NOVA SOUTHEASTERN UNIVERSITY

Graduate School of Computer and Information Sciences

Graduate Catalog

2013–2014

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

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September 4, 2013

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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 supersedes previous web and printed versions. The NSU *Student Handbook* specifies rights, responsibilities, and specific university policies and procedures. It 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 April 30, 2013. Revised September 4, 2013.

ACADEMIC CALENDARS

(Please refer to the school website for a more detailed calendar with updated application deadlines)

Fall 2013 *(08/26/13 – 12/15/13)* Term Code 201420

Registration Period *(no Late Fees):*	05/06/13 – 08/15/13
Late Registration Period *(with Late Fees):*	08/16/13 – 08/25/13
First Day of Term:	08/26/13
Drop/Add Deadline:	09/01/13
Observed Holiday:	09/02/13 (Labor Day)
New Student Orientation:	**08/29/13 (1st Day CTE Meeting Dates)**
CTE Student Meeting Dates:	**08/29/13 – 09/01/13**
Non-CTE 1st Meeting Dates:	**08/30/13 – 09/01/13**
Non-CTE 2nd Meeting Dates:	**10/25/13 – 10/27/13**
Observed Holiday:	11/28/13 (Thanksgiving)
Last Day to Withdraw from a course with final grade of W:	11/25/13
Last Day to Request an Incomplete:	12/02/13
Last Day of the Term:	12/15/13

Shaded area indicates relevant for doctoral students only

Winter 2014 *(01/06/14 – 04/27/14)* Term Code 201430

Registration Period *(no Late Fees):*	10/14/14 – 12/25/13
Late Registration Period *(with Late Fees):*	12/26/13 – 01/05/14
First Day of Term:	01/06/14
New Student Orientation:	**01/16/14 (1st Day CTE Meeting Dates)**
CTE Student Meeting Dates:	**01/16/14 – 01/19/14**
Non-CTE 1st Meeting Dates:	**01/17/14 – 01/19/14**
Drop/Add Deadline:	01/12/14
Observed Holiday:	01/20/14 (Martin Luther King Day)
Non-CTE 2nd Meeting Dates:	**03/07/14 – 03/09/14**
Observed Holiday:	04/20/14 (Easter)
Last Day to Withdraw from a course with final grade of W:	04/07/14
Last Day to Request an Incomplete:	04/14/14
Last Day of the Term:	04/27/14

Shaded area indicates relevant for doctoral students only

Summer 2014 *(05/12/14 – 08/17/14)* Term Code 201450

Registration Period *(no Late Fees):*	03/24/14 – 05/01/14
Late Registration Period *(with Late Fees):*	05/02/14 – 05/11/14
First Day of Term:	05/12/14
Drop/Add Deadline:	05/18/14
Observed Holiday:	05/26/14 (Memorial Day)
Observed Holiday:	07/04/14 (Independence Day)
Last Day to Withdraw from a course with final grade of W:	07/28/14
Last Day to Request an Incomplete:	08/04/14
Last Day of the Term:	08/17/14

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 28,000 students and is the largest private, non-profit university in the Southeast United States. It is the ninth 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, 89 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 150,000 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 learning 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, cutting edge curricula, 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. 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 and video-conferenced evening master's degree programs are tailored to meet the needs of 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 up to four campus weekend visits each year. The school's M.S. students may apply for early admission into a Ph.D. program, which provides the opportunity to earn the doctorate in a shorter time.

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 hundreds of 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.

All M.S. programs employ a three-term format: Fall (16-week term starting in August), Winter (16-week term starting in January) and Summer (14-week term starting in May).

All Ph.D. programs employ a semester format, which includes two 16-week terms a year during course work. The fall term starts in August and the winter term starts in January. While taking courses, students attend two or four cluster sessions per year (one or two per term, depending on the program of study), held over an extended 3- or 4-day weekend on the university's main campus. These cluster weekends bring together students and faculty for participation in courses, seminars, and dissertation counseling, and provide ample opportunity for student-faculty and student-student interaction. Between sessions, students work on course assignments and research, and participate in online activities that facilitate frequent interaction with the faculty and with other students. There is a third (summer) term where doctoral students can register for dissertation or possibly other non-residential courses.

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 a web-based 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.

