Nova Southeastern University

Graduate School of Computer and Information Sciences

Graduate Catalog

2008–2009

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

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August 22, 2008

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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 supercedes 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 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 associate's, bachelor's, master's, 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.

Published Aug. 22, 2008, revised (calendars only) Feb. 11, 2009

Master's Programs

Summer 2008 (Jun 23 – Sep 12, 08) Term: 200910

Apr 28–Jun 13, 08	Registration period (no late fees)
Jun 14–Jun 23, 08	Late registration period (late fees)
Jun 23, 08	First day of term
Jun 28, 08	Drop/add deadline
Jul 4, 08	Holiday
Aug 1, 08	Last day to withdraw from a course with a final grade of W
Aug 30, 08	Last day to request an Incomplete
Sep 1, 08	Holiday
Sep 12, 08	Last day of term

Fall 2008 (Sep 15 – Dec 5, 08) Term Code: 200920

Jul 21–Sep 5, 08	Registration period
Sep 6–Sep 15, 08	Late registration period
Sep 15, 08	First day of term
Sep 20, 08	Drop/add deadline
Sep 30, 08	Holiday
Oct 9, 08	Holiday
Oct 24, 08	Last day to withdraw from a course with a final grade of W
Nov 22, 08	Last day to request an Incomplete
Nov 27–28, 08	Holiday
Dec 5, 08	Last day of term

Winter 2009 (Jan 5 – Mar 27, 09) Term Code: 200930

Nov 10–Dec 26, 08	Registration period (no late fees)
Dec 27 08–Jan 5, 09	Late registration period (late fees)
Jan 5, 09	First day of term
Jan 10, 09	Drop/add deadline
Jan 19, 09	Holiday
Feb 13, 09	Last day to withdraw from a course with a final grade of W
Mar 14, 09	Last day to request an Incomplete
Apr 10, 09	Holiday
Mar 27, 09	Last day of term

Spring 2009 (Mar 30 – Jun 19, 09) Term: 200940

Feb 2–Mar 20, 09	Registration period (no late fees)
Mar 21–Mar 30, 09	Late registration period (late fees)
Mar 30, 09	First day of term
Apr 4, 09	Drop/add deadline
May 8, 09	Last day to withdraw from a course with a final grade of W
May 25, 09	Holiday
Jun 6, 09	Last day to request an Incomplete
Jun 19, 09	Last day of term

Doctoral Programs, Cluster Format

Fall 2008 (Sep 12, 08 – Feb 11, 09) Term Code: 200920

Before Aug 29, 08	Registration period (no late fees)
Aug 29–Sep 12, 08	Late registration period (late fees)
Sep 11, 08	New student orientation
Sep 12, 08	First day of term
Sep 12–14, 08	First meeting dates
Sep 13, 08	Drop/add deadline
Nov 26, 08	Last day to withdraw from a course with a final grade of W
Dec 5–7, 08	Second meeting dates
Jan 29, 09	Last day to request an Incomplete
Feb 11, 09	Last day of term

Spring 2009 (Mar 6 – Aug 5, 09) Term Code: 200940

Before Feb 20, 09	Registration period (no late fees)
Feb 20–Mar 6, 09	Late registration period (late fees)
Mar 5, 09	New student orientation
Mar 6, 09	First day of term
Mar 6–8, 09	First meeting dates
Mar 7, 09	Drop/add deadline
May 20, 09	Last day to withdraw from a course with a final grade of W
Jun 5–7, 09	Second meeting dates
Jul 23, 09	Last day to request an Incomplete
Aug 5, 09	Last day of term

Doctoral Programs, Institute Format

Summer 2008 (Jul 13 – Dec 12, 08) Term Code: 200910

Before Jun 27, 08	Registration period (no late fees)
Jun 27–Jul 13, 08	Late registration period (late fees)
Jul 12, 08	New student orientation
Jul 13, 08	First day of term
Jul 13–18, 08	Meeting dates
Jul 14, 08	Drop/add deadline
Sep 26, 08	Last day to withdraw from a course with a final grade of W
Nov 29, 08	Last day to request an Incomplete
Dec 12, 08	Last day of term

Winter 2009 (Jan 4 – Jun 5, 08) Term Code: 200930

Before Dec 19, 08	Registration period (no late fees)
Dec 19, 08–Jan 4, 09	Late registration period (late fees)
Jan 3, 09	New student orientation
Jan 4, 09	First day of term
Jan 4–9, 09	Meeting dates
Jan 5, 09	Drop/add deadline
Mar 20, 09	Last day to withdraw from a course with a final grade of W
May 23, 09	Last day to request an Incomplete
Jun 5, 09	Last day of term

CONTENTS

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, online, and at distant sites. 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 330 acre campus in Fort Lauderdale, Florida, NSU has more than 27,000 students and is the largest private, non-profit university in the Southeast United States. It is the sixth 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 following four libraries: the Alvin Sherman Library, Research, and Information Technology Center; the Shepard Broad Law Library and Technology Center; The William S. Richardson Ocean Science Library; and the Health Professions Division Library. The NSU libraries' online catalog, NovaCat, is accessible to students and faculty members wherever they may be located. Online subscription databases complement the print 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 five-story, 325,000 square-foot facility, the largest library structure in Florida, has 1,000 user seats, 20 electronic classrooms and a 500-seat auditorium.

Nova Southeastern University has produced more than 100,000 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:

- Forty 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, 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

Mission Statement The Graduate School of Computer and Information Sciences conducts basic and applied research and provides outstanding programs of graduate study in computer science, information technology, information systems, information security, and educational technology. The school's students learn to become reflective scholars and professionals with a critical understanding of theory and practice. The school strives to meet the needs of a diverse student population using computing technologies and effective methods of on-campus and online delivery.

A major force in educational innovation, the Graduate School of Computer and Information Sciences (GSCIS) provides educational programs of distinction to prepare students for leadership roles in information technology. Its strengths include a distinguished faculty, a cutting edge curriculum, and flexible online and campus-based formats for its six M.S. and four Ph.D. programs as well as for its graduate certificate programs 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 Ph.D. program requires only four weekend or two weeklong campus visits each year.

Widely recognized as a leader in online education, the school began offering online graduate programs in 1983 and created the first electronic classroom in 1984. It now offers more than 300 online classes annually.

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 (NSA) and the Department of Homeland Security. The school's curriculum in information security has been certified by NSA for compliance with the national standards of the Committee on National Security Systems (CNSS). Collaborative programs include 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), one of 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 concentrations or graduate certificate options which may require additional courses. Terms are 12 weeks long, and there are four terms each year. They start in September, January, April, and June. The school's M.S. students may apply for early admission into the Ph.D. program, which provides the opportunity to earn the doctorate in a shorter time.

Depending on the program, Ph.D. 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 Ph.D. terms are five months long.

Online students use the web to access course materials, announcements, email, distance library services, subscription library databases, 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, email, and other online tools. 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 concentration in information security)
- Computer Science
- Computing Technology in Education (optional concentration in information security)
- Information Security
- Information Technology (concentrations in software development, information system security, educational technology, information security management, and information technology management)
- Management Information Systems (optional concentration in information security)

Doctor of Philosophy (Ph.D.)

- Computer Information Systems (optional concentration in information security)
- Computer Science
- Computing Technology in Education
- Information Systems (optional concentrations in information science or information security)

Graduate Certificates

- Information Security (see the sections M.S. in Information Security, M.S. in Computer Information Systems, M.S. in Information Technology, and M.S. in Management Information Systems)

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 on individual faculty web pages.

Student Organizations

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

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 benefits such as technical publications, career development, and financial services.

Application for Admission

Requirements and procedures for admission are specified in the section Master's Degree and Certificate Programs or the section Ph.D. Programs.

Library Resources

The university's library system (www.nova.edu/library) is composed of the following four libraries: the Alvin Sherman Library, Research, and Information Technology Center; the Health Professions Division Library; the Shepard Broad Law Library and Technology Center; and the William S. Richardson Ocean Science Library. The NSU libraries' online catalog, NovaCat, is accessible to students and faculty members wherever they may be located. NSU libraries provide access to more than 200 subscription databases and provide online access to a variety of full-text resources including 20,000 unduplicated full-text journals, 260,000 dissertations, 70,000 ERIC ED documents, and 27,000 ebooks. Students are able to obtain books and periodicals quickly and efficiently, and have access to more than 10 million books through NSU's libraries and 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 email. These services are provided by the Alvin Sherman Library's Document Delivery Department, 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. Print materials sent to students in the United States are sent by first-class mail. Print materials sent to international students are sent via DHL when necessary. Students also may call the Alvin Sherman Library's Reference Desk at 800-541-6682, ext. 24613 for reference information, advice on research strategies and resources, and suggestions on other library resources that may be of use. The desk is staffed 86 hours per week. Students may also email questions to refdesk@nova.edu.

The school provides orientations for its new students before the start of their first term. In addition, a tutorial and subject guides for students of the Graduate School of Computer and Information Sciences may be accessed from the school's home page (www.scis.nova.edu) by selecting "Visit the Library" from the list on the left side of the page. For general assistance on use of the library, visit NSU's library help page: www.nova.edu/library/help. For training/workshops, visit www.nova.edu/library/help/libtraining.html.

The university continues to expand its library system to meet the needs of its growing community. For example, the 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 NSU's *2008–2009 Student Handbook.* Student requests for accommodation based on ADA will be considered on an individual basis. Students with disabilities should discuss their needs with their academic advisors before the commencement of classes if possible.

Financial Information

Tuition and Fees

See the sections Master's Degree and Certificate Programs, and Ph.D. Programs.

Responsibility for Payment of Tuition and Fees

Once registered, students are personally responsible for the payment of their tuition and fees. Returned checks, cancelled credit cards, employer or agency refusal to pay, ineligibility for financial aid, and other reasons for non-payment may result in a direct bill to the student, and/or referral to a collection agency.

Payment and refund policies are based on the view that a student registering for a class is reserving a place in that class and that tuition and fees cover the opportunity to secure that place in the class. Since no other person can purchase that place, the student is responsible for the tuition and fees associated with it. Simply not attending does not constitute a reason for non-payment.

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 advisors 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/cwis/finaid. Students must work directly with the university's Office of Student Financial Assistance because the school's program office does not administer or manage the financial aid process. (A representative of this office resides in the school's program office.) 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 Options

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 options are 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

Three types of policies apply to students of the Graduate School of Computer and Information Sciences:

1. *University-wide policies* These apply to all NSU students and are contained in NSU's *2008–2009 Student Handbook* (http://www.nova.edu/cwis/studentaffairs/forms/ustudenthandbook.pdf). Where appropriate, some of these policies are referenced or repeated in this catalog.
2. *School-specific academic policies* These apply to all students of the Graduate School of Computer and Information Sciences and are contained in the next section of this catalog.
3. *Program-specific policies* These apply to the specific degrees or programs and are contained in the following sections of this catalog: (a) Master's Degree and Certificate Programs; and (b) Ph.D. Programs.

School-Specific Academic Policies for all Programs

Writing Skills and Form and Style Requirements

Students must demonstrate proficiency in the use of the English language. Grammatical errors, spelling errors, and writing that fails to express ideas clearly will affect their grades and the completion of their academic programs. The faculty will not provide remedial help concerning grammatical errors or other writing difficulties. It is the student's responsibility to proofread and edit his or her work which, in both form and content, should be letter-perfect. Work that is not properly edited will be rejected. It is university policy that students must submit their own work, not that of another person. Consequently, they should refrain from using outside editors to revise their work.

