integrity models and mechanisms, and programming and vulnerability analysis. An emphasis will be placed on current issues, future directions, and research areas.

**DCIS 735 Knowledge Management** (3 credits)
Knowledge management (KM) is said to promote innovation, improve efficiency and effectiveness, and provide a sustainable competitive advantage in today’s global environment. This course examines computer-based systems for supporting KM. Principles of developing systems for KM are explored. System architectures, tools and techniques, and their use in capturing, storing, locating, evaluating, disseminating, and using information and knowledge are examined. Topics will include techniques for indexing, searching, retrieving, and displaying information from knowledge bases. Investigation of the issues in the application of knowledge management to organizational learning and decision making is included. Application of these principles and techniques through the use of rapidly evolving information/communication technologies is studied in the context of their impact on organizations.

**DCIS 740 Data Communications and Computer Networking** (3 credits)
Recent advances and new applications in the expanding field of mobile computing are examined. The technical fundamentals, architecture, and design of mobile networks are described. Strategies, tools, and techniques for planning, implementation, management, maintenance, and security are delineated. Topics include topologies, configurations, protocols, and performance characteristics. Trends in mobile information systems research, design and development are explored. The emphasis of the material for this class will be in the analysis, design, development, and management of mobile information systems. Infrastructure issues are aligned with strategy to deliver current and future solutions for mobile information systems.

**DCIS 750 Database Systems** (3 credits)
Theory and principles of databases and their management. Design, implementation, and traditional and nontraditional applications of database management systems. An emphasis will be placed on current issues, future directions, and research topics.

**DCIS 760 Artificial Intelligence and Expert Systems** (3 credits)
Theory of, and major approaches to, artificial intelligence. Topics include knowledge representation, heuristic search, artificial neural networks, machine learning, intelligent agents, and knowledge-based systems.

**DCIS 770 Software Engineering** (3 credits)
Covers advanced topics in the development of software-intensive systems, system life cycles, requirements definition and analysis, behavioral specification, design, implementation, verification and validation, system evolution, and project management. An emphasis will be placed on current issues, future directions, and research topics.

**DCIS 791 Distributed Systems** (3 credits)
Students are expected to contribute to the expansion of the networking and distributed system paradigms with a focus on distributed applications and information systems. Topics include the components of distributed systems architecture, operating systems, networking, interprocess communication, user interface, middleware, distributed objects, groupware, security, and software development. The role of standards in distributed systems development is discussed, including a detailed study of protocols. The development of the distributed computing model and its application to enterprise strategy, architecture, and management issues are explored with a pragmatic and research approach. The emphasis of the material for this class will be in the analysis, design, development, and management of distributed applications and information systems. The theory behind each component will be presented while exploring current research, design and development strategies for information systems.

**DCIS 799 Special Topics in Computer Information Systems** (3 credits)
Covers advanced topics in areas of current research interest in computer information systems. Topics will vary depending on student and faculty interest.
DCIS 810  Project in Decision Support Systems  (4 credits)
Students advance their knowledge through the completion of a research paper or project in the area of decision support systems. Some topics of current interest include model management, investigation of decision support aids, knowledge-based systems and intelligent systems, group DSS, and distributed DSS.

DCIS 820  Project in Human-Computer Interaction  (4 credits)
Students produce a research paper or project on a current topic in HCI. Some topics of current interest include interface quality and evaluation, computer system and computer interface architecture, user and task analysis, advancements in usability engineering, Internet-based user interface design issues, legal and ethical aspects of computing, speech interfaces, agent technology, handheld and wearable technology, and computer-supported cooperative work.

DCIS 830  Project in Information Security  (4 credits)
Students pursue a research project or implementation on a current topic in information security and assurance. Topics of current interest include secure operating systems and networks, intrusion detection, cryptographic theory and applications, vulnerability analysis, and malicious code detection.

DCIS 835  Project in Knowledge Management  (4 credits)
Students pursue a research study, project, or implementation in knowledge management.

DCIS 840  Project in Data Communications and Computer Networking  (4 credits)
Students will advance their data communications and computer networking knowledge through the completion of a research paper or project.

DCIS 850  Project in Database Systems  (4 credits)
Students pursue a research study on a current topic in database systems or complete a database-oriented development project. Some areas of current interest include object-oriented database systems, extended relational DBMS, federated or heterogeneous database systems, high-performance parallel database systems, and advanced conceptual logic database modeling.

DCIS 860  Project in Artificial Intelligence and Expert Systems  (4 credits)
Students pursue a research or development project in artificial intelligence. Some topics of current interest are artificial life, learning technologies (including symbolic learning, neural networks, and genetic algorithms), intelligent agents, natural language processing, deep domain models in expert systems, vision, speech recognition, handwriting recognition, and parallel and distributed artificial intelligence.

DCIS 870  Project in Software Engineering  (4 credits)
Students pursue a research project in a current topic in software engineering or complete a software engineering development project. Some topics of current interest include object-oriented analysis and design, software/system life cycles, reusability, specification, and verification.

DCIS 891  Project in Distributed Systems  (4 credits)
Students will advance their client-server/distributed systems knowledge through the completion of a research paper or project.

DCIS 899  Project in Special Topics in Computer Information Systems  (4 credits)
Students pursue a research study, project, or implementation related to DCIS 799.

DCIS 910  Dissertation I  (12 credits)
The student develops a framework within which doctoral research will be conducted and offers evidence of qualifications to pursue the research. Prerequisite: Satisfactory completion of all course work.

DCIS 915  Dissertation II  (12 credits)
Concepts and theories underlying the student’s doctoral research are articulated; the problem is clearly stated; specific, measurable goals are specified; a thorough literature review is presented; the methods of conducting the research are delineated; and a strategy to achieve the goal is given. Prerequisite: Dissertation I.
DCIS 920 Continuing Dissertation (6 credits)
Students who have not completed the dissertation by the end of Dissertation II must register for Continuing Dissertation each term in order to receive faculty and administrative advice and support related to the dissertation. Prerequisite: Dissertation II.