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 (concentrations in theory, software engineering, computer systems, database, security, and real-world computing)
- Information Technology in Education (optional concentrations in educational technology management, information security management, instructional design and development, and social computing and learning)
- Information Security
- Information Technology (concentrations in application development, database, and system administration)
- Management Information Systems (optional concentrations in business intelligence/analytics and information security management)

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 and information security)

Graduate Certificates

- Information Security (see the section M.S. in Information Security)
- Information Security Management (see the section M.S. in Management Information Systems)
- Business Intelligence / Analytics (see the section M.S. in Management Information Systems)

Computer and Information Science Concentrations Offered in Other NSU Programs

- Institute for the Study of Human Service, Health & Justice, M.S. in Criminal Justice
    - Track in Information Systems
    - Track in Information Security
- Huizenga School of Business and Entrepreneurship, Master of Business Administration
    - Concentration in Business Intelligence / Analytics
- Graduate School of Humanities and Social Sciences, M.S. in Cross-Disciplinary Studies
    - Concentration in Information Systems and Society
- Graduate School of Humanities and Social Sciences, M.S. in National Security Affairs
    - Concentration in Cyber-terrorism and Security
- Graduate School of Humanities and Social Sciences, Graduate Minor in Information Systems
- College of Osteopathic Medicine
    - M.S. in Biomedical Informatics
    - M.S. in Disaster and Emergency Preparedness, track in Cyber Security

Faculty and Research

The school's faculty members are leaders in their fields and are active in teaching and research over a range of disciplines. The school's research, conducted by students and faculty, advances knowledge, improves professional practice, and contributes to understanding in the computer and information sciences. Faculty research interests are listed in this catalog and also 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. An online version of the orientation includes links to general library information as well as subject guides for the disciplines of the school. This orientation may be accessed from the school's home page (www.scis.nova.edu) by selecting "Online Orientation" from the "For Current Students" menu. 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's library system supports the larger 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 Americans with Disabilities Act (ADA). The university's detailed policy on disabilities is contained in NSU's *2013–2014 Student Handbook.* Student requests for accommodation based on ADA will be considered on an individual basis. Students with disabilities should discuss their needs with NSU's ADA Coordinator (see www.nova.edu/disabilityservices/studentinfo.html) 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 http://www.nova.edu/financialaid/. Students must work directly with the university's Office of Student Financial Assistance because the school's program office does not administer or manage the financial aid process. For additional information or application forms (1) call 954-262-3380 or 800-806-3680; or (2) send email to finaid@nova.edu. To continue financial aid, at a minimum, enrolled students must demonstrate satisfactory academic progress toward a stated educational objective in accordance with the university's policy on satisfactory progress for financial aid recipients.

Tuition Payment 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) Please see the Office of the University Bursar for more information.
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 $75 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 *2013–2014 Student Handbook*. 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. Writing, including grammatical errors and spelling errors, 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.

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* (2011) 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) (2010), a comprehensive handbook on writing for publication, addresses editorial style, grammar, and organization. Give particular attention to Chapter 2, Manuscript Structure and Content; Chapter 3, Writing Clearly and Concisely; and Chapter 4, The Mechanics of Style. Chapter 3 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 www.scis.nova.edu/program/irb.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 *2013–2014 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 Words or Ideas*)
- 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 Words or Ideas* below)

Crediting Words or Ideas

When using exact words from another work, 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, Sixth Edition,* (2010, pp. 170–173) contains standards and examples on quotation methods.

When paraphrasing (summarizing, or rewriting) words or ideas from another work, a proper citation must be provided. (*Publication Manual of the American Psychological Association, Sixth Edition* (2010) contains standards and examples on citation methods (pp. 174–179) and reference lists (pp. 180–224).) 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 Words or Ideas*). At all times, students are expected to comply with the school's accepted citation practice and policy. The school and its faculty are committed to maintaining high standards of academic integrity. Student work will be routinely submitted to plagiarism detection tools (such as those at www.turnitin.com) for review.

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.
PR	Progress. May be assigned to thesis or dissertation registrations. Carries credit hours but no grade points. Indicates progress toward completion of a thesis or dissertation.
NPR	No Progress. May be assigned to thesis or dissertation registrations. Carries no credit hours. Indicates insufficient progress toward completion of a thesis or dissertation. Repeated NPR grades may result in evaluation for dismissal.
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, PR, and NPR do not affect the GPA. With the exception of the grade of I, once a final grade in a course has been recorded by the Office of the University Registrar it can be changed only in cases of computational error or other justifiable cause approved by the dean (see Challenge of Course Grade). A student may not do additional work nor 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. The completion date will not typically extend beyond 30 days from the last day of the term for master's courses or 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 withdrawal deadline (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. Doctoral students, see also section Leave of Absence.