For an individual course, the course professor will specify form and style requirements in the course syllabus. For the M.S. thesis, students must follow the guidance of their thesis advisors. Ph.D. students must follow the policies, procedures, and formatting requirements contained in the school's *Dissertation Guide* (2006) for the planning and preparation of the dissertation, as well as the guidance of their dissertation advisors. M.S. and Ph.D. students may find the *Dissertation Guide* helpful in the preparation of other work.

Several books contain general guidelines for form, style, and writing. *On Writing Well* (Zinsser, 2006) is an excellent guide to clear, logical, and organized writing. *The Elements of Style* (Strunk & White, 2000) is a compact handbook on the basic principles of composition, grammar, word usage and writing style. The *Publication Manual of the American Psychological Association* (APA) (2001), a comprehensive handbook on writing for publication, addresses editorial style, grammar, and organization. Give particular attention to Chapter 1, Content and Organization of a Manuscript; Chapter 2, Expressing Ideas and Reducing Bias in Language; and Chapter 3, APA Editorial Style. Chapter 2 also has good advice on writing style and grammar. Another excellent handbook on writing for publication is *The Chicago Manual of Style* (2003). The APA manual and the Chicago manual contain guidance on punctuation, spelling, capitalization, abbreviations, quotations, numbers, statistical and mathematical material, tables, figures, footnotes, appendixes, and reference citations in text. Students should use a good dictionary such as *Merriam-Webster's Collegiate Dictionary* (11th ed.).

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 involving human subjects falls into the exempt category, which requires a rather simple process, but it must be logged appropriately. Doctoral students doing such research should contact the GSCIS IRB representative by the time they start working on their dissertation proposals. Additional information can be found at http://www.scis.nova.edu/doctoral.html.

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/irb.

Standards of Academic Integrity

For the university-wide policy on academic standards, see the section Code of Student Conduct and Academic Responsibility in NSU's *2008–2009 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 and academic work)
- Not engage in cheating (e.g., giving or receiving help during examinations; acquiring and/or transmitting test questions prior to an examination; or 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 the next section *Crediting the Words or Ideas of Others*)
- Not use or consult paper writing services, software coding services, or similar services for the purpose of obtaining assistance in the preparation of materials to be submitted for course assignments or for theses or dissertations.
- Not commit plagiarism (*Merriam-Webster's Collegiate Dictionary* (2004) 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 others, but such thoughts or words must be identified using quotation marks or indentation and must properly identify the source (see the previous section *Crediting the Words or Ideas of Others*). 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 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, or remediation.

Student Participation in Extracurricular Research

Research is a critical component in maintaining the quality of educational programs. Research may require the collection of data from human subjects. 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.

Grading System

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

Grade	Grade Points
A	4.0
A–	3.7
B+	3.3
B	3.0
B–	2.7
C+	2.3
C	2.0
C–	1.7

F	0.0
I	A temporary grade assigned for incomplete course work. See the section The Temporary Grade of Incomplete (I).
W	Withdrawn from course. See the section Grade Policy Regarding Withdrawals.
WU	Withdrawn by the university.
P	Carries credit hours but no grade points. The grade P will be assigned to all thesis and dissertation registrations.
AU	Audit. For students who register for a course on an audit basis (master's students only).

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, and P 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 (see 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. When the incomplete contract ends the course professor will assign a grade based upon the work completed. 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. 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

See the paragraphs Academic Progress, Grade Requirements, and Academic Standing in the sections Master's Degree and Graduate Certificate Programs, and Ph.D. Programs.

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 should visit www.nova.edu/cwis/registrar and click on Transcript Requests. Official transcripts 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 15 calendar days of posting 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 procedure described in the section 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 Board, 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 identified (see NSU's *2008–2009 Student Handbook*). A report of the findings and penalty will be provided to the accused who may acquiesce in the penalty or may contest in writing and may also request 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 school's Academic Review Board 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 *2008–2009 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 Board. 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 Board'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 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 NSU Card Office. There is a fee to replace the card.

Textbooks

Book information is included on the GSCIS website within the posted schedules for upcoming terms. 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

The Office of Residential Life and Housing helps students find housing on- and off-campus. One- and two-bedroom furnished apartments are available for graduate students without children. For further information about on-campus and off-campus housing contact the university's Office of Residential Life and Housing at 954-262-7052 or 800-541-6682, ext. 27052.

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
- Satisfaction of program requirements including completion of courses, master's thesis where appropriate and, for the Ph.D., an approved dissertation as specified in program documentation
- Ph.D. students: Attendance at all required cluster or institute meetings
- Attainment of a cumulative GPA of at least 3.0 (M.S. students) or 3.25 (Ph.D. students)
- Completion of the form *Application for Degree* and payment of the degree application 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 annually 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 Graduate 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. (Programs with optional concentrations may take longer to complete.) 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, April, 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. 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 Ph.D. program, which provides the opportunity to earn the doctorate in a shorter time. Each student must have an active broadband account with an Internet Service Provider (ISP) and must have his or her own personal computer (www.scis.nova.edu/Info/Faqpages/PC_Requirements/Comp-requirement.html).

Application for Admission

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

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 Graduate Record Exam (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. For instructions on applying, visit the school's admissions page: www.scis.nova.edu/Admissions. For additional information, contact:

Graduate School of Computer and Information Sciences
Nova Southeastern University
3301 College Avenue, DeSantis Building, 4th Floor
Fort Lauderdale, Florida 33314-9918

800-986-2247 or 954-262-2001
Email: scisinfo@nova.edu
Website: www.scis.nova.edu

Minimum Admission Requirements

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. The application fee must be in U.S. dollars.
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. Proficiency in the English language. (See the section Writing Skills and Form and Style Requirements.) Applicants who are unable to write correctly and clearly are urged to seek remedial help before enrolling in any of the school's programs.

The school may request additional documentation to support the application.

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. 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/internationalstudents. Applicants may contact the university's Office of International Students by email: intl@nova.edu; telephone: 954-262-7240 or 800-541-6682, ext. 27240; or fax: 954-262-3846. An I-20 cannot be issued to a non-degree, graduate certificate, 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 or 80 on the Internet-based test; (2) International English Language Testing System (IELTS) (www.ielts.org): 6.0 on the test module; and (3) GMAT: score of 450; GRE: score of 1,000. 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/internationalstudents.

Admission of Non-Degree Students

Applicants may take 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 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. Non-degree students are not eligible for financial aid or for an I-20.

Provisional Admission

Students are provisionally admitted based on a review of unofficial transcripts or other specific program admission requirements. This admission, however, 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 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 or to non-degree students.

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

This option provides the school's M.S. students the opportunity to earn the Ph.D. 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 Ph.D. program, students will take the remaining 12 credits for the M.S. degree in the Ph.D. 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 Ph.D. 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 Ph.D. 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 DVD-based orientations that include computer and software requirements; online access, tools and methods; and library access/resources. 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, April, 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.

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). Graduate certificates in information security each require 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 6:00 p.m. to 8:30 p.m. for 12 weeks.

GSCIS students are provided NSU computer accounts but must obtain their own Internet service providers and use their own computer systems. Online students use the web to access course materials, announcements, email, distance library services, subscription library databases, 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.

Tuition and Fees for Master's Programs (See sections Tuition Payment Options 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	$500 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
Degree Application Fee	$75
Deferment 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. Students can confirm their registration status by accessing NSU WebSTAR (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 by the calendar midpoint of the course (see specific dates in the Academic Calendar on p. ii). 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 28th calendar day of the term will receive a 25 percent refund of tuition paid. Students withdrawing after the 28th calendar day of the term will receive no refund. If a student is using one of the payment plans (see section Tuition Payment Options) the tuition due or the amount refunded will be adjusted accordingly.

Auditing a Master's Course

To audit a master's 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.

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

Each student must maintain a cumulative grade point average (GPA) of at least 3.0 for the duration of his or her program 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. Students with four withdrawals will be dismissed. Students who receive an F grade have the right to repeat the course. Students who receive a second grade of F in any course will be dismissed (independent of whether the first F was repeated with a passing grade). A student dismissed for poor academic performance or for violation of academic standards will have no right to apply for readmission.

A student who has passed a course with a grade of B– or higher is not permitted to repeat it for credit. A student receiving a grade of C+ or lower has one opportunity to repeat the course and earn a higher grade. Students may not repeat more than two courses to raise passing grades. Permission for repeating a course must be obtained from the Director of Graduate Programs. 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.

Time Limitations

Students must complete requirements for the master's degree within five years from the date of their first registration. Students must complete certificate programs 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. (See the following sections on readmission.)

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 for the better. The director may request additional documentation and may request evaluations by the faculty. Readmitted students will be given a new time limit.

Readmission Following Dismissal

A student dismissed for poor academic performance or for violation of academic standards will have no right to apply for readmission. A student dismissed for exceeding the time limitation may be invited to apply for readmission. The application for readmission must be submitted to the Office of Admissions and must include the items listed in the minimum admission requirements for master's programs. The applicant, in a separate letter, must present the reasons why academic potential has changed for the better. The applicant need only send transcripts not previously submitted. If readmitted, the student must meet all program requirements in effect at the time of readmission and will be given a new time limit.

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
Graduate Certificate in Information Security (Information System Security)

The M.S. in Computer Information Systems is a 36 credit-hour program. It focuses on the information technology foundations of computer information systems including areas such as database systems, human-computer interaction, data and computer communications, artificial intelligence, information security, computer graphics, and software engineering. 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 earn the M.S. in Computer Information Systems with Concentration in Information Security, which requires a total of 42 credit hours (14 courses), or the Graduate Certificate in Information Security (Information System Security) which requires a total of 15 credit-hours (five courses). The concentration and graduate certificate are recognized by the National Security Agency (NSA) based on its certification of the school's curriculum for compliance with the requirements of NSA national training standards NSTISSI No. 4011 (Information Systems Security Professionals) and CNSSI No. 4013 (System Administrators). 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. Students who complete the concentration may also request the graduate certificate.

Graduates with the M.S. in Computer Information Systems are able to: (1) communicate computer information systems concepts, designs, and solutions effectively and professionally; (2) apply knowledge of computer information systems to produce effective designs and solutions for specific problems; (3) identify, analyze, and synthesize scholarly literature relating to the field of computer information systems; and (4) use software development tools, software systems, and modern computing platforms.

Program-Specific Admission Requirements
(For general requirements, see the section Application for Admission.)

These programs are designed for students with undergraduate majors in computer science, information systems, information technology, 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 Ph.D. 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 Ph.D. Program, the student must have completed MCIS 611 Programming Languages, MCIS 615 Operating Systems, MCIS 630 Database Systems, MCIS 645 Software Engineering, and MCIS 650 Computer Networks.

Curriculum for the M.S. in Computer Information Systems

Core courses and electives are listed below. Students must take all ten core course and two electives. If the thesis option is elected, students must take all ten core courses plus six thesis credits. Students who wish to take an additional elective must request approval from the program office prior to registration. Plans for the thesis option must be made with and approved by the program office.

Core Courses (three credits each)
MCIS 611 Programming Languages
MCIS 615 Operating Systems
MCIS 625 Computer Graphics
MCIS 630 Database Systems
MCIS 645 Software Engineering
MCIS 650 Computer Networks
MCIS 665 Client-Server Computing
MCIS 670 Artificial Intelligence
MCIS 671 Decision Support Systems
MCIS 680 Human-Computer Interaction

Electives (three credits each)
MCIS 623 Legal and Ethical Aspects of Computing
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

Curriculum for the M.S. in Computer Information Systems with Concentration in Information Security

Required Courses (three credits each)
MCIS 611 Programming Languages
MCIS 615 Operating Systems
MCIS 630 Database Systems
MCIS 645 Software Engineering
MCIS 650 Computer Networks
MCIS 665 Client-Server Computing
MCIS 670 Artificial Intelligence
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

Curriculum for the Graduate Certificate in Information Security (Information System 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

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

The M.S. in Computer Science is a 36 credit-hour program. It is designed to give students advanced 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.