Ph.D. in Computer Science

This program offers a course of study leading to the degree of doctor of philosophy (Ph.D.) in computer science. It is offered in the cluster format, which combines traditional and online instruction to give professionals the opportunity to pursue graduate study while continuing to work in their current positions. The program is especially well suited to those in industry, education, or government who are involved with one of the many areas of computer science. It provides research-oriented professionals with knowledge in the major areas of computer science and the ability to develop creative solutions to substantive real-world problems. Each student must complete eight courses, four projects, and a dissertation.

Program-Specific Admission Requirements (See Application for Admission for general requirements.)

This program is designed for the student with a master’s degree in computer science, or a closely related field. The applicant should satisfy graduate prerequisites or have equivalent experience in programming languages, data communications and computer networks, operating systems, compilers, database management systems, theory of computation, design and analysis of algorithms, and computer architecture. Alternatively, GSCIS master’s students may apply for early admission into the Ph.D. program. (For requirements, see the master’s section of this catalog.)

The Curriculum for the Ph.D. in Computer Science

The program requires 64 credit hours, of which 40 are for courses and 24 are for the dissertation. Most students take two core courses and one project course per term during the first two years and register for the dissertation in the third year. Courses and dissertation registrations are listed below:

Core Courses (three credits each) (Select eight of these.)
CISD 700 Theory and Principles of Programming
CISD 730 Operating Systems
CISD 740 Data Communications and Computer Networking
CISD 750 Database Management Systems
CISD 760 Artificial Intelligence
CISD 770 Software Engineering
CISD 792 Computer Graphics
CISD 794 Knowledge Discovery in Databases
CISD 799 Special Topics in Computer Science (offered on various subjects; may take up to two of these)

Project Courses (four credits each) (Select four of these. Must be taken concurrently with, or following completion of, the corresponding core course.)
CISD 800 Project in Theory and Principles of Programming
CISD 830 Project in Operating Systems
CISD 840 Project in Data Communications and Computer Networking
CISD 850 Project in Database Management Systems
CISD 860 Project in Artificial Intelligence
CISD 870 Project in Software Engineering
CISD 892 Project in Computer Graphics
CISD 894 Project in Knowledge Discovery in Databases
CISD 899 Project in Special Topics in Computer Science
Dissertation Registrations
CISD 910 Dissertation I (12 credits)
CISD 915 Dissertation II (12 credits)
CISD 920 Continuing Dissertation (6 credits)

Course Descriptions for the Ph.D. in Computer Science

CISD 700 Theory and Principles of Programming (3 credits)
Covers advanced topics in areas of current research interest in programming languages, semantics, visual languages, and compiler design for contemporary systems and applications.

CISD 730 Operating Systems (3 credits)
Recent advances in the theory and practice of state-of-the-art methods in the structure and development of operating systems with an emphasis on parallel and distributed systems. Topics include research in operating system architectures, clusters, parallel and distributed operating systems, real-time issues, performance, and software engineering issues associated with systems development. An emphasis will be placed on current systems development, future directions, and research topics.

CISD 740 Data Communications and Computer Networking (3 credits)
This course will focus on the theory and application of large-scale resource sharing, applications, and performance infrastructures as required in support of ad-hoc, mobile, and ubiquitous environments. Included in the course topics will be ad-hoc networking, mobile and ubiquitous computing, parallel algorithms, software agents, resource discovery and management, communication, performance management, fault tolerance, and computing services. The course materials will provide a foundation for the study of recent advances and new applications in the expanding field of ad-hoc, mobile, and ubiquitous computing. This course examines the relationship of computer applications to network architecture and subsystems. Current topics are presented, as well as future research trends.

CISD 750 Database Management Systems (3 credits)
Theory and principles of databases and their management. Design, implementation, and traditional and nontraditional applications of database management systems.

CISD 760 Artificial Intelligence (3 credits)
Theory and practice of artificial intelligence and knowledge-based expert systems including issues in knowledge representation, search, heuristics, learning techniques, tools, languages, and programming techniques. Current issues, future directions, and research topics will be explored.

CISD 770 Software Engineering (3 credits)
Covers advanced topics in areas of current research interest in the development of software-intensive systems. Topics include metrics, requirements definition, development life cycles, software engineering processes, reuse, formal methods, verification and validation, and project management.

CISD 792 Computer Graphics (3 credits)
This course will focus on algorithms and techniques that have emerged in the past several years. Topics include basic and advanced modeling and rendering methods, volume and scientific visualization techniques, visual programming languages and environments, and computer animation.

CISD 794 Knowledge Discovery in Databases (3 credits)
This course will study a number of emerging technical approaches to knowledge discovery in databases such as data clustering and summarization, algorithms for learning classification and characteristic rules, finding dependency networks, analyzing changes, detecting anomalies, and their applications. Current issues, future directions, and research topics will be explored.

CISD 799 Special Topics in Computer Science (3 credits)
Covers advanced topics in areas of current research interest in computer science. May include topics in advanced computer architecture, artificial intelligence, distributed database management systems, advanced computer graphics, object-oriented technology, and parallel computation. Topics will vary depending on student and faculty interest. Depending on interest, several special topics courses may be offered concurrently.
CISD 800  Project in Theory and Principles of Programming  (4 credits)
The mathematics of algorithms and the specification of design are the basis for the project to illustrate the benefits of structured models, quantitative documentation, and logical assertions for the interpretation and structure of computer programs. The projects include the use of modern languages to demonstrate the abstract structures necessary for application and system development.

CISD 830  Project in Operating Systems  (4 credits)
Students pursue a research project or implementation on a current topic in operating systems.

CISD 840  Project in Data Communications and Computer Networking  (4 credits)
Students pursue a research or implementation project on a current topic in data communications and computer networking.

CISD 850  Project in Database Management Systems  (4 credits)
Students pursue a research study on a current topic in database systems or complete a database-oriented development project. Some areas of current interest include object-oriented database systems, extended relational DBMS, deductive and logic-based expert database systems, federated or heterogeneous database systems, other high-performance parallel database systems, and advanced conceptual logic database modeling.