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/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 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 *2013–2014 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 *2013–2014 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.

Readmission

Any student who has been withdrawn or dismissed and wishes to continue in the program must apply for readmission, where the application is to restart the program not before one year since withdrawal or dismissal. The application for readmission must be submitted to the Office of Admissions and must

include the items listed in the minimum admission requirements. The applicant, in a separate letter, must present the reasons why the conditions that led to dismissal or withdrawal have been remediated and why the applicant now feels more confident about succeeding. 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.

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. In addition, the Graduate School of Computer and Information has an Office of Alumni Affairs that supports its alumni. For information visit NSU's Office of Alumni Relations at www.nova.edu/alumni or the school's alumni office at www.scis.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 class 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 May or June 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

The master's degree requires 36 credit hours (12 courses or 10 courses and a thesis). (Concentrations may require additional credits.) Graduate certificates each require 15 credit hours. Full-time on-campus and online students may be able to complete the M.S. degree in 12 months. Part-time on-campus and online students may complete the degree in 16–24 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.

There are three master's terms each academic year: Fall (16 weeks), Winter (16 weeks) and Summer (14 weeks) (see page ii, Academic Calendars, for detailed schedules). 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.

Application for Admission

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

We strive to identify future students with tremendous professional outlook. Our admission process takes into consideration both professional and academic accomplishments. 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, 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 begin the program within two years of the date of their first possible registration. If the student has not begun within two years, the offer of admission is withdrawn; subsequent enrollment will require a new application. 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, Carl 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. Typically accepted applicants have earned a 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). In addition, the applicant must have earned a GPA of 3.0 in the major. Lower GPA scores must be accompanied with a supplemental letter explaining why the low GPA does not reflect inadequate potential for success in the program.
2. Online application form and application fee.
3. Sealed official transcripts of all undergraduate and graduate education.
4. A résumé.
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. In addition, you may submit standardized test scores or any additional documentation to strengthen your 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 and Scholars: www.nova.edu/internationalstudents. Applicants may contact the university's Office of International Students and Scholars 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 (and an equivalent GPA in the major of at least 3.0). 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 with a GPA calculation 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): 550 on the paper-based test, 213 on the computer-based test, or 80 on the Internet-based test; and (2) International English Language Testing System (IELTS) (www.ielts.org): 6.0 on the test module. Official test results must be sent directly from the testing agency to Nova Southeastern University.

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, résumé, and an application fee.

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 submit a petition to the Admissions Office for a degree status change at any time. 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 provided a web-based orientation that includes an overview on NSU's online tools as well as library access and resources. Advisement is provided by the program office and the faculty.

Earning a Second Master's Degree in the Graduate School of Computer and Information Sciences

Students admitted into a master's program who wish to pursue a second master's degree must petition the program office for admission into the second program. Such students may request approval to apply up to 12 credit hours of courses completed in the first program to the second degree. At a minimum, students must complete at least 24 credit hours in the second program.

Graduates of one of the school's master's programs who are interested in pursuing a second master's degree must formally apply for admission into the second degree program. Such applicants may request approval to apply up to 12 credit hours of courses completed in the first program to the second degree. At a minimum, at least 24 credit hours must be completed in the second degree program.

Thesis Option

(Applicable to programs that support a thesis.) 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

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 as a resource for current students.

Program Formats

Admitted students are able to take courses in either format (online or on-campus). Students 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 8:00 p.m. for 16 weeks in the fall and winter terms and 14 weeks in the summer term. Most degree programs include an optional six-credit thesis (the six credits for thesis are in lieu of course credit hours).

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 the faculty and fellow students. Online, interactive learning methods are based on the use of a web-based course management system. Online activities facilitate frequent student-to-faculty and student-to-student interaction. They are supported by threaded discussion boards, white boards, web and video conferencing, chat rooms, email, and multimedia presentations.

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 (2013–2014)	$625 per credit hour
Student Services Fee (per term)	$150 (3 credit hours or less); $300 (over 3 credit hours)
Registration Fee	$30 nonrefundable
Late Registration Fee	$100 nonrefundable
Readmission Fee	$50 nonrefundable
Degree Application Fee	$100

Registration

Registration information is posted on the school's website. Students can register and confirm their registration status by accessing NSU SharkLink (sharklink.nova.edu). Students are expected to register during the published registration period. Registration after the close of the published registration period, when permitted, will incur 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 withdrawal deadline date for that term. (See Academic Calendar on page ii). Failure to attend class or participate in class activities will not automatically withdraw a student from the class. The amount of refund, if any, will be calculated as a percentage of the course tuition, as published on the school's website. 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 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 are recommended to consult with their academic advisor before registering for a repeated course. Students may not repeat more than two courses to raise passing grades. 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 beginning the program. Students must complete certificate programs within three years from beginning the program. 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

(See also section Readmission.) 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.