Graduates are able to: Graduates are able to (1) communicate computer science concepts, designs, and solutions effectively and professionally; (2) apply knowledge of computing to produce effective designs

and solutions for specific problems; (3) identify, analyze, and synthesize scholarly literature relating to the field of computer science; and (4) use software development tools, software systems, and modern computing platforms.

Program-Specific Admission Requirements
(For general requirements, see the section Application for Admission.)

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

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 Ph.D. 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 Ph.D. Program, the student must have completed CISC 610 Programming Languages, CISC 615 Design and Analysis of Algorithms, CISC 630 Compilers, CISC 631 Theory of Computation, and CISC 640 Operating Systems.

Curriculum for the M.S. in Computer Science

Core courses and electives are listed below. Students must take all nine core courses and three electives. If the thesis option is elected, students must take all nine core courses, one elective, and six thesis credits. Students who wish to take an additional elective beyond those specified above must request approval from the program office prior to registration. Plans for the thesis option must be made with and approved by the program office.

Core Courses (three credits each)
CISC 610 Programming Languages
CISC 615 Design and Analysis of Algorithms
CISC 630 Compilers
CISC 631 Theory of Computation
CISC 640 Operating Systems
CISC 650 Computer Networks
CISC 660 Database Management Systems
CISC 665 Distributed Systems
CISC 680 Software Engineering

Electives (three credits each)
CISC 647 Computer Architecture
CISC 654 Information Security
CISC 670 Artificial Intelligence
CISC 681 Computer Graphics
CISC 683 Object-Oriented Design
CISC 685 Human-Computer Interaction
CISC 690 Special Topics in Computer Science

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 information 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.)

In addition, students have the option to earn the M.S. in Computing Technology in Education with Concentration in Information Security, which requires a total of 42 credit hours (14 courses). The concentration is recognized by the National Security Agency (NSA) based on its certification of the school's curriculum for compliance with the requirements of NSA national training standards NSTISSI No. 4011 (Information Systems Security Professionals) and CNSSI No. 4013 (System Administrators). 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. Individuals may apply to take one or more certified information security courses as non-degree students.

Graduates with the M.S. in Computing Technology in Education are able to: (1) incorporate effectively both existing and emerging computing and information technology to improve learning in either educational or training environments; (2) train or mentor others to incorporate effectively computing and information technology as an enhancement to educational or training efforts; (3) make informed decisions or recommendations regarding adoption considerations of existing or emerging computing and information technologies in a learning environment; and (4) communicate effectively with professionals both within and outside educational and training environments.

Program-Specific Admission Requirements

(For general requirements, see the section Application for Admission.)

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 Ph.D. Program

This option provides the opportunity for master's students in computing technology in education to earn the Ph.D. in computing technology in education in a shorter time. See detailed requirements specified in the section Early Admission into the Ph.D. Program.

Curriculum for the M.S. in Computing Technology in Education (36 credit hours)

Core Courses (three credits each) If the thesis option is elected, two courses may be omitted.
MCTE 615 The Internet
MCTE 625 Survey of Instructional Technologies
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

Curriculum for the M.S. in Computing Technology in Education with Concentration in Information Security (42 credit hours)

Students must take nine of the following courses: (If the thesis option is elected, students must take seven of the following courses courses plus six thesis credits.)
MCTE 615 The Internet
MCTE 625 Survey of Instructional Technologies
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

In addition, students must take all of the following concentration courses:
MCTE 620 Management Information Systems
MCTE 621 Information Systems Project Management
MCTE 684 Information Security Management
MCTE 685 Information Security Policy, Privacy, and Ethics
MCTE 686 Information System Auditing and Secure Operations

Master of Science (M.S.) in Information Security
Graduate Certificate in Information Security (Information System 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 M.S. and graduate certificate are recognized by the National Security Agency (NSA) based on its certification of the school's curriculum for compliance with the requirements of NSA national training

standards NSTISSI No. 4011 (Information Systems Security Professionals) and CNSSI No. 4013 (System Administrators). 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. The Graduate Certificate in Information Security is a 15 credit-hour program that requires the completion of five courses. Students who complete the M.S. may also request the graduate certificate.

A graduate with a M.S. in Information Security will have the ability to: (1) identify the physical and logical threats and vulnerabilities present in an existing information system infrastructure; (2) identify relevant security technologies and techniques, and identify administrative support services, necessary to secure an information infrastructure based upon the requirements specified in a security policy; (3) implement specific technical control measures necessary to satisfy the stated requirements for a secure information systems infrastructure; and (4) conduct an analysis of an existing information systems infrastructure to evaluate the validity and reliability of the security systems.

Program-Specific Admission Requirements
(For general requirements, see the section Application for Admission.)

These programs are designed for students with undergraduate majors in computer science, information systems, information technology, 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.

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

Option for Early Admission into the Ph.D. Program

This option provides the opportunity for master's students in information security 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 Ph.D. 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).

Curriculum for the M.S. in Information Security

Core courses and electives are listed below. Students must take all ten core courses and two electives. Students who wish to take an additional elective must request approval from the program office prior to registration. If the thesis option is elected, students must take all ten core courses and six thesis credits. Plans for the thesis option must be made with and approved by the program office.

Core Courses (three credits each)
MCIS 615 Operating Systems
MCIS 630 Database Systems
MCIS 645 Software Engineering
MCIS 650 Computer 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 Programming Languages
MCIS 623 Legal and Ethical Aspects of Computing
MCIS 654 Electronic Commerce on the Internet
MCIS 670 Artificial Intelligence
MCIS 671 Decision Support Systems
MCIS 680 Human-Computer Interaction

Curriculum for the Graduate Certificate in Information Security (Information System 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

Master of Science (M.S.) in Information Technology

Information Technology spans organizational information systems, application technologies, software methods and technologies, and systems infrastructure. It focuses on meeting the needs of users within an organizational and societal context through the selection, creation, application, integration and administration of computing technologies and resources. The M.S. in Information Technology is a 36 credit-hour program with five concentration options:

1. Software Development
2. Information System Security
3. Educational Technology
4. Information Security Management
5. Information Technology Management

Each concentration includes a set of seven or eight core courses and four or five electives. All courses carry three credit hours. The program includes topics such as computer languages, database systems, human-computer interaction, system analysis and design, data networks, telecommunications, information

security, computer graphics, software engineering, project management, decision making, client-server and distributed computing, electronic commerce, instructional technology, and multimedia. Graduates will have a broad technical understanding of current and emerging technologies in the IT field and the application of those technologies.

The program's formats offer full-time students the opportunity to earn the degree in twelve months and working professionals the opportunity to earn the degree in 12–18 months. Students select a preferred concentration and format (online or on-campus) in their admission applications (once admitted, students may take courses in either format). Each concentration includes a thesis option requiring six thesis credits, which would be in lieu of two elective courses.

The concentrations in Information System Security and Information Security Management include the award of graduate certificates in information security based upon existing certificate programs that are recognized by the U.S. Government. Students taking other concentrations have the option to earn a graduate certificate in information security by taking additional courses.

The graduate certificate programs are recognized by the National Security Agency (NSA) based on its certification of the school's curriculum under NSA national training standards NSTISSI No. 4011 (Information Systems Security Professionals) and CNSSI No. 4013 (System Administrators). 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.

Program-Specific Admission Requirements

General requirements for admission are contained in the catalog section Application for Admission. Applicants to the M.S. in Information Technology must also satisfy the concentration-specific admission requirements contained in the descriptions of the individual program concentrations.

Option for Early Admission into the Ph.D. Program

In addition to the general requirements contained in the catalog section Early Admission into the Ph.D. Program, the student must complete the requirements specified in the section on their individual concentrations.

Concentration in Software Development

This concentration focuses on the software and systems technology aspects of information systems including areas such as programming languages, operating systems, database systems, human-computer interaction, data and computer communications, and software engineering. In addition, the concentration offers the opportunity for award of a graduate certificate in information security that is recognized by the U.S. National Security Agency.

Graduates with the Concentration in Software Development are able to: (1) communicate software development concepts, designs, and solutions effectively and professionally; (2) apply knowledge of computing to produce effective designs and solutions for specific problems; (3) identify, analyze, and synthesize scholarly literature relating to software development; and (4) use software development tools, software systems, and modern computing platforms.

Concentration-Specific Admission Requirements
(For general requirements, see the section Admission Requirements.)

This concentration is designed for students with undergraduate majors in computer science, information systems, information technology, 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 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 (see below), when required, must be completed prior to taking courses at the 600 level; however some exceptions may be permitted by the program director. MCIS 501 is prerequisite to MCIS 503.

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

Option for Early Admission into the Ph.D. Program

This option provides the opportunity for IT master's students concentrating in software development 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 Ph.D. Program, the student must have completed the core courses for the concentration.

Curriculum for the Concentration in Software Development

Core courses are listed below. Students must take all seven core courses and five electives. If the thesis option is elected, students must take all seven core courses, three electives, and six thesis credits. Electives must be consistent with the student's program plan and approved in advance by the program director. Plans for the thesis option must be made with and approved by the program office.

Core Courses (three credits each)
MCIS 611 Programming Languages
MCIS 615 Operating Systems
MCIS 630 Database Systems
MCIS 645 Software Engineering
MCIS 650 Computer Networks
MCIS 665 Client-Server Computing
MCIS 680 Human-Computer Interaction

Suggested Electives (three credits each)
Use of other courses in the M.S. in IT program as electives must be approved by the program director.
MCIS 625 Computer Graphics
MCIS 670 Artificial Intelligence
MCIS 671 Decision Support Systems
MCIS 623 Legal and Ethical Aspects of Computing
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

The Graduate Certificate in Information Security (Information System Security)

To earn the graduate certificate, students must take the five elective 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

Concentration in Information System Security

This concentration was developed to address the rapidly growing global problems of maintaining and securing computer information. Important areas addressed by the concentration 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 concentration is recognized by the National Security Agency (NSA) based on its certification of the school's curriculum for compliance with the requirements of NSA national training standards NSTISSI No. 4011 (Information Systems Security Professionals) and CNSSI No. 4013 (System Administrators). 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. On completion of the core courses of this concentration, the student will be awarded the Graduate Certificate in Information Security (Information System Security).

A graduate with a concentration in information system security will have the ability to: (1) identify the physical and logical threats and vulnerabilities present in an existing information system infrastructure; (2) identify relevant security technologies and techniques, and identify administrative support services, necessary to secure an information infrastructure based upon the requirements specified in a security policy; (3) implement specific technical control measures necessary to satisfy the stated requirements for a secure information systems infrastructure; and (4) conduct an analysis of an existing information systems infrastructure to evaluate the validity and reliability of the security systems.

Concentration-Specific Admission Requirements
(For general requirements, see the section Admission Requirements.)

This concentration is designed for students with undergraduate majors in computer science, information systems, information technology, 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 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 (see below), 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 Ph.D. Program

This option provides the opportunity for IT master's students concentrating in information system security 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 Ph.D. Program, the student must have completed the core courses for the concentration.