CISD 860  Project in Artificial Intelligence  (4 credits)
Students pursue a research or development project in artificial intelligence. Topics of current interest are artificial life, learning technologies (including symbolic learning, neural networks, and genetic algorithms), intelligent agents, natural language processing, deep domain models in expert systems, vision, speech recognition, handwriting recognition, and parallel and distributed artificial intelligence.

CISD 870  Project in Software Engineering  (4 credits)
A research report or implementation is the focus of a student project. Topics of current interest are metrics, formal methods, development life cycles, reuse, object-oriented analysis and design and software engineering for distributed systems.

CISD 892  Project in Computer Graphics  (4 credits)
Students pursue a research or implementation project on a current topic in computer graphics. Topics of interest include basic and advanced modeling and rendering methods, volume and scientific visualization techniques, visual programming languages and environments, computer animation, and virtual reality.

CISD 894  Project in Knowledge Discovery in Databases  (4 credits)
Students pursue a research project or implementation on a current topic in knowledge discovery in databases. The research process for the project includes searching the literature, dissecting the existing methodologies for knowledge discovery in databases, and developing a new approach for knowledge discovery in databases.

CISD 899  Project in Special Topics in Computer Science  (4 credits)
Students pursue a research study, project, or implementation related to the Special Topics in Computer Science course.

CISD 910  Dissertation I  (12 credits)
The student develops a framework within which doctoral research will be conducted and offers evidence of qualifications to pursue the research. Prerequisite: Satisfactory completion of all course work.

CISD 915  Dissertation II  (12 credits)
Concepts and theories underlying the student’s doctoral research are articulated; the problem is clearly stated; specific, measurable goals are specified; a thorough literature review is presented; the methods of conducting the research are delineated; and a strategy to achieve the goal is given. Prerequisite: Dissertation I.

CISD 920  Continuing Dissertation  (6 credits)
Students who have not completed the dissertation by the end of Dissertation II must register for Continuing Dissertation each term in order to receive faculty and administrative advice and support related to the dissertation. Prerequisite: Dissertation II.
Ph.D./Ed.D. in Computing Technology in Education

This program offers a course of study leading to the degree of doctor of philosophy (Ph.D.) or doctor of education (Ed.D.) in computing technology in education. It is offered in both cluster and institute formats, which combine on-campus and online instruction to provide professionals the opportunity to pursue graduate study while continuing to work in their current positions. This program addresses (1) the use of computing technologies to improve cognition; (2) the development, management, and evaluation of computing systems that support the educational process; and (3) the role of computing and other advanced technology in education and training. The program is especially well suited to educational administrators, college faculty members, directors of academic computing, teachers of all grades, district and building technology administrators, industry and armed forces trainers, and instructional system designers and developers. It provides technology-oriented professionals with the knowledge and ability to develop creative solutions to substantive real-world problems. Each student must complete eight courses, four projects, and a dissertation. A student may declare a degree preference (Ph.D. or Ed.D.) at any time during the program. The difference between these degrees is a name difference only. 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. After students complete the course requirements they may apply for the educational specialist (Ed.S.) degree.

Program-Specific Admission Requirements (See Application for Admission for general requirements.)

This program is designed for the student with a master’s degree in education, training and learning, instructional design, educational leadership, or a closely related field. The candidate must have broad experience in computing. Alternatively, GSCIS master’s students in computing technology in education may apply for early admission into the Ph.D./Ed.D. program. (For requirements, see the master’s section of this catalog.)

The Curriculum for the Ph.D./Ed.D. in Computing Technology in Education

The program requires 64 credit hours, of which 40 are for courses and 24 are for the dissertation. Most students take two core/elective courses and one project course per term during the first two years and register for the dissertation in the third year. Students are required to take concurrently the core course and project course in Research Methodology (DCTE 700/800). Core courses, elective courses, project courses, and dissertation registrations are listed below:

Core Courses (three credits each) (All students must take these.)
DCTE700 Research Methodology
DCTE720 Human-Computer Interaction
DCTE730 Online Learning Environments
DCTE740 Telecommunications and Computer Networks
DCTE750 Educational Database Systems
DCTE760 Instruction Delivery Systems
DCTE770 Courseware Design and Development

Elective Courses (three credits each) (Select one of these.)
DCTE747 Learning Theory and Computer Applications
DCTE799 Special Topics in Computing Technology in Education
Project Courses (four credits each) (Select four of these. Must be taken concurrent with, or following completion of, the corresponding core or elective course.)

DCTE800 Project in Research Methodology (required concurrent with DCTE 700)
DCTE820 Project in Human-Computer Interaction
DCTE830 Project in Online Learning Environments
DCTE840 Project in Telecommunications and Computer Networks
DCTE847 Project in Learning Theory and Computer Applications
DCTE850 Project in Educational Database Systems
DCTE860 Project in Instruction Delivery Systems
DCTE870 Project in Courseware Design and Development
DCTE899 Project in Special Topics in Computing Technology in Education

Dissertation Registrations
DCTE910 Dissertation I (12 credits)
DCTE915 Dissertation II (12 credits)
DCTE920 Continuing Dissertation (6 credits)

Course Descriptions for the Ph.D./Ed.D. in Computing Technology in Education

DCTE 700 Research Methodology (3 credits)
An in-depth treatment of the research process from an experimental, developmental, and evaluative perspective is provided. Techniques for planning and designing these types of projects as well as the methodologies for data collection, evaluation, and analysis are examined. Special emphasis is placed on the appropriate choice of methodologies for a variety of problem situations. Corequisite: DCTE 800.

DCTE 720 Human-Computer Interaction (3 credits)
Techniques facilitating effective human-computer interaction are presented. Basic elements, procedures, tools, and environments contributing to the development of a successful user interface are explored. Design principles, guidelines, and methodologies for building, installing, managing, and maintaining interactive systems that optimize user productivity are reviewed. Topics include the multidisciplinary dynamics of human-computer interaction, current and projected developments in HCI research, usability engineering, computer-supported cooperative work, and strategies for implementing and evaluating human-computer dialogues.