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

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 16–24 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). 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 agencies may sponsor civilian and military personnel to take the school's certified graduate courses, 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 a graduate certificate (see Section Master of Science in Information Security; Graduate Certificate in Information Security).

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.

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 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. All 500-level courses must be completed with a grade of 'B' or higher to continue in the program. MCIS 501 is prerequisite to MCIS 503.

Additional Requirements to Apply Early to 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 CISC 610 Programming Languages, CISC 640 Operating Systems, MCIS 630 Database Systems, CISC 680 Software Engineering, and CISC 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 courses 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)
CISC 610 Programming Languages
MMIS 625 Introduction to Computer Graphics
MCIS 630 Database Systems
CISC 640 Operating Systems
CISC 650 Computer Networks
MCIS 665 Web Services
CISC 670 Artificial Intelligence
MMIS 671 Decision Support Systems
CISC 680 Software Engineering
CISC 685 Interaction Design

Electives (three credits each)
MMIS 623 Information Privacy and Ethics
MMIS 654 Electronic Commerce on the Internet
MSIT 670 Fundamentals of Information Security
MMIS 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)
CISC 610 Programming Languages
MCIS 630 Database Systems
CISC 640 Operating Systems
CISC 650 Computer Networks
MCIS 665 Web Services
CISC 670 Artificial Intelligence
MMIS 671 Decision Support Systems
CISC 680 Software Engineering
CISC 685 Interaction Design
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 16–24 months.

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 501 Java Programming Language
MCIS 502 Mathematics in Computing
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. All 500-level courses must be completed with a grade of 'B' or higher to continue in the program. MCIS 501 is a prerequisite to MCIS 503.

Additional Requirements to Apply Early to 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, CISC 640 Operating Systems, and CISC 680 Software Engineering.

Curriculum for the M.S. in Computer Science

The M.S. in Computer Science is offered with six concentrations. Student must complete four core courses (twelve credits), one concentration (nine credits), and fifteen elective credits. Core courses, concentrations, and electives are listed below. If the thesis option is elected, students take nine credits of elective and six credits of thesis. 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 640 Operating Systems
CISC 680 Software Engineering

Theory Concentration, Curriculum Courses (three credits each)
CISC 630 Compilers
CISC 631 Theory of Computation
MCIS 684 Applied Cryptography

Software Engineering Concentration, Curriculum Courses (three credits each)
CISC 682 Software Requirements Engineering
CISC 684 Software Testing and Verification
Either
CISC 683 Object-Oriented Design
or
CISC 685 Interaction Design

Computer Systems Concentration, Curriculum Courses (three credits each)
CISC 647 Computer Architecture
CISC 650 Computer Networks
CISC 665 Distributed Systems

Database Concentration, Curriculum Courses (three credits each)
CISC 660 Database Management Systems
MCIS 685 Database Security
CISC 662 Data Mining and Knowledge Discovery in Databases

Security Concentration, Curriculum Courses (three credits each). **Choose three:**
MCIS 683 Secure Computer Systems
MCIS 684 Applied Cryptography
MCIS 685 Database Security
MCIS 686 Advanced Network Security

Real-World Computing Concentration, Curriculum Courses (three credits each)
CISC 670 Artificial Intelligence
CISC 681 Computer Graphics
CISC 665 Distributed Systems

Elective Courses (three credits each)
Any course in the concentrations described above is also an elective course in the program. Additionally, any offerings of CISC 690, Special Topics in Computer Science, will count as electives. Students may also petition to count other courses at the school as electives.

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

These programs were developed to address the rapidly growing global problems of maintaining and securing computer information. Important areas addressed by the programs include threats and vulnerabilities, cryptography, authentication and access control, security models, network security, trusted computer systems, distributed systems security, Internet 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 agencies may sponsor civilian and military personnel to take the school's certified graduate courses, 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. Its formats offer full-time students the opportunity to earn the degree in 12 months and working professionals the opportunity to earn the degree 16–24 months. 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 an 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.

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 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. All 500-level courses must be completed with a grade of 'B' or higher to continue in the program. MCIS 501 is prerequisite to MCIS 503.