Curriculum for the Concentration in Information System Security

Core courses are listed below. Students must take all eight core courses and four electives. If the thesis option is elected, students must take all eight core courses, two electives, and six thesis credits. Electives must be consistent with the student's program plan and approved in advance by the program director. Plans for the thesis option must be made with and approved by the program office.

Core Courses (three credits each)
MCIS 615 Operating Systems
MCIS 630 Database Systems
MCIS 650 Computer Networks
MCIS 683 Secure Computer Systems
MCIS 684 Applied Cryptography
MCIS 685 Database Security
MCIS 686 Advanced Network Security
MCIS 687 Information Security Project

Suggested Electives (three credits each)
Use of other courses in the M.S. in IT program as electives must be approved by the program director.
MCIS 611 Programming Languages
MCIS 623 Legal and Ethical Aspects of Computing
MCIS 625 Computer Graphics
MCIS 645 Software Engineering
MCIS 654 Electronic Commerce on the Internet
MCIS 665 Client-Server Computing
MCIS 670 Artificial Intelligence
MCIS 671 Decision Support Systems
MCIS 680 Human-Computer Interaction
MCIS 681 Multimedia Systems

Curriculum for the Graduate Certificate in Information Security (Information System Security)

The certificate will be awarded following completion of 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

Concentration in Educational Technology

This concentration 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. It enhances knowledge of how computers, software, and other forms of information technology can be used to improve learning outcomes. 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.) In addition, the concentration offers the opportunity for award of a graduate certificate in information security that is recognized by the U.S. National Security Agency.

Graduates with the Concentration in Educational Technology are able to: (1) incorporate effectively both existing and emerging computing and information technology to improve learning in either educational or training environments; (2) train or mentor others to incorporate effectively computing and information technology as an enhancement to educational or training efforts; (3) make informed decisions or recommendations regarding adoption considerations of existing or emerging computing and information technologies in a learning environment; and (4) communicate effectively with professionals both within and outside educational and training environments.

Concentration-Specific Admission Requirements

(For general requirements, see the section Admission Requirements.)

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

Option for Early Admission into the Ph.D. Program

This option provides the opportunity for IT master's students concentrating in educational technology to earn the Ph.D. in computing technology in education in a shorter time. In addition to the requirements specified in the section Early Admission into the Ph.D. Program, the student must have completed the core courses for the concentration.

Curriculum for the Concentration in Educational Technology

Core courses are listed below. Students must take all seven core courses and five electives. If the thesis option is elected, students must take all seven core courses, three electives, and six thesis credits. Electives must be consistent with the student's program plan and approved in advance by the program director. Plans for the thesis option must be made with and approved by the program office.

Core Courses (three credits each)

MCTE 620 Management Information Systems
MCTE 625 Survey of Instructional Technologies
MCTE 628 Instructional Systems Design
MCTE 630 Database Systems
MMIS 652 Information Security
MCTE 661 Online Learning Environments
MCTE 680 Human Computer Interaction

Suggested Electives (three credits each)
Use of other courses in the M.S. in IT program as electives must be approved by the program director.

MCTE 621 Information Systems Project Management
MMIS 627 Enterprise Information Systems, Technologies, and Infrastructures
MCTE 650 Computer Networks
MMIS 656 Web Design Technologies
MMIS 660 Systems Analysis and Design
MCTE 660 Multimedia Systems
MCTE 670 Learning Theory and Computer Applications
MMIS 671 Decision Support Systems
MMIS 683 Fundamentals of Security Technologies
MCTE 684 Information Security Management
MCTE 685 Information Security Policy, Privacy, and Ethics
MCTE 686 Information System Auditing and Secure Operations
MMIS 687 Information Security Project
MCTE 690 Research Methodology
MCTE 691 Masters Project in CTE

Graduate Certificate in Information Security (Administration of Information Security)

To earn the certificate, students must take the five elective 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.

MMIS 683 Fundamentals of Security Technologies
MCTE 684 Information Security Management
MCTE 685 Information Security Policy, Privacy, and Ethics
MCTE 686 Information System Auditing and Secure Operations
MMIS 687 Information Security Project

Concentration in Information Security Management

This concentration was developed to address the rapidly growing global problems of maintaining and securing computer information. Important areas addressed by the concentration include threats and vulnerabilities, authentication and access control, information security management, security policies, privacy, ethics, auditing, World Wide Web security, and applications security.

The concentration and graduate certificate are recognized by the National Security Agency (NSA) based on its certification of the school's curriculum under NSA national training standards NSTISSI No. 4011 (Information Systems Security Professionals) and CNSSI No. 4013 (System Administrators). 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. Students who complete this concentration will be awarded the Graduate Certificate in Information Security (Administration of Information Security).

Graduates with the Concentration in Information Security Management are able to: (1) communicate information security management concepts, designs, and solutions effectively and professionally;

(2) apply knowledge of information security management to produce effective designs and solutions for specific problems; (3) identify, analyze, and synthesize scholarly literature relating to information security management; and (4) evaluate software development tools, software systems, and modern computing platforms.

Concentration-Specific Admission Requirements
(For general requirements, see the section Admission Requirements.)

This concentration is designed for students with undergraduate majors in information technology, management information systems, computer information systems, business administration, or a related field, and with knowledge and significant experience in computer applications. 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 Ph.D. Program

This option provides the opportunity for IT master's students concentrating in information security management 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 Ph.D. Program, the student must have completed the core courses for the concentration.

Curriculum for the Concentration in Information Security Management

Core courses are listed below. Students must take all eight core courses and four electives. If the thesis option is elected, students must take all eight core courses, two electives, and six thesis credits. Electives must be consistent with the student's program plan and approved in advance by the program director. Plans for the thesis option must be made with and approved by the program office.

Core Courses (three credits each)
MMIS 627 Enterprise Information Systems, Technologies, and Infrastructures
MMIS 630 Database Systems
MMIS 653 Telecommunications and Computer Networking
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

Suggested Electives (three credits each)
Use of other courses in the M.S. in IT program as electives must be approved by the program director.
MMIS 610 Survey of Computer Languages
MMIS 615 Quantitative Methods
MMIS 620 Management Information Systems
MMIS 621 Information Systems Project Management
MMIS 623 Legal and Ethical Aspects of Computing
MMIS 625 Computer Graphics
MMIS 640 System Test and Evaluation
MMIS 642 Data Warehousing

MMIS 654 Electronic Commerce on the Internet
MMIS 655 Server-Side Development of eCommerce Applications
MMIS 656 Web Design Technologies
MMIS 660 Systems Analysis and Design
MMIS 661 Object-Oriented Applications
MMIS 671 Decision Support Systems
MMIS 680 Human-Computer Interaction
MMIS 681 Multimedia Systems

Curriculum for the Graduate Certificate in Information Security (Administration of Information Security)

The certificate will be awarded following completion of 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.

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

Concentration in Information Technology Management

This concentration focuses on the application of information technology 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. In addition, the concentration offers the opportunity for award of a graduate certificate in information security that is recognized by the U.S. National Security Agency.

Graduates with the Concentration in Information Technology Management are able to: (1) communicate information technology management concepts, designs, and solutions effectively and professionally; (2) apply knowledge of information technology management to produce effective designs and solutions for specific problems; (3) identify, analyze, and synthesize scholarly literature relating to information technology management; and (4) evaluate software development tools, software systems, and modern computing platforms.

Concentration-Specific Admission Requirements
(For general requirements, see the section Admission Requirements.)

This concentration is designed for students with undergraduate majors in information technology, management information systems, computer information systems, business administration, or a related field, and with knowledge and significant experience in computer applications. 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 Ph.D. Program

This option provides the opportunity for master's students concentrating in information technology management 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 Ph.D. Program, the student must have completed the core courses for the concentration and also must have completed MMIS 610 Survey of Programming Languages.

Curriculum for the Concentration in Information Technology Management

Core courses are listed below. Students must take all eight core courses and four electives. If the thesis option is elected, students must take seven core courses, three electives, and six thesis credits. Electives must be consistent with the student's program plan and approved in advance by the program director. Plans for the thesis option must be made with and approved by the program office.

Core Courses (three credits each)
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

Suggested Electives (three credits each)
Use of other courses in the M.S. in IT program as electives must be approved by the program director.
MMIS 610 Survey of Computer Languages
MMIS 615 Quantitative Methods
MMIS 623 Legal and Ethical Aspects of Computing
MMIS 625 Computer Graphics
MMIS 640 System Test and Evaluation
MMIS 642 Data Warehousing
MMIS 652 Information Security
MMIS 654 Electronic Commerce on the Internet
MMIS 655 Server-Side Development of eCommerce Applications
MMIS 656 Web Design Technologies
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

Graduate Certificate in Information Security (Administration of Information Security)

To earn the certificate, students must take the five elective 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.

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

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

The M.S. in Management Information Systems is a 36 credit-hour program. It focuses on the application of information technology 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 earn the M.S. in Management Information Systems with Concentration in Information Security, which requires a total of 42 credit hours (14 courses), or the Graduate Certificate in Information Security (Administration of Information Security), which requires a total of 15 credit-hours (five courses). The concentration and graduate certificate are recognized by the National Security Agency (NSA) based on its certification of the school's curriculum under NSA national training standards NSTISSI No. 4011 (Information Systems Security Professionals) and CNSSI No. 4013 (System Administrators). 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. Students who complete the concentration may also request the graduate certificate.

Graduates with the M.S. in Management Information Systems are able to: (1) communicate management information systems concepts, designs, and solutions effectively and professionally; (2) apply knowledge of management information systems to produce effective designs and solutions for specific problems; (3) identify, analyze, and synthesize scholarly literature relating to the field of management information systems; (4) evaluate software development tools, software systems, and modern computing platforms.

Program-Specific Admission Requirements
(For general requirements, see the section Application for Admission.)

These programs are designed for students with undergraduate majors in management information systems, computer information systems, information technology, business administration, or a related field, and having knowledge and significant experience in computer applications. 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 Ph.D. 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 Ph.D. Program, the student must have completed MMIS 610 Survey of Computer Languages; MMIS 620 Management Information Systems; MMIS 627 Enterprise Information Systems, Technologies, and Infrastructures; MMIS 630 Database Systems; and MMIS 660 Systems Analysis and Design.

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, students must take ten core courses plus six thesis credits. Plans for the thesis option must be made with and approved by the program office.

Core 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 642 Data Warehousing
MMIS 653 Telecommunications and Computer Networking
MMIS 654 Electronic Commerce on the Internet
MMIS 660 Systems Analysis and Design
MMIS 661 Object-Oriented Applications
MMIS 671 Decision Support Systems
MMIS 680 Human-Computer Interaction

Electives (three credits each)
MMIS 615 Quantitative Methods
MMIS 623 Legal and Ethical Aspects of Computing
MMIS 625 Computer Graphics
MMIS 640 System Test and Evaluation
MMIS 652 Information Security
MMIS 655 Server-Side Development of eCommerce Applications
MMIS 656 Web Design Technologies
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 Management Information Systems

Curriculum for the M.S. in Management Information Systems with Concentration 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

Curriculum for the Graduate Certificate in Information Security (Administration of 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.