DCTE 730 Online Learning Environments (3 credits)
This course covers theory and practice involving online learning systems and online communication processes. It explores models of online learning environments (OLEs) as viable alternatives or supplements to traditional campus or building-based learning. Students will investigate the theoretical, conceptual, instructional, and technical framework of implementing and using OLEs in pursuit of lifelong learning. Relevant issues include the technology infrastructure, program development and administration, and most significantly, the Internet as cyberschool. (The Institute course usually has a collaborative online component.)

DCTE 740 Telecommunications and Computer Networks (3 credits)
This course provides an examination of major developments in the expanding field of broadband communications and computer networks and their impacts on eLearning network design and deployment. Topics include broadband technologies, network architectures and configurations, network security, and transborder eLearning configurations. Distinctive attributes of next-generation research and education networks such as Internet2 and GEANT2 and the role of broadband technologies in supporting eLearning applications and initiatives are described. Trends in standardization and internetworking and advances in wireless and wireline network solutions are explored.

DCTE 747 Learning Theory and Computer Applications (3 credits)
Computing technology is assuming an increasingly dominant role in instructional delivery. In this course, students explore learning theories and how learning is achieved when instruction is presented from a computer-based paradigm. The course examines the value of the computer as a learning device to model learning theories associated with behaviorism, cognitivism, and human information processing. An emphasis will be placed on current issues, future directions, and research topics.
DCTE 750  Educational Database Systems  (3 credits)
Techniques for determining database requirements and managing organizational data resources are examined. Strategies for designing database management systems applications that satisfy specific requirements are presented. Components and architecture of the relational data model are analyzed. Methods for creating and implementing object-oriented information systems are explored. Topics include object-oriented languages, the user interface, databases and expert systems, distributed computing, and the advantages and drawbacks of commercially available DBMS tools and products.

DCTE 760  Instruction Delivery Systems  (3 credits)
This course provides opportunity for independent, creative, innovative exploration and development in teaching and learning in the age of communications. Course content combines experiential learning based in the asynchronous student forum with related scholarly pursuit. Synchronous and asynchronous delivery systems in buildings and in cyberspace will enable the best possible matches between societal needs and instruction delivery. The purpose of this course is to re-engineer education to meet the needs of society, to use any and all technology to devise the best possible learning experiences for learners of all ages.

DCTE 770  Courseware Design and Development  (3 credits)
Students use instructional design methods that include analysis, design, development, implementation, and evaluation. Two courseware applications are developed, a tutorial and a drill and practice. The programs may be constructed with an authoring system or a state-of-the-art, visual programming language. Each application must run on a computer without network or internet connectivity. The courseware applications may be delivered on a zip disk, CD-ROM or DVD. The courseware must be viewable using a web browser or a run-time program.

DCTE 799  Special Topics in Computing Technology in Education  (3 credits)
This course introduces state-of-the-art topics in emerging fields relevant to the program. Topics may cover theory, practice, development, experimentation, assessment, or application. Several special topics courses may be offered concurrently.

DCTE 800  Project in Research Methodology  (4 credits)
Focuses on the collection and analysis of data collected from experimental, developmental, and evaluative studies. Emphasis will be placed on the application of tools and techniques appropriate to the scenario and data type collected. The logical development of decisions based on the data analysis in terms of predefined hypotheses and/or project goals and objectives will be discussed. Corequisite: DCTE 700.

DCTE 820  Project in Human-Computer Interaction  (4 credits)
Students produce a research paper or project on a current topic in HCI. Some topics of current interest include interface quality and evaluation, computer system and computer interface architecture, user and task analysis, advancements in usability engineering, Internet-based user interface design issues, legal and ethical aspects of computing, speech interfaces, agent technology, handheld and wearable technology, and computer-supported cooperative work.

DCTE 830  Project in Online Learning Environments  (4 credits)
Students will produce original work that is grounded in theory and practice on a relevant issue in OLE research. Students will be encouraged to submit their work for potential presentation at conferences or for possible publication related to educational technology and online learning research.

DCTE 840  Project in Telecommunications and Computer Networks  (4 credits)
Students pursue a research study, project, or implementation in telecommunications and computer networks. Specific procedures are subject to the discretion of the course professor.

DCTE 847  Project in Learning Theory and Computer Applications  (4 credits)
Students pursue a research study, project, or implementation in learning theory and computer applications. Specific procedures are subject to the discretion of the course professor.
DCTE 850  Project in Educational Database Systems  (4 credits)
Students pursue a research study, project, or implementation in educational database management systems. Specific procedures are subject to the discretion of the course professor.

DCTE 860  Project in Instruction Delivery Systems  (4 credits)
Students pursue a research study, project or implementation in instruction delivery systems. Specific procedures are subject to the discretion of the course professor.

DCTE 870  Project in Courseware Design and Development  (4 credits)
Students produce an entire courseware evaluation package. Evaluation activities track the four assignments in DCTE 770. A hypothetical representative target population must be used for purposes of beta testing the resulting products. The reports will contain a review of the relevant instructional design literature that focuses on evaluation.

DCTE 899  Project in Special Topics in Computing Technology in Education  (4 credits)
The goal of the project is to extend the learning experience of the accompanying 799 course. Specific procedures are subject to the discretion of the course professor.

DCTE 910  Dissertation I  (12 credits)
The student develops a framework within which doctoral research will be conducted and offers evidence of qualifications to pursue the research. Prerequisite: Satisfactory completion of all course work.

DCTE 915  Dissertation II  (12 credits)
Concepts and theories underlying the student’s doctoral research are articulated; the problem is clearly stated; specific, measurable goals are specified; a thorough literature review is presented; the methods of conducting the research are delineated; and a strategy to achieve the goal is given. Prerequisite: Dissertation I.

DCTE 920  Continuing Dissertation  (6 credits)
Students who have not completed the dissertation by the end of Dissertation II must register for Continuing Dissertation each term in order to receive faculty and administrative advice and support related to the dissertation. Prerequisite: Dissertation II.

Ph.D. in Information Science

This program offers a course of study leading to the degree of doctor of philosophy (Ph.D.) in information science. This is an interdisciplinary program drawing on the fields of information systems and computing technology in education. It is offered in both cluster and institute formats, which combine traditional and online instruction to provide professionals the opportunity to pursue graduate study while continuing to work in their current positions. The program focuses on information organization and retrieval, which have evolved into issues of enormous importance in light of the continued rapid developments in computing technology. The program is especially well suited to professionals working in a library or information center environment in education, business, government, or industry. It provides research- and technology-oriented professionals the knowledge and ability to develop creative solutions to substantive real-world problems in information science. Each student must complete eight courses, four projects, and a dissertation.

Program-Specific Admission Requirements  (See Application for Admission for general requirements.)

This program is designed for the student with a master’s degree in information systems, information science, library science, computer education, or a closely related area. The candidate must have a significant amount of experience using computer applications and the Internet. Alternatively, GSCIS master’s degree students may apply for early admission into the Ph.D. program. (For requirements, see the master’s section of this catalog.)
The Curriculum for the Ph.D. in Information Science

The program requires 64 credit hours, of which 40 are for courses and 24 are for the dissertation. Most students take two core/elective courses and one project course per term during the first two years and register for the dissertation in the third year. Courses and dissertation registrations are as follows:

**Core Courses** (three credits each) (All students must take these.)
- DCTE720 Human-Computer Interaction
- DISC 725 Online Information Systems
- DISC 735 Knowledge Management
- DCTE740 Telecommunications and Computer Networks
- DISS 770 Information Policy

**Elective Courses** (three credits each) (Select three of these.)
- DCTE700 Research Methodology (DCTE 800 must be taken concurrently)  
  or DISS 700 Research Methodology
- DCTE730 Online Learning Environments
- DCTE750 Educational Database Systems
- DISS 755 Information Security
- DCTE760 Instruction Delivery Systems
- DISC 799 Special Topics in Information Science (offered on various subjects)

**Project Courses** (four credits each) (Select four of these. Must be taken concurrent with, or following completion of, the corresponding core or elective course.)
- DCTE800 Project in Research Methodology (must be taken concurrent with DCTE 700)  
  or DISS 800 Project in Research Methodology (must be taken concurrent with DISS 700)
- DCTE820 Project in Human-Computer Interaction
- DISC 825 Project in Online Information Systems
- DCTE830 Project in Online Learning Environments
- DISC 835 Project in Knowledge Management
- DCTE840 Project in Telecommunications and Computer Networks
- DCTE850 Project in Educational Database Systems
- DISS 855 Project in Information Security
- DCTE860 Project in Instruction Delivery Systems
- DISS 870 Project in Information Policy
- DISC 899 Project in Special Topics in Information Science

**Dissertation Registrations**
- DISC 910 Dissertation I (12 credits)
- DISC 915 Dissertation II (12 credits)
- DISC 920 Continuing Dissertation (6 credits)

**Course Descriptions for the Ph.D. in Information Science**

**DCTE 700 Research Methodology** (3 credits)
An in-depth treatment of the research process from an experimental, developmental, and evaluative perspective is provided. Techniques for planning and designing these types of projects as well as the methodologies for data collection, evaluation, and analysis are examined. Special emphasis is placed on the appropriate choice of methodologies for a variety of problem situations. Corequisite: DCTE 800.
DISS 700  Research Methodology  (3 credits)
This course presents an in-depth treatment of the research process from an experimental, developmental, and evaluative perspective. Techniques for planning and designing these types of research projects, as well as the methodologies for data collection, evaluation, and analysis are examined. Special emphasis is placed on the appropriate choice of methodologies for a variety of problem situations.

DCTE 720  Human-Computer Interaction  (3 credits)
Techniques facilitating effective human-computer interaction are presented. Basic elements, procedures, tools, and environments contributing to the development of a successful user interface are explored. Design principles, guidelines, and methodologies for building, installing, managing, and maintaining interactive systems that optimize user productivity are reviewed. Topics include the multidisciplinary dynamics of human-computer interaction, current and projected developments in HCI research, usability engineering, computer-supported cooperative work, and strategies for implementing and evaluating human-computer dialogues.

DISC 725  Online Information Systems  (3 credits)
The evolution, design, and structure of online information systems. Principles, concepts, and techniques for information retrieval. Topics include the methodology of the search process, bibliometrics, the World Wide Web, user interface design and considerations, hypermedia, and related technologies, as well as information standards. Trends in system enhancements, use of online services for information retrieval, electronic document delivery, electronic publishing, and end-user training and support. Problems and issues associated with electronic information access and delivery.

DCTE 730  Online Learning Environments  (3 credits)
This course covers theory and practice involving online learning systems and online communication processes. It explores models of online learning environments (OLEs) as viable alternatives or supplements to traditional campus or building-based learning. Students will investigate the theoretical, conceptual, instructional, and technical framework of implementing and using OLEs in pursuit of lifelong learning. Relevant issues include the technology infrastructure, program development and administration, and most significantly, the Internet as cyberschool. (The Institute course usually has a collaborative online component.)

DISC 735  Knowledge Management  (3 credits)
Principles of knowledge management and their use in locating, evaluating, disseminating, and using information and knowledge. Application of these principles and techniques through the use of rapidly evolving information/communication technologies is delineated in the context of a flexible and responsive organizational structure. This nexus, which can promote innovation, improve efficiency and effectiveness, and provide a sustainable competitive advantage in today’s global environment, is outlined.

DCTE 740  Telecommunications and Computer Networks  (3 credits)
This course provides an examination of major developments in the expanding field of broadband communications and computer networks and their impacts on eLearning network design and deployment. Topics include broadband technologies, network architectures and configurations, network security, and transborder eLearning configurations. Distinctive attributes of next-generation research and education networks such as Internet2 and GEANT2 and the role of broadband technologies in supporting eLearning applications and initiatives are described. Trends in standardization and internetworking and advances in wireless and wireline network solutions are explored.