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. and Graduate Certificate Programs

CISC 610 Programming Languages (3 credits)
The study of the organization and types of programming languages including analysis of imperative, object-oriented, functional, and declarative language paradigms. Other topics include formal languages and language hierarchies, syntactic and semantic specification, context-free languages, abstraction, modularity, program structure and fundamental programming language concepts. (Cross-listed with MCIS 611)

CISC 615 Design and Analysis of Algorithms (3 credits)
Principles and techniques used in the design and analysis of computer algorithms. 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 630 Compilers (3 credits)
Application of language theory to the design of compilers and interpreters for high-level programming languages. Lexical, syntactic, and semantic analysis, and code generation. Other topics include storage allocation, symbol table management, optimization, and the use of modern compiler generation tools. Prerequisites: CISC 610 and CISC 631.

CISC 631 Theory of Computation (3 credits)
Automata and language theory: regular and context free languages; finite state automata and pushdown automata; regular expressions; pumping lemmas. Computability theory: Turing machine and its variants; decidability and reductions; recursive, recursively enumerable (r.e.), and non-r.e. languages. Complexity theory: time complexity and NP-completeness; a survey of NP-complete problems; space complexity and PSPACE-completeness.

CISC 640 Operating Systems (3 credits)
Concepts of computer operating systems are presented with an emphasis on structured design. Topics include operating systems structure, multiprocessing, synchronization and communication, task management, virtual memory management, file systems, protection and security, operating system extension techniques, fault tolerance, and systems programming. Recent developments in operating systems theory and implementation are covered. (Cross-listed with MCIS 615)

CISC 647 Computer Architecture (3 credits)
Characteristics and organization of modern processors are presented with an emphasis on the concepts and design of architecture for computer systems and subsystems (personal computers, servers, and embedded devices). Topics include processor fundamentals, instruction set principles, instruction-level parallelism, cache hierarchies, memory organization, virtual memory, multiprocessors and parallel architectures, thread-level parallelism, I/O and storage systems, performance evaluation, fault-tolerance, and clusters.

CISC 650 Computer Networks (3 credits)
The concepts of computer networks and network services, communication protocols, network and protocol architectures, packet switching techniques, the Internet architecture, topology, internetworking, TCP/IP, network design and analysis methods, switching, and routing. Topics include wired and wireless Ethernet, software and conceptual models, error detection, error correction, transfer and routing protocols, congestion and flow control, quality-of-service, network programming, security, current and future applications. (Cross-listed with MCIS 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)
Concepts of three levels of database architectures and their relationships, DBMS internals and their functions with associated API interfaces, various types of data models and their implementations in both internal and external perspectives, principles and techniques for database design and implementation, organizations of data and file structures and access methods, theory of query processing and optimization, mechanisms of concurrency control and transaction processing, and other new trends of database technologies.

CISC 665 Distributed Systems (3 credits)
Concepts and design of distributed systems and applications with an emphasis on protocols and distributed state. Topics include distributed systems architecture (system models, communication, and peer-to-peer systems); middleware (distributed objects, security, directory services, and web services); distributed systems infrastructure (distributed file systems, and distributed shared memory); distributed state coordination (time and global states, coordination, transactions, concurrency control, and replication); mobile and ubiquitous computing and future research directions. This course extends the foundation of operating systems and computer networking. Prerequisites: CISC 640 and CISC 650.

CISC 670 Artificial Intelligence (3 credits)
Theory and practice of artificial intelligence and knowledge-based expert systems. Topics 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. 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. (Cross-listed with MCIS 670)

CISC 680 Software Engineering (3 credits)
The development of software-intensive systems; software quality factors; software engineering principles; system life-cycle models and paradigms; requirements definition and analysis; behavioral specification; software design; implementation; software testing techniques; verification and validation; system evolution; software project management. (Cross-listed with MCIS 645)

CISC 681 Computer Graphics (3 credits)
Principles of computer graphics, including fundamental raster operations including scan conversion, fill methods, and anti-aliasing. Coordinate systems, transformations, scene graphs and other 3D modeling methods. Rendering, hidden surface removal and ray tracing. Animation; graphical user interfaces. Modern computer graphics languages.

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)
Focuses on the dynamics of human-computer interaction (HCI). Provides a broad and comprehensive overview of HCI as a sub-area of computer science and implements user-centered design approaches to computer systems including Internet and web-based environments. Areas to be addressed include the user interface and software design strategies and methodologies, user experience levels, interaction styles, and usability engineering. Students will design, evaluate, implement, and test user interfaces using appropriate computer science concepts and methodologies using current programming language environments.

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. Prerequisite: Consent of the course professor and program director based on student's qualifications.

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 strategies to achieve the goal are supplied. 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.

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

MCIS 501 Java Programming Language (3 credits)
An in-depth study of the Java programming language. Principles of the object-oriented paradigm. Object-oriented programming theory and practice.

MCIS 502 Mathematics in Computing (3 credits)
Graph theory, lattices and boolean algebras, state models and abstract algebraic structures, logical systems, production systems, computability theory, recursive function theory.

MCIS 503 Data Structures and Algorithms (3 credits)
Sorting and searching, algorithms for tree structures, advanced data structures, graph algorithms, complexity, dynamic programming, optimization problems. Prerequisite: MCIS 501 or equivalent.

MCIS 611 Programming Languages (3 credits)
The study of the organization and types of programming languages including analysis of imperative, object-oriented, functional, and declarative language paradigms. Other topics include formal languages and language hierarchies, syntactic and semantic specification, context-free languages, abstraction, modularity, program structure and fundamental programming language concepts. (Cross-listed with CISC 610)

MCIS 615 Operating Systems (3 credits)
Concepts of computer operating systems are presented with an emphasis on structured design. Topics include operating systems structure, multiprocessing, synchronization and communication, task management, virtual memory management, file systems, protection and security, operating system extension techniques, fault tolerance, and systems programming. Recent developments in operating systems theory and implementation are covered. (Cross-listed with CISC 640)

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. (Cross-listed with MMIS 623)

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. (Cross-listed with MMIS 625)

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. (Cross-listed with CISC 680)

MCIS 650 Computer Networks (3 credits)
The concepts of computer networks and network services, communication protocols, network and protocol architectures, packet switching techniques, the Internet architecture, topology, internetworking, TCP/IP, network design and analysis methods, switching, and routing. Topics include wired and wireless Ethernet, software and conceptual models, error detection, error correction, transfer and routing protocols, congestion and flow control, quality-of-service, network programming, security, current and future applications. (Cross-listed with CISC 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. (Cross-listed with MMIS 654)

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 (3 credits)
Theory and practice of artificial intelligence and knowledge-based expert systems. Topics 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. 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. (Cross-listed with CISC 670)

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. (Cross-listed with MMIS 671)

MCIS 680 Human-Computer Interaction (3 credits)
The dynamics of human-computer interaction (HCI) are examined along with applying knowledge and theory of systems concepts to computer information systems. Provides a broad and comprehensive overview of HCI as a sub-area of computer information systems. Areas to be addressed include user-centered design approaches to computer information systems, user interface and software design strategies, web site usability, user experience levels, interaction styles, usability engineering, and collaborative systems technology. Suitable methods will be examined for collecting users' requirements. Students will perform formal interface evaluations and usability tests that apply to current computer information systems technology.

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. (Cross-listed with MMIS 681)

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 Concentration 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 strategies to achieve the goal are supplied. 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.

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 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. (Cross-listed with MMIS 620)

MCTE 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. (Cross-listed with MMIS 621)

MCTE 625 Survey of Instructional Technologies (3 credits)
Students explore strategies for infusing instructional software and other technologies into various teaching and learning environments. Students will survey instructional software materials including: drill-and-practice, tutorials, simulations, instructional games, problem-solving software, and integrated learning systems, as well as emerging instructional technologies such as Web 2.0 technologies, visual immersion systems, and intelligent applications. Students are challenged to formulate their own informed vision of how instructional software and other technologies can influence teaching and learning.

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)
This course provides a framework for understanding computer network functionality, characteristics, and configurations. Topics include network topologies, protocols, and architectures and emerging trends in network technologies and services. The role of optical technologies in supporting national and international implementations is explored. Strategies for network planning, implementation, management, and security are introduced. Recent advances in standardization, internetworking, and deployment of LANs (local area networks), MANs (metropolitan area networks), and WANs (wide area networks) are introduced. (Cross-listed with MMIS 653)

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)
The field of human-computer interaction (HCI) is explored. HCI is examined in the context of the design and usability of education environments and technology use. Provides a broad and comprehensive overview and offers specific background relating to user-centered design approaches and how these approaches impact educational environments. 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 interface evaluations and usability tests that apply to educational uses of technology in various ways.

MCTE 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: MCTE 620, 621. (Cross-listed with MMIS 684)

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

MCTE 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: MCTE 620, 621. (Cross-listed with MMIS 686)

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: Completion of second thesis registration.

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.

MMIS 501 Introduction to Java Programming (3 credits)
An introduction to the Java programming language. The course includes an introduction to the concepts of object-oriented programming and shows how Java supports this programming paradigm. Students learn about the Java environment and write both applets (programs that execute in a web browser) and applications (stand-alone programs). In addition to learning about basic language statements, students 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. Emphasis on 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. (Cross-listed with MCTE 620)

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. (Cross-listed with MCTE 621)

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. (Cross-listed with MCIS 623)

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. (Cross-listed with MCIS 625)

MMIS 627 Enterprise Information Systems, Technologies, and Infrastructures (3 credits)
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 of enterprise systems and architectures are analyzed.

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 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 computer network functionality, characteristics, and configurations. Topics include network topologies, protocols, and architectures and emerging trends in network technologies and services. The role of optical technologies in supporting national and international implementations is explored. Strategies for network planning, implementation, management, and security are introduced. Recent advances in standardization, internetworking, and deployment of LANs (local area networks), MANs (metropolitan area networks), and WANs (wide area networks) are introduced. (Cross-listed with MCTE 650)

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. (Cross-listed with MCIS 654)

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 660 Systems Analysis and Design (3 credits)
Analysis of requirements for information systems. Elicitation/fact-finding, problem analysis, decomposition, and the requirements document. Concepts, methods, techniques, and tools for systems analysis, modeling and simulation, and prototyping. Structured and object-oriented analysis. Role of the systems analyst in the organization. Gaining user commitment and fulfilling user needs. Concepts, tools, and techniques for systems design. Design principles, quality factors, decomposition of complex systems, and modularization techniques. Design methods such as object-oriented and function-oriented design. Comparison of analysis and design techniques.

MMIS 661 Object-Oriented Applications (3 credits)
Principles and concepts of the object-oriented paradigm and object-oriented programming languages. Notation and techniques for the analysis, design, and implementation of object-oriented systems. Mechanisms for reuse, including composition, inheritance, design patterns, and application frameworks. The use of object-oriented methods in common applications.

MMIS 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. (Cross-listed with MCIS 671)

MMIS 680 Human-Computer Interaction (3 credits)
The dynamics of human-computer interaction (HCI) are examined with a blend of theory and practice pertaining to the study of information systems. Provides a broad and comprehensive overview and offers specific background relating to user-centered approaches in the design and evaluation of information systems applications. Areas to be addressed include the user interface and software design strategies, user experience levels, interaction styles, usability engineering, web site usability, and collaborative systems technology. Students will perform formal interface evaluations and usability tests applied to current information systems technology.

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. (Cross-listed with MCIS 681)

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, 627.

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. (Cross-listed with MCTE 684)

MMIS 685 Information Security Policy, Privacy, and Ethics (3 credits)
This course covers the development and need for information security policies, issues regarding privacy, and the application of computer ethics. It also covers legal issues and legislation that impacts the design, implementation, and administration of secure infrastructures. Prerequisite: MMIS 620. (Cross-listed with MCTE 685)

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. (Cross-listed with MCTE 686)

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 Concentration 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 concentration courses. Prerequisites: MMIS 683, 684, 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.