DCTE 750  Educational Database Systems  (3 credits)
Techniques for determining database requirements and managing organizational data resources are examined. Strategies for designing database management systems applications that satisfy specific requirements are presented. Components and architecture of the relational data model are analyzed. Methods for creating and implementing object-oriented information systems are explored. Topics include object-oriented languages, the user interface, databases and expert systems, distributed computing, and the advantages and drawbacks of commercially available DBMS tools and products.

DISS 755  Information Security  (3 credits)
Security policies, models, and mechanisms for secrecy, integrity, and availability. Topics will include threats to information systems, information security policies and management issues, the evaluation of secure information
systems, encryption and authentication, network security, requirements analysis, and the practical problems that have to be solved in order to make those technologies workable in a networked environment. Emphasis on current issues, future directions, and research areas.

**DCTE 760 Instruction Delivery Systems** (3 credits)
This course provides opportunity for independent, creative, innovative exploration and development in teaching and learning in the age of communications. Course content combines experiential learning based in the asynchronous student forum with related scholarly pursuit. Synchronous and asynchronous delivery systems in buildings and in cyberspace will enable the best possible matches between societal needs and instruction delivery. The purpose of this course is to re-engineer education to meet the needs of society, to use any and all technology to devise the best possible learning experiences for learners of all ages.

**DISS 770 Information Policy** (3 credits)
Information technology’s dramatic global impact on society, government, and the economy has given rise to complex legal, regulatory, and policy issues. This course explores issues ranging from the consequences of information commodification to the impact of privacy concerns, eCommerce, information ownership (patents/copyrights/trademarks), social equity, crime, free speech, telecommunications, national security, international trade, etc. All have immediate relevance to the IT workplace. While U.S. policy issues serve as the framework for the course, the U.S. experience is compared and contrasted to policy developments worldwide.

**DISC 799 Special Topics in Information Science** (3 credits)
Advanced topics in areas of current research interest in information science. May include topics such as the virtual library, network security, the emerging national information infrastructure (NII), Internet issues, and design/implementation of information system services and applications. Topics will vary depending on student and faculty interest.

**DCTE 800 Project in Research Methodology** (4 credits)
Focuses on the collection and analysis of data collected from experimental, developmental, and evaluative studies. Emphasis will be placed on the application of tools and techniques appropriate to the scenario and data type collected. The logical development of decisions based on the data analysis in terms of predefined hypotheses and/or project goals and objectives will be discussed. Corequisite: DCTE 700.

**DISS 800 Project in Research Methodology** (4 credits)
This course focuses on the application of tools and techniques appropriate to the scenario and data type collected from experimental, developmental, and evaluative studies. The logical development of decisions based on the data analysis in terms of predefined hypotheses and/or project goals and objectives will be discussed.

**DCTE 820 Project in Human-Computer Interaction** (4 credits)
Students produce a research paper or project on a current topic in HCI. Some topics of current interest include interface quality and evaluation, computer system and computer interface architecture, user and task analysis, advancements in usability engineering, Internet-based user interface design issues, legal and ethical aspects of computing, speech interfaces, agent technology, handheld and wearable technology, and computer-supported cooperative work.

**DISC 825 Project in Online Information Systems** (4 credits)
Students pursue a research study, project, or implementation in online information systems. Specific procedures are subject to the discretion of the course professor.

**DCTE 830 Project in Online Learning Environments** (4 credits)
Students pursue a research study, project, or implementation in online learning environments. Specific procedures are subject to the discretion of the course professor.

**DISC 835 Project in Knowledge Management** (4 credits)
Students pursue a research study, project, or implementation in knowledge management. Specific procedures are subject to the discretion of the course professor.
DCTE 840  Project in Telecommunications and Computer Networks  (4 credits)
Students pursue a research study, project, or implementation in telecommunications and computer networks. Specific procedures are subject to the discretion of the course professor.

DCTE 850  Project in Educational Database Systems  (4 credits)
Students pursue a research study, project, or implementation in educational database management systems. Specific procedures are subject to the discretion of the course professor.

DISS 855  Project in Information Security  (4 credits)
Students will pursue a research project or implementation on a current topic in information security and assurance. Topics: security-related applications and systems, vulnerability analysis, information security policies and management issues, security audits, and secure eCommerce.

DCTE 860  Project in Instruction Delivery Systems  (4 credits)
Students pursue a research study, project or implementation in instruction delivery systems. Specific procedures are subject to the discretion of the course professor.

DISS 870  Project in Information Policy  (4 credits)
Students pursue a research study, project, or implementation in information policy. Specific procedures are subject to the discretion of the course professor.

DISC 899  Project in Special Topics in Information Science  (4 credits)
Students pursue a research study, project, or implementation in special topics in information science. Specific procedures are subject to the discretion of the course professor.

DISC 910  Dissertation I  (12 credits)
The student develops a framework within which doctoral research will be conducted and offers evidence of qualifications to pursue the research. Prerequisite: Satisfactory completion of all course work.

DISC 915  Dissertation II  (12 credits)
Concepts and theories underlying the student’s doctoral research are articulated; the problem is clearly stated; specific, measurable goals are specified; a thorough literature review is presented; the methods of conducting the research are delineated; and a strategy to achieve the goal is given. Prerequisite: Dissertation I.

DISC 920  Continuing Dissertation  (6 credits)
Students who have not completed the dissertation by the end of Dissertation II must register for Continuing Dissertation each term in order to receive faculty and administrative advice and support related to the dissertation. Prerequisite: Dissertation II.

Ph.D. in Information Systems

This program offers a course of study leading to the degree of doctor of philosophy (Ph.D.) in information systems. It is offered in both cluster and institute formats, which combine traditional and online instruction to provide professionals the opportunity to pursue graduate study while continuing to work in their current positions. The program is especially well suited to professionals working in areas such as information system planning, systems analysis and design, project management, information system administration, or software engineering. It provides technology-oriented professionals with the knowledge and ability to develop creative solutions to substantive real-world problems in information systems. Each student must complete eight courses, four projects, and a dissertation.

Program-Specific Admission Requirements  (See Application for Admission for general requirements.)

This program is designed for the student with a master’s degree in information systems, information science, computer science, or a related area. The applicant should satisfy graduate prerequisites or have
equivalent experience in information systems, programming languages, database systems, systems analysis and design, and telecommunications and computer networks. Alternatively, GSCIS master’s students in information systems may apply for early admission into the Ph.D. program. (For requirements, see the master’s section of this catalog.)

The Curriculum for the Ph.D. in Information Systems

The program requires 64 credit hours, of which 40 are for courses and 24 are for the dissertation. Most students take two core courses and one project course per term during the first two years and register for the dissertation in the third year. Courses and dissertation registrations are as follows:

Core Courses (three credits each) (Select eight of these.)
DISS 700 Research Methodology  
DISS 710 Decision Support Systems  
DISS 720 Human-Computer Interaction  
DISS 725 The System Development Process  
DISS 740 Telecommunications and Computer Networks  
DISS 745 Electronic Commerce  
DISS 750 Database Systems  
DISS 755 Information Security  
DISS 770 Information Policy  
DISS 791 Client-Server Computing  
DISS 792 Enterprise Architecture Infrastructures Planning and Management  
DISS 799 Special Topics in Information Systems (offered on various subjects)

Project Courses (four credits each) (Select four of these. Must be taken concurrent with, or following completion of, the corresponding core course.)
DISS 800 Project in Research Methodology  
DISS 810 Project in Decision Support Systems  
DISS 820 Project in Human-Computer Interaction  
DISS 825 Project in the System Development Process  
DISS 840 Project in Telecommunications and Computer Networks  
DISS 845 Project in Electronic Commerce  
DISS 850 Project in Database Systems  
DISS 855 Project in Information Security  
DISS 870 Project in Information Policy  
DISS 891 Project in Client-Server Computing  
DISS 892 Project in Enterprise Architecture Infrastructures Planning and Management  
DISS 899 Project in Special Topics in Information Systems

Dissertation Registrations
DISS 910 Dissertation I (12 credits)  
DISS 915 Dissertation II (12 credits)  
DISS 920 Continuing Dissertation (6 credits)

Course Descriptions for the Ph.D. in Information Systems

DISS 700 Research Methodology (3 credits)
This course presents an in-depth treatment of the research process from an experimental, developmental, and evaluative perspective. Techniques for planning and designing these types of research projects, as well as the methodologies for data collection, evaluation, and analysis are examined. Special emphasis is placed on the appropriate choice of methodologies for a variety of problem situations.
DISS 710 Decision Support Systems (3 credits)
Structure, functions, capabilities, and limitations of decision support systems (DSS) are discussed. Development tools and techniques for constructing DSS are investigated. The focus is on automatic support for decision making and organizational problem solving. Topics include decision theory, modeling and simulation, decision support system architecture, group decision support systems, knowledge-based expert systems, and intelligent systems.

DISS 720 Human-Computer Interaction (3 credits)
Issues relating to effective human-computer interaction are presented. Basic elements, procedures, tools, and environments contributing to the development of successful user interfaces are explored. User interface design principles, guidelines, and methodologies are reviewed. Other topics include the multidisciplinary dynamics of human-computer interaction as a field of study, current and projected developments in HCI research, and usability engineering.

DISS 725 The System Development Process (3 credits)
System life-cycle models, application development strategies, and feasibility assessment. Techniques, methods, and tools for the analysis and specification of information systems. Design principles including abstraction, modularity, encapsulation, information hiding, and reusability. Quality factors. Contemporary design methods and tools, including object-oriented design and function-oriented design. Study of the verification and validation process. Integration and acceptance testing. Reliability measurement. Software testing techniques. Test of concurrent and real-time systems. Techniques for managing hardware, software, communications, distributed applications, multimedia systems, and end-user computing. Approaches to project planning, managing change and innovation, and facilitating computer and communications security.

DISS 740 Telecommunications and Computer Networks (3 credits)
This course features an examination of technical advances in the dynamic field of broadband communications and computer networks and their impacts on the development and implementation of enterprise network solutions. IS methodologies facilitating network design, deployment, and management are described. Topics include broadband technologies, DWDM, IPv6, 10 Gigabit Ethernet, 3G wireless configurations, ubiquitous computing, ad hoc networking, IP networks, network security, and grid initiatives. Trends in standardization and internetworking are highlighted. Capabilities of next-generation networks and innovations in enterprise broadband network solutions are explored.

DISS 745 Electronic Commerce (3 credits)
This course examines the theories, frameworks and methodologies used to study the strategic impact of electronic commerce on systems, organizations, and markets. The goal of the course is to provide doctoral students with the necessary background knowledge to appreciate eCommerce research in the IS field and to develop academic research proposals.

DISS 750 Database Systems (3 credits)
Theory and principles of databases and their management. Design, implementation, and traditional and nontraditional applications of database management systems. Emphasis will be placed on current issues, future directions, and research topics.

DISS 755 Information Security (3 credits)
A study of security policies, models, and mechanisms for secrecy, integrity, and availability. Topics include threats to information systems, information security policies and management issues, the evaluation of secure information systems, encryption and authentication, network security, requirements analysis, and the practical problems that have to be solved in order to make those technologies workable in a networked environment. Emphasis on current issues, future directions, and research areas.

DISS 770 Information Policy (3 credits)
Information technology’s dramatic global impact on society, government, and the economy has given rise to complex legal, regulatory, and policy issues. This course explores issues ranging from the consequences of information commodification to the impact of privacy concerns, eCommerce, information ownership (patents/copyrights/trademarks), social equity, crime, free speech, telecommunications, national security,
international trade, etc. All have immediate relevance to the IT workplace. While U.S. policy issues serve as the framework for the course, the U.S. experience is compared and contrasted to policy developments worldwide.