Ph.D. Programs

The school offers a unique Ph.D. 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 on-campus sessions students work on core course assignments and research project courses, 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.

Each student must have an active broadband account with an Internet Service Provider (ISP) and must have his or her own personal computer (www.scis.nova.edu/Info/Faqpages/PC_Requirements/Comp-requirement.html).

Application for Admission

Application for Admission to the Ph.D. 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. For instructions on applying, visit the school's admissions page: www.scis.nova.edu/Admissions. For additional information, contact:

Graduate School of Computer and Information Sciences
Nova Southeastern University
3301 College Avenue, DeSantis Building, 4th Floor
Fort Lauderdale, Florida 33314-9918

Telephone: 800-986-2247 or 954-262-2001
Email: scisinfo@nova.edu
Website: www.scis.nova.edu

Minimum Admission Requirements

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 Ph.D. program with a suitable major (see master's section of this catalog for requirements).
2. Application form, application fee, and essay. The application fee must be in U.S. dollars.
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 curriculum vitae (CV) that provides a short account of your academic background and professional experience.
6. Proficiency in the English language. Ph.D. 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.

The school may request additional documentation to support the application.

Additional Admission Requirements for International Ph.D. 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.
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): 213 on the computer-based test or 80 on the Internet-based test; (2) International English Language Testing System (IELTS) (www.ielts.org): 6.0 on the test module; and (3) GMAT: score of 450; GRE: score of 1,000. 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 website: www.nova.edu/internationalstudents.
4. Pursuant to U.S. Citizenship and Immigration Services (USCIS) regulations, international students who are granted full admission to the Ph.D. program will require an I-20 in order to obtain a student (F-1) visa for study in the U.S. for the length of their programs. Such students must reside in Florida in order to maintain F-1 status. An I-20 cannot be issued to a provisionally admitted student. Students traveling to the U.S. only to attend cluster or institute meetings should contact the university's Office of International Students and Scholars (see below).

For additional information regarding United States immigration rules and regulations as they apply to international students, contact the university's Office of International Students and Scholars: intl@nova.edu; www.nova.edu/internationalstudents/; telephone: 954-262-7240 or 800-541-6682 ext. 27240; or fax: 954-262-3846.

Provisional Admission

Students are provisionally admitted based on a review of unofficial transcripts or other specific program admission requirements. This admission, however, 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 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 Ph.D. Program (see requirements under Master's Degree Programs)

This option provides the school's master's degree students the opportunity to earn the Ph.D. in a shorter time.

Orientation and Advisement

New Ph.D. 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 Ph.D. 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.scis.nova.edu/Doctoral. The student enters candidacy upon completion of course requirements with a cumulative GPA of at least 3.25. Immediately following candidacy, 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. Students are strongly encouraged to register for each term following the one in which they enter candidacy until the dissertation has been completed. Doctoral residence is defined as continuous enrollment for two consecutive terms at a minimum 12 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 core course assignments and research project courses 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, subscription library databases, 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. Students can confirm their registration status by accessing NSU WebSTAR (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 Ph.D. 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 (See earlier 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 by the calendar midpoint of the course (see specific dates in the Academic Calendar on p. ii). 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.

Attendance Policy

Ph.D. 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 Ph.D. 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

Students are expected to make academic progress through their programs. Relevant academic policies are as follows (also see the section Time Limitations):

- Students must maintain a cumulative grade point average (GPA) of at least 3.25 for the duration of their programs to remain in good academic standing. If the cumulative GPA falls below 3.25 the student will be automatically placed on academic probation. (Academic probation may adversely affect financial aid.) If the cumulative GPA is not raised to 3.25 within two terms the student will be dismissed from the program. Upon achieving a cumulative GPA of 3.25, the student will be removed from academic probation. If the cumulative GPA could not be raised to 3.25 within the required period the student will be dismissed immediately. Students who do not have a cumulative GPA of 3.25 at the end of their course work will not be eligible to enter doctoral candidacy or register for dissertation.
- Students with four withdrawals will be dismissed immediately.
- Students who receive an F grade have the right to repeat the course. Students who receive a second F grade in any course will be dismissed immediately (independent of whether the first F was repeated with a passing grade). Students permitted to repeat a course must pay course tuition and fees.
- No student will be allowed to repeat a course in order to change a passing grade.
- Students are encouraged to register for each term following the one in which they enter candidacy (i.e., complete course requirements with a cumulative GPA of at least 3.25). Unregistered dissertation students risk losing their advisors/committees, especially if their stop-outs have not been coordinated with their advisors.

- Registered but inactive dissertation students risk losing their advisors/committees, especially if their inactivity has not been coordinated with their advisors.
- Students who make unsatisfactory progress toward the completion of a dissertation will be evaluated for probation or dismissal (see the section Evaluation of Dissertation Progress).
- Students dismissed for poor academic performance or for violation of academic standards will have no right to apply for readmission.

Time Limitation

Students must complete requirements for the Ph.D. degree within 10 years from the date of their first registration. No extensions will be granted. Students dismissed for exceeding the time limit will have no right to apply for readmission.

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 Ph.D. 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 3.25. 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 Ph.D. 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 Ph.D., students are encouraged to submit their dissertation research for publication. Ph.D. students must follow the policies, procedures, and formatting requirements contained in the *Dissertation Guide* (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

(See the section Academic Progress, Grade Requirements, and Academic Standing.)

Students are evaluated on a number of occasions regarding their 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 Board and possible probation, suspension, or dismissal from the Ph.D. program. Students are encouraged to register for each term following the one in which they enter candidacy (i.e., complete course requirements with a cumulative GPA of at least 3.25). Unregistered dissertation students risk losing their advisors/committees if the stop-out has not been coordinated with their advisors. Registered but inactive dissertation students risk losing their advisors/committees. Students 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 Board. 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. (See the section Writing Skills and Form and Style Requirements.)

Tuition and Fees for Ph.D. Programs (See sections Tuition Payment Options 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. Ph.D. students must be registered for core courses, research project courses, 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	$600 per credit hour
Dissertation I or II	$6,600 per term ($550 per credit hour)
Continuing Dissertation	$3,300 per term ($550 per credit hour)
Student Services Fee (per term)	$250 (4 or more credit hours)
Registration Fee	$30 nonrefundable
Late Registration Fee	$100 nonrefundable
Program Change Fee	$50 nonrefundable
Degree Application Fee	$75
Deferment 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 or the Ph.D. in Computer Information Systems with Concentration in Information Security. 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 information technology 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 information technology professionals with the knowledge and ability to develop creative solutions to substantive real-world problems. Each student must complete eight core courses, two research project courses, and a dissertation.

The concentration in information security is recognized by the U.S. National Security Agency (NSA) based on its certification of the school's curriculum for compliance with the requirements of NSA national

training standards NSTISSI No. 4011 (Information Systems Security Professionals) and CNSSI No. 4013 (System Administrators). Students who complete the concentration may also request a graduate certificate.

A graduate with a Ph.D. in Computer Information Systems will have the ability to: (1) Acquire advanced knowledge and deeper understanding of the field of computer information systems; (2) Communicate professionally and ethically about computer information systems research issues; (3) Identify, analyze, and synthesize scholarly literature related to computer information systems; and (4) Generate new knowledge through research/scholarship and disseminate that knowledge to others by demonstrating the necessary technical and intellectual skills to produce a written document that makes an original contribution to the field of computer information systems.

Program-Specific Admission Requirements
(For general requirements, see the section Application for Admission.)

This program is designed for the student with a master's degree in computer information systems, computer science, information technology, 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, and data communications and networks. Alternatively, GSCIS master's students in computer science, computer information systems, information security, or information technology may apply for early admission into the Ph.D. program. (For requirements, see the master's section of this catalog.)

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. Courses and dissertation registrations are listed below:

Core Courses (four credits each) (Select eight of these.)
DCIS 710 Decision Support Systems
DCIS 720 Human-Computer Interaction
DCIS 730 Network 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)

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

Curriculum for the Ph.D. in Computer Information Systems with Concentration in Information Security

The Ph.D. in Computer Information Systems with Concentration in Information Security was developed to address the rapidly growing global problems of maintaining and securing computer information. The program requires 64 credit hours, of which 40 are for courses and 24 are for the dissertation. The dissertation must be in an area closely related to information security. Courses and dissertation registrations are as follows:

Required Core Courses (four credits each)
DCIS 730 Network Security
DCIS 750 Database Systems
DCIS 765 Secure Systems Analysis and Design
DCIS 770 Software Engineering
DCIS 775 Privacy
DCIS 791 Distributed Systems

Elective Core Courses (four credits each) (select two of these)
DCIS 710 Decision Support Systems
DCIS 720 Human-Computer Interaction
DCIS 735 Knowledge Management
DCIS 740 Data Communications and Computer Networking
DCIS 760 Artificial Intelligence and Expert Systems
DCIS 799 Special Topics in Computer Information Systems (offered on various subjects)

Research Project Courses (four credits each) (Select two of these. Must be taken concurrent with, or following completion of, the corresponding core course.)
DCIS 830 Research Project in Network Security
DCIS 865 Research Project in Secure Systems Analysis and Design
DCIS 875 Research Project in Privacy

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

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 and information technology. It provides research-oriented professionals with knowledge in the major areas of computer science the ability to develop creative solutions to substantive real-world problems. Each student must complete eight core courses, two research project courses, and a dissertation.

A graduate with a Ph.D. in Computer Science will have the ability to: (1) acquire advanced knowledge and deeper understanding of the field of computer science; (2) communicate professionally and ethically about computer science research issues; (3) identify, analyze, and synthesize scholarly literature related to the field of computer science; and (4) generate new knowledge through research/scholarship and disseminate that knowledge to others by demonstrating the necessary technical and intellectual skills to produce a written document that makes an original contribution to the field of computer science.

Program-Specific Admission Requirements
(For general requirements, see the section Application for Admission.)

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 in computer science may apply for early admission into the Ph.D. program. (For requirements, see the master's section of this catalog.)

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. Courses and dissertation registrations are listed below:

Core Courses (four credits each) (All students must take 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

Research Project Courses (four credits each) (Select two of these. Must be taken concurrent with, or following completion of, the corresponding core course.)
CISD 800 Research Project in Theory and Principles of Programming
CISD 830 Research Project in Operating Systems
CISD 840 Research Project in Data Communications and Computer Networking
CISD 850 Research Project in Database Management Systems
CISD 860 Research Project in Artificial Intelligence
CISD 870 Research Project in Software Engineering
CISD 892 Research Project in Computer Graphics
CISD 894 Research Project in Knowledge Discovery in Databases

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

Ph.D. in Computing Technology in Education

This program offers a course of study leading to the degree of Doctor of Philosophy (Ph.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. The program addresses (1) the use of information technology 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 information technology professionals with the knowledge and ability to develop creative solutions to substantive real-world problems.

Each student must complete eight core courses, two research project courses, and a dissertation. 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.

Graduates with the Ph.D. in Computing Technology in Education will: (1) possess advanced knowledge and deeper understanding of the field of computing technology in education; (2) communicate professionally and ethically about computing technology in education research issues; (3) identify, analyze, and synthesize scholarly literature related to the field of computing technology in education; and (4) generate new knowledge through research/scholarship and disseminate that knowledge to others using the necessary technical and intellectual skills to produce a written document that makes an original contribution to the field of computing technology in education.

Program-Specific Admission Requirements
(For general requirements, see the section Application for Admission.)