**DISS 791 Client-Server Computing** (3 credits)
This course provides current techniques and research that apply to enterprise-wide software design, development and implementation strategies. Focus is on the planning and management of information systems development in distributed business environments. This course applies both a pragmatic and research focus directed towards the issues involved in application integration and process management. Covered are both the technical and organizational issues related to enterprise-wide software design, development, and management. Additionally, the distributed application and system relationship is explored from an internal and external perspective.

**DISS 792 Enterprise Architecture Infrastructures Planning and Management** (3 credits)
This course provides current techniques and research that apply to the creation, maintenance, and refinement of the strategic planning disciplines essential to enterprise infrastructures. Enterprise strategy, architecture, and management issues are explored with a pragmatic and research approach. Best practices are refined to present architectural models that are capable of managing dynamic business requirements and technology demands. Infrastructure issues are aligned with business strategy to deliver current and future solutions to the business management process. Prerequisite: DISS 791.

**DISS 799 Special Topics in Information Systems** (3 credits)
Covers advanced topics in areas of current research interest in information systems. May include topics such as client-server computing, distributed database systems, advanced computer graphics, object-oriented technology, the integration of networks and operating systems, ATM-based networks (asynchronous transfer mode), computer and network security, and parallel computation. Topics will vary depending on student and faculty interest.

**DISS 800 Project in Research Methodology** (4 credits)
This course focuses on the application of tools and techniques appropriate to the scenario and data type collected from experimental, developmental, and evaluative studies. The logical development of decisions based on the data analysis in terms of predefined hypotheses and/or project goals and objectives will be discussed.

**DISS 810 Project in Decision Support Systems** (4 credits)
Completion of a research paper or project in the area of decision support systems. Some topics of current interest include comparisons of decision support aids, the relationship between decision support systems and expert systems, DSS hardware and software, group DSS, distributed DSS and data communications, and human problem solving through DSS.

**DISS 820 Project in Human-Computer Interaction** (4 credits)
Students produce a research paper or project on a current topic in HCI. Some topics of interest include interface quality and evaluation, computer system and computer interface architecture, Internet-based user interface design issues, legal and ethical aspects of computing, speech interfaces, and computer-supported cooperative work.

**DISS 825 Project in the System Development Process** (4 credits)
Students pursue a research study, project, or implementation in the system development process. Specific procedures are subject to the discretion of the course professor.

**DISS 840 Project in Telecommunications and Computer Networks** (4 credits)
Students pursue a research study, project, or implementation in computer networks and telecommunications. Specific procedures are subject to the discretion of the course professor.

**DISS 845 Project in Electronic Commerce** (4 credits)
Students pursue a research study or project in electronic commerce. Specific procedures are subject to the discretion of the course professor.
DISS 850  Project in Database Systems  (4 credits)
Students pursue a research study on a current topic in database systems or complete a database-oriented development project. Some areas of current interest include object-oriented database systems, extended relational DBMS, federated or heterogeneous database systems, high-performance parallel database systems, and advanced conceptual logic database modeling.

DISS 855  Project in Information Security  (4 credits)
Students pursue a research project or implementation on a current topic in information security: security-related applications and systems, vulnerability analysis, information security policies and management issues, security audits, and secure eCommerce.

DISS 870  Project in Information Policy  (4 credits)
Students pursue a research study, project, or implementation in information policy. Specific procedures are subject to the discretion of the course professor.

DISS 891  Project in Client-Server Computing  (4 credits)
Students pursue a research project or implementation on a current topic in client-server/distributed systems. Specific procedures are subject to the discretion of the course professor.

DISS 892  Project in Enterprise Architecture Infrastructures Planning and Management  (4 credits)
Students pursue a research project or implementation on a current topic in enterprise architecture infrastructures. Specific procedures are subject to the discretion of the course professor.

DISS 899  Project in Special Topics in Information Systems  (4 credits)
Students pursue a research study, project, or implementation in special topics in information systems. Specific procedures are subject to the discretion of the course professor.

DISS 910  Dissertation I  (12 credits)
The student develops a framework within which doctoral research will be conducted and offers evidence of qualifications to pursue the research. Prerequisite: Satisfactory completion of all course work.

DISS 915  Dissertation II  (12 credits)
Concepts and theories underlying the student’s doctoral research are articulated; the problem is clearly stated; specific, measurable goals are specified; a thorough literature review is presented; the methods of conducting the research are delineated; and a strategy to achieve the goal is given. Prerequisite: Dissertation I.

DISS 920  Continuing Dissertation  (6 credits)
Students who have not completed the dissertation by the end of Dissertation II must register for Continuing Dissertation each term in order to receive faculty and administrative advice and support related to the dissertation. Prerequisite: Dissertation II.

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. Associate 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.

William L. Hafner, Ph.D., Nova Southeastern University. Associate 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. Broadband communications technologies, next-generation networks, ad hoc networking, grid computing, enterprise network solutions, eLearning, network security.

Frank Mitropoulos, Ph.D., Nova Southeastern University. Assistant Professor. Programming languages, data structures, software engineering, object-oriented design.

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. Associate Professor. Electronic commerce, decision support systems, security, privacy and trust in online environments, economics of information systems.

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

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Research and Planning
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**Reference List**


**Minimum 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 GSCIS 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
- 128 megabytes of RAM (256MB or higher preferred)
- CD-ROM
- 30GB hard drive (40GB 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**
- G3 processor, G4 recommended
- 128 megabytes of RAM (256MB or higher preferred)
- CD-ROM
- 30GB hard drive (40GB or higher preferred)
- 1024 x 768 or higher display resolution, thousands of colors
- Full duplex sound with a microphone
- System 10.1 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 6.0 or higher
• Microsoft Office 2000 or higher
• Proprietary browser versions (those not downloaded directly from Netscape or Microsoft) may not work reliably with GSCIS online systems. If you use other office type programs, please note that some professors may require you to convert your files to an 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