A master's degree in any liberal arts, science, education or applied science field with a GPA of 3.25 is required. The candidate must have strong skills in computing and communication in the English language. GSCIS master's students in computing technology in education or information technology may apply for early admission into the Ph.D. program. For details, see the master's degree section of this catalog.

Curriculum for the Ph.D. in Computing Technology in Education

The program requires 64 credit hours, of which 40 are for courses and 24 are for the dissertation. Core courses, research project courses, and dissertation registrations are listed below:

Core Courses (four credits each) (All students must take these.)
DCTE 700 Analysis and Application of Educational Research
DCTE 710 Qualitative and Quantitative Research Methodologies (Prerequisite: DCTE 700)
DCTE 720 Human-Computer Interaction
DCTE 730 Online Learning Environments
DCTE 740 Telecommunications and Computer Networks
DCTE 750 Management of Data, Information, and Knowledge in Education
DCTE 760 Instruction Delivery Systems
DCTE 770 Courseware Design and Development

Research Project Courses (four credits each) (Select two of these. Must be taken concurrent with, or following completion of, the corresponding core course, with the exceptions noted below.)

DCTE 810 Advanced Methods of Educational Research (Prerequisites: DCTE 700, DCTE 710)
DCTE 820 Research Project in Human-Computer Interaction
DCTE 830 Research Project in Online Learning Environments
DCTE 840 Research Project in Telecommunications and Computer Networks
DCTE 850 Research Project in Management of Data, Information, and Knowledge in Education
DCTE 860 Research Project in Instruction Delivery Systems
DCTE 870 Research Project in Courseware Design and Development

Dissertation Registrations

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

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 or the Ph.D. in Information Systems with Concentration in Information Science or the Ph.D. in Information Systems with Concentration in Information Security. It is offered in both cluster and institute formats, which combine traditional and online instruction to provide information technology 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, information security, systems analysis and design, project management, information system administration, information science, or software engineering. It provides information technology professionals with the knowledge and ability to develop creative solutions to substantive real-world problems in information systems. Each student must complete eight core courses, two research project courses, and a dissertation.

The concentration in information security is recognized by the National Security Agency (NSA) based on its certification of the school's curriculum for compliance with the requirements of NSA national training standards NSTISSI No. 4011 (Information Systems Security Professionals) and CNSSI No. 4013 (System Administrators). Students who complete the concentration may also request a graduate certificate.

A graduate with a Ph.D. in Information Systems will have the ability to: (1) acquire advanced knowledge and deeper understanding of the field of information systems; (2) communicate professionally and ethically about information systems research issues; (3) identify, analyze, and synthesize scholarly literature related to information systems; and (4) generate new knowledge through research/scholarship and disseminate that knowledge to others by demonstrating the necessary technical and intellectual skills to produce a written document that makes an original contribution to the field of information systems.

Program-Specific Admission Requirements

(For general requirements, see the section Application for Admission.)

This program is designed for the student with a master's degree in information systems, information science, computer science, information technology, 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, information security, or information technology may apply for early admission into the Ph.D. program. (For requirements, see the master's section of this catalog.)

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. Courses and dissertation registrations are as follows:

Core Courses (four 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 735 Knowledge Management
DISS 740 Telecommunications and Computer Networks
DISS 745 Electronic Commerce
DISS 750 Database Systems
DISS 755 Information Security Management
DISS 765 Managing Risk in Secure Systems
DISS 770 Information Policy
DISS 775 Privacy
DISS 791 Client-Server Computing
DISS 792 Enterprise Architecture Infrastructures Planning and Management
DISS 799 Special Topics in Information Systems (offered on various subjects)

Research Project Courses (four credits each) (Select two of these. Must be taken concurrent with, or following completion of, the corresponding core course.)
DISS 800 Project in Research Methodology
DISS 810 Research Project in Decision Support Systems
DISS 820 Research Project in Human-Computer Interaction
DISS 825 Research Project in the System Development Process
DISS 835 Research Project in Knowledge Management
DISS 840 Research Project in Telecommunications and Computer Networks
DISS 845 Research Project in Electronic Commerce
DISS 850 Research Project in Database Systems
DISS 855 Research Project in Information Security Management
DISS 865 Research Project in Managing Risk in Secure Systems
DISS 870 Research Project in Information Policy
DISS 875 Research Project in Privacy
DISS 891 Research Project in Client-Server Computing
DISS 892 Research Project in Enterprise Architecture Infrastructures Planning and Management
DISS 899 Research 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)

Curriculum for the Ph.D. in Information Systems with Concentration in Information Science

The Ph.D. in Information Systems with Concentration in Information Science focuses on information aspects of information systems including access to and management of information. It requires 64 credit hours of which 40 are for courses and 24 are for the dissertation. The dissertation must be in an area closely related to information science. Courses and dissertation registrations are listed below:

Required Core Courses (four credits each)
DISS 735 Knowledge Management
DISS 750 Database Systems
DISS 755 Information Security Management
DISS 770 Information Policy

Elective Core Courses (four credits each)
Any four additional DISS 700-level courses.

Research Project Courses (four credits each) (Select two of these. Must be taken concurrent with, or following completion of, the corresponding core course.)
DISS 835 Research Project in Knowledge Management
DISS 850 Research Project in Database Systems
DISS 855 Research Project in Information Security Management
DISS 870 Research Project in Information Policy

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

Curriculum for the Ph.D. in Information Systems with Concentration in Information Security

The Ph.D. in Information Systems with Concentration in Information Security was developed to address the rapidly growing global problems of maintaining and securing computer information. The program requires 64 credit hours, of which 40 are for courses and 24 are for the dissertation. The dissertation must be in an area closely related to information security. Courses and dissertation registrations are as follows:

Required Core Courses (four credits each)
DISS 725 The System Development Process
DISS 750 Database Systems
DISS 755 Information Security Management
DISS 765 Managing Risk in Secure Systems
DISS 775 Privacy
DISS 791 Client-Server Computing

Elective Core Courses (four credits each) (select two of these)
DISS 700 Research Methodology
DISS 710 Decision Support Systems
DISS 720 Human-Computer Interaction
DISS 740 Telecommunications and Computer Networks
DISS 745 Electronic Commerce
DISS 770 Information Policy
DISS 792 Enterprise Architecture Infrastructures Planning and Management
DISS 799 Special Topics in Information Systems (offered on various subjects)

Research Project Courses (four credits each) (Select two of these. Must be taken concurrent with, or following completion of, the corresponding core course.)
DISS 855 Research Project in Information Security Management
DISS 865 Research Project in Managing Risk in Secure Systems
DISS 875 Research Project in Privacy

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. Programs

CISD 700 Theory and Principles of Programming (4 credits)
Syntax of programming languages by parsing to abstract syntax. Semantics of common language constructs using an interpreter: arithmetic, symbolic, and conditional expressions; blocks; lexically-scoped recursive first-class procedures; control structures; and parameter passing variations. Static type checking and type inference; imperative, functional, and object-oriented language paradigms. Recent research and current trends will be explored.

CISD 730 Operating Systems (4 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 (4 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 (4 credits)
Theory and principles of databases and their management. Selected topics in design and implementation of traditional and nontraditional database management systems to retrieve and store various types of data. Current issues, trends, future directions, and research topics in the areas will be explored.

CISD 760 Artificial Intelligence (4 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 (4 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 (4 credits)
Principles of computer graphics including raster operations and 3D graphics: transformations, scene graphs and other modeling methods, hidden surface removal and rendering, programming and graphics systems, visualization, and computer animation. Recent research and current trends will be explored.

CISD 794 Knowledge Discovery in Databases (4 credits)
This course will study a number of emerging technical approaches to knowledge discovery in databases such as algorithms for mining various types of data, measurements for set of mined rules, classification and predication, data clustering and summarization, finding dependency networks, analyzing changes, detecting anomalies, and their applications. Current issues, trends, future directions, and research topics in the areas will be explored.

CISD 800 Research Project in Theory and Principles of Programming (4 credits)
Students pursue research on a current topic on the theory, principles, and design of programming languages, and related research areas.

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

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

CISD 850 Research Project in Database Management Systems (4 credits)
Students pursue research on a current topic in database management systems and closely related research areas.

CISD 860 Research Project in Artificial Intelligence (4 credits)
Students pursue research 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 Research Project in Software Engineering (4 credits)
Students pursue research on a current topic in software engineering. 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 Research Project in Computer Graphics (4 credits)
Students pursue research on a current topic in computer graphics and related research areas.

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

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.

DCIS 710 Decision Support Systems (4 credits)
Principles and techniques relating to automated support for decision making and organizational problem solving. The focus is on current research in decision support systems. 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 (4 credits)
The course focuses on current and future research in HCI pertaining to computer information systems. Design elements, procedures, tools, and environments contributing to the development of successful user interfaces are explored. Design principles that support usability for user interfaces and methodologies for evaluating user interfaces are presented.

DCIS 730 Network Security (4 credits)
Study of the technical challenges of securing computer networks, the tools and techniques that have been developed to address these challenges, and the current research in protecting critical information networks. Topics in the course will include network protocols designed to enhance security, wireless security approaches, intrusion detection, cryptography, and authentication and access control techniques. A significant focus of the course will be on current and emerging network security research areas.

DCIS 735 Knowledge Management (4 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 (4 credits)
Recent advances and trends in data communication and computer network research are explored. 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, reliability, fault tolerance, and computing services. Infrastructure issues are aligned with research to deliver current and future solutions for dependable information systems.

DCIS 750 Database Systems (4 credits)
Theory and principles of data models and data modeling, databases and their management. Selected topics in design, implementation, and applications of traditional and nontraditional database management systems. Current issues, trends, future directions, and research topics in the areas will be explored.

DCIS 760 Artificial Intelligence and Expert Systems (4 credits)
Theory of, and major approaches to, artificial intelligence. Topics include knowledge representation, heuristic search, and machine learning, and reasoning under uncertainty. Recent research and current trends are explored.

DCIS 765 Secure Systems Analysis and Design (4 credits)
Study of the tools and methodologies utilized in analyzing and assessing the security of critical information systems. Topics include the design of secure architectures, vulnerability assessments, and the analysis of potential security threats. An emphasis will be placed on current issues, future directions, and research opportunities for students in this field.

DCIS 770 Software Engineering (4 credits)
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 775 Privacy (4 credits)
This course will study the principles of privacy and current privacy issues regarding information systems. Privacy will be looked at as an extension of basic computer security. Discussions will cover the legal, technological, ethical and policy aspects of privacy in our modern technologically-based society. Techniques and practices used in on-line systems such as e-commerce, transaction systems, and data management will be included. Methods to address privacy concerns in the development, selection, deployment, and management of systems will be the course focus. Privacy representation languages and trust models will be discussed.

DCIS 791 Distributed Systems (4 credits)
Students are expected to contribute to the body of research in the area of networking and distributed systems with a focus on dependable distributed applications and information systems. Topics include the components of distributed systems architecture, operating systems, networking, interprocess communication, middleware, security, and

software development. The development of the distributed computing model and its application to enterprise strategy, architecture, and management issues are explored with an emphasis on current research, design and development strategies for dependable information systems.

DCIS 799 Special Topics in Computer Information Systems (4 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 Research Project in Decision Support Systems (4 credits)
Students pursue research on a current topic in the area of decision support systems.

DCIS 820 Research Project in Human-Computer Interaction (4 credits)
Students pursue research on a current topic in HCI related to computer information systems.

DCIS 830 Research Project in Network Security (4 credits)
Students pursue a research project on a current topic in network security. Topics of current interest include wireless security, intrusion detection, cryptographic theory and applications, enhanced authentication and access control measures, and malicious code detection.

DCIS 835 Research Project in Knowledge Management (4 credits)
Students pursue research on a current topic in knowledge management.

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

DCIS 850 Research Project in Database Systems (4 credits)
Students pursue a research study on a current topic in database systems and its closely related research areas.

DCIS 860 Research Project in Artificial Intelligence and Expert Systems (4 credits)
Students pursue research on a current topic in the area of artificial intelligence.

DCIS 865 Research Project in Secure Systems Analysis and Design (4 credits)
Students advance their knowledge of secure systems analysis and design by participating in a series of practical exercises and directed group assignments designed to allow students to demonstrate their abilities to design and assess secure information systems.

DCIS 870 Research Project in Software Engineering (4 credits)
Students pursue research on a current topic in software engineering.

DCIS 875 Research Project in Privacy (4 credits)
Students investigate research topics on privacy in systems. Studies include reviewing current research in aspects of privacy, developing publication quality research proposals and interacting with other students in sharing research topics. Some topics of current interest are user perception and actions related to privacy in application areas, preserving privacy in systems, compliance, development of enhanced Privacy Enhancing Technology (PET) and federated identity models and protocols.

DCIS 891 Research Project in Distributed Systems (4 credits)
Students pursue research on a current topic in distributed systems.

DCIS 899 Research Project in Special Topics in Computer Information Systems (4 credits)
Students pursue research on a current topic 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.

DCTE 700 Analysis and Application of Educational Research (4 credits)
Core competencies (e.g., problem statement, literature review, hypothesis development) required for critical understanding, evaluation, and use of published educational research. Introduction to historical, descriptive and experimental research methods as well as sampling, measurement, data collection, analysis and hypothesis testing.

DCTE 710 Qualitative and Quantitative Research Methodologies (4 credits)
Methods and procedures of in-depth qualitative and quantitative research in education. Philosophical issues, conceptualizing research questions, choosing appropriate research designs, data collection, computerized data analysis, and interpretation. Prerequisite: DCTE 700.

DCTE 720 Human-Computer Interaction (4 credits)
This course focuses on current and future research in HCI pertaining to computing technology in education and learning environments. Techniques facilitating effective human-computer interaction are presented. Design 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, evaluating, and maintaining interactive systems that optimize user productivity are reviewed.

DCTE 730 Online Learning Environments (4 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 and report upon 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 (4 credits)
This course examines major developments in the expanding field of broadband communications and computer networks and their impacts on e-learning network applications and initiatives. Topics include broadband technologies, network architectures, network configurations, network security, and transborder e-learning cyberinfrastructures. Distinctive attributes of next-generation research and education networks such as Internet2 and Geant2 and the role of broadband technologies as enablers of advances in fields such as e-government and e-medicine are described. Trends in grid implementations and developments in wireless and wireline network solutions are explored.

DCTE 750 Management of Data, Information, and Knowledge in Education (4 credits)
This course explores several issues of interest in managing data, information, and knowledge in an educational setting. Included among the topics examined are: database design, structure, and capabilities; data warehousing; data mining; text mining; information retrieval; information policy, security, and privacy; and knowledge management.

DCTE 760 Instruction Delivery Systems (4 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 roles of Web 2.0 tools in learning will be researched and experienced. 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 (4 credits)
Using a systematic instructional design process, students will create interactive, media-enhanced courseware. Students will identify an instructional problem, goal, and learning objectives. They will apply instructional strategies that will help learners achieve the objectives and use an authoring system or state-of-the-art visual programming language to develop and deliver the courseware. Students will also design and implement alpha and beta tests to evaluate the courseware.

DCTE 810 Advanced Methods of Educational Research (4 credits)
Advanced design, data collection, and data analysis issues in qualitative, quantitative and mixed-methods research. Applied data analysis using appropriate text and numeric software and the effective dissemination of results. Prerequisites: DCTE 700 and DCTE 710.

DCTE 820 Research Project in Human-Computer Interaction (4 credits)
Students pursue research on a current topic in HCI related to computing technology in education.

DCTE 830 Research 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 Research Project in Telecommunications and Computer Networks (4 credits)
Students pursue research in the field of broadband telecommunications and computer networks. Suggested areas for investigation include e-learning cyberinfrastructures, wireline and/or wireless networks, network security, e-medicine implementations, wireless sensor networks, teleworking, and e-government solutions.

DCTE 850 Research Project in Management of Data, Information, and Knowledge in Education (4 credits)
Students pursue research on a current topic related to the management of data, information, and knowledge in education.

DCTE 860 Research Project in Instruction Delivery Systems (4 credits)
Students pursue research on a current topic related to instruction delivery systems.

DCTE 870 Research Project in Courseware Design and Development (4 credits)
Students pursue research on a current topic related to courseware design and development.

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.

DISS 700 Research Methodology (4 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 (4 credits)
Principles and techniques relating to automated support for decision making and organizational problem solving. The focus is on current research in decision support systems. 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 (4 credits)
Issues relating to effective HCI are presented. Design elements, procedures, tools, and environments contributing to the management of successful user interfaces are examined. Other topics include current and projected developments in HCI research related to information systems.

DISS 725 The System Development Process (4 credits)
Acquire advanced knowledge and deeper understanding of system development process including theories and studies related to system life-cycle models, system development strategies, and implementation success. Review of relevant research in the area of techniques, methods, and tools for the analysis and specification of information systems. Review of studies dealing with design principles, requirements gathering, reusability, and quality assurance. Moreover, review of studies and theories relevant to verification and validation process, integration and acceptance testing, reliability measurements, system testing techniques, end-user computing, implementation effectiveness, and system value. Additionally, review of classical theories in information systems and system analysis and design.

DISS 735 Knowledge Management (4 credits)
Acquire advanced knowledge and deeper understanding of knowledge management including theories and studies related to knowledge management and knowledge management systems. Review of relevant research in the area of locating, evaluating, disseminating, and using information as well as knowledge. Review of studies and theories relevant to knowledge acquisition, information sharing, information ownership, knowledge process, knowledge integration, knowledge gathering, knowledge repositories, and knowledge reuse. Additionally, review of current research in knowledge management and knowledge management systems.

DISS 740 Telecommunications and Computer Networks (4 credits)
This course focuses on 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 in facilitating network design, deployment, and management are described. Topics include DWDM, advanced Gigabit Ethernet technologies such as 10GbE, network security, cellular and mobile wireless networks, architectural frameworks such as IMS (Internet Protocol Multimedia Subsystem), and wireline and/or wireless computational grids. Trends in standardization and internetworking are reviewed. Capabilities of next-generation networks and innovations in enterprise broadband communications solutions are examined.

DISS 745 Electronic Commerce (4 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 (4 credits)
Theory and principles of databases and their management. Selected topics in design, implementation, and applications of traditional and nontraditional database systems for various types of data management. Current issues, trends, future directions, applications, and research topics in the areas will be explored.

DISS 755 Information Security Management (4 credits)
Study of the managerial and procedural aspects of effectively securing enterprise information systems. Topics in this course will include security policies and best practices, asset classification and control, personnel security, business continuity management, regulatory compliance, operational security, and information security program lifecycles. The course will include an analysis of current practices and procedures in securing critical information infrastructures, with an emphasis placed on emerging trends and opportunities for research in the management of information security.

DISS 765 Managing Risk in Secure Systems (4 credits)
Study of the theory and practice of risk management in secure systems and networks. The course will focus on the current tools and best practices available in mitigating system vulnerabilities and the accepted methodologies for managing residual risks. Topics include operational security, risk reduction techniques, auditing of information systems, and effective long-term risk monitoring approaches. An emphasis will be placed on current issues and future directions in managing risks, and research opportunities for students in this field.

DISS 770 Information Policy (4 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 775 Privacy (4 credits)
This course will study the principles of privacy and current privacy issues regarding information systems. Privacy will be looked at as an extension of basic computer security. Discussions will cover the legal, technological, ethical and policy aspects of privacy in our modern technologically-based society. Techniques and practices used in on-line systems such as e-commerce, transaction systems, and data management will be included. Methods to address privacy concerns in the development, selection, deployment, and management of systems will be the course focus. Privacy representation languages and trust models will be discussed.

DISS 791 Client-Server Computing (4 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 (4 credits)
Students acquire advanced knowledge and deeper understanding of enterprise architecture infrastructures planning including theories and studies related to enterprise resource planning. Review of relevant research in the area of enterprise systems, enterprise infrastructures implementation, alignment of enterprise infrastructures with business strategy, and business management processes. Review of relevant research in the area of creation, maintenance, and refinement of enterprise architecture infrastructures planning. Review of studies and theories relevant to critical success factors of enterprise systems.

DISS 799 Special Topics in Information Systems (4 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 Research Project in Decision Support Systems (4 credits)
Students pursue research on a current topic in the area of decision support systems.

DISS 820 Research Project in Human-Computer Interaction (4 credits)
Students pursue research on a current topic in HCI related to information systems.

DISS 825 Research Project in the System Development Process (4 credits)
Students pursue research on a current topic in the system development process.

DISS 835 Research Project in Knowledge Management (4 credits)
Students pursue research on a current topic in the area of knowledge management.

DISS 840 Research Project in Telecommunications and Computer Networks (4 credits)
Students pursue research in the field of broadband telecommunications and computer networks. Suggested areas for investigation include wireline and/or wireless computational grids, IMS, critical infrastructure security, e-government, and wireless sensor networks.

DISS 845 Research Project in Electronic Commerce (4 credits)
Students pursue research on a current topic in electronic commerce.

DISS 850 Research Project in Database Systems (4 credits)
Students pursue research on a current topic in database systems and its closely related research, management, and application areas.

DISS 855 Research Project in Information Security Management (4 credits)
Students pursue research on a current topic in information security management. Topics of current interest include information security policies and management issues, security audits, business continuity management/disaster recovery, information security lifecycle management, and secure eCommerce.

DISS 865 Research Project in Managing Risk in Secure Systems (4 credits)
Students advance their knowledge of risk management by participating in a series of practical exercises and directed group assignments designed to allow students to demonstrate their abilities to effectively evaluate, mitigate, and manage risk in critical information systems.

DISS 870 Research Project in Information Policy (4 credits)
Students pursue research on a current topic in information policy.

DISS 875 Research Project in Privacy (4 credits)
Students advance their knowledge of privacy in systems by participating in a series of practical exercises and directed group assignments designed to demonstrate their abilities to work in privacy research.

DISS 891 Research Project in Client-Server Computing (4 credits)
Students pursue research on a current topic in client-server/distributed systems.

DISS 892 Research Project in Enterprise Architecture Infrastructures Planning and Management (4 credits)
Students pursue research on a current topic in enterprise architecture infrastructures.

DISS 899 Research Project in Special Topics in Information Systems (4 credits)
Students pursue research on special topics in information systems.

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

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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. Professor. Multimedia design and application, application of database technology to education, online learning environments, adult education.

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. Associate Professor. Online learning systems effectiveness, value of information systems, eCommerce, telecommunications and networking.

Wei Li, Ph.D., Mississippi State University. Assistant Professor. Computer security, network security, software engineering, artificial intelligence, database systems.

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

Peixiang Liu, Ph.D., Imperial College London. Assistant Professor. Computer networks, QoS routing, database systems, machine learning.

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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.

John Scigliano, Ed.D., University of Florida. Professor Emeritus. Management information systems; enterprise information systems, technologies and infrastructures; project management; online learning environments.

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

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

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

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Reference List

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