Additional Requirements to Apply Early to 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 (CISC 640 and 650, and MCIS 630).

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)
CISC 640 Operating Systems
MCIS 630 Database Systems
CISC 650 Computer Networks
MCIS 665 Web Services
CISC 680 Software Engineering
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)
CISC 610 Programming Languages
MMIS 623 Information Privacy and Ethics
MMIS 654 Electronic Commerce on the Internet
CISC 670 Artificial Intelligence
MMIS 671 Decision Support Systems
CISC 685 Interaction Design

Curriculum for the Graduate Certificate in Information Security

Students must take the five courses listed below. Each of these courses has prerequisite requirements that 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. 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 16–24 months.

A graduate with an M.S. in Information Technology will have the ability to: (1) communicate information technology concepts, designs, and solutions effectively and professionally; (2) apply knowledge of information technology to produce effective designs and solutions for specific problems; (3) use software development tools, software systems, and modern computing platforms; and (4) use current technologies and tools and apply best practices to develop real-world solutions (e.g., applications, deployments, etc.).

Program-Specific Admission Requirements

This program is designed for students with undergraduate majors in science, math, engineering, or business. In addition, applicants must have knowledge of structured programming in a modern high-level language as well as assembly language and computer organization. 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.

MSIT 500 Foundations of Systems
MSIT 501 Foundations of Programming, Data Structures, and Algorithms

Curriculum for the M.S. in Information Technology

The M.S. in Information Technology is offered with three concentrations. Student must complete four core courses (twelve credits), one concentration (nine credits), and fifteen elective credits. Core courses, concentrations, and electives are listed below. If the thesis option is elected, students take nine credits of elective and six credits of thesis. Plans for the thesis option must be made with and approved by the program office.

Core Courses (three credits each)
MCIS 630 Database Systems
MSIT 650 Platform and Network Technologies
MSIT 660 Software Development
MSIT 670 Fundamentals of Information Security

Application Development Concentration, Curriculum Courses (three credits each)
MCIS 665 Web Services
Either MSIT 662 Mobile Application Development in iOS
or MSIT 664 Mobile Application Development in Android
MSIT 668 Mobile Application Development Capstone

Database Concentration, Curriculum Courses (three credits each)
MMIS 671 Decision Support Systems
MMIS 643 Data Mining
MSIT 638 Database Capstone

System Administration Concentration, Curriculum Courses (three credits each)
MSIT 652 System Integration and Administration
MSIT 654 Database Integration and Administration
MSIT 658 System and Database Administration Capstone

Elective Courses
Students may select from any course at the school with prefix MMIS or MCIS, except MMIS 501, 610, 620, 630, 653, or 661.

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

This 36 credit-hour program is designed to meet the needs of working professionals such as educators, trainers, administrators, technical support staff, and developers working in the public or 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 16–24 months.

Graduates with the M.S. in Information Technology in Education are able to: (1) select and use existing and emerging technologies to improve learning in formal and informal settings; (2) create effective learning systems and environments that leverage the power of information and learning technologies; (3) manage human, financial, computing, and physical resources to achieve planned goals; (4) make informed decisions or recommendations regarding the adoption of technologies for learning; and (5) communicate effectively with professionals within and outside educational and training environments about information and learning technologies.

Students can earn the M.S. in Information Technology in Education with no concentration or with one of the following concentrations (all require 36 credit hours):

1. Educational Technology Management
2. Information Security Management
3. Instructional Design and Development
4. Social Computing and Learning

Each student must complete seven core courses (21 credit hours). Students may elect a four-course concentration (12 credit hours) and one elective course (3 credit hours) or five elective courses from those listed in the MITE program; some have prerequisites.

The Concentration in Information Security includes the award of a graduate certificate 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 (see Section Master of Science in Management Information Systems; Graduate Certificate in Information Security Management).

The Concentration in Information Security and the Graduate Certificate in Administration of Information Security 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 agencies may sponsor civilian and military personnel to take the school's certified graduate courses. Individuals may apply to take one or more certified information security courses as non-degree students.

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 Internet.

Additional Requirements to Apply Early to the Ph.D. Program

This option provides master's students in information technology in education the opportunity to earn the Ph.D. in computing technology in education in a shorter time. Students must complete the core courses and must satisfy the requirements specified in the section Early Admission into the Ph.D. Program. Students who have not received a grade of B+ or higher in an undergraduate or graduate Introduction to Statistics or closely related course are required to take RESD 610 Introduction to Statistics and obtain a grade of B+ or above.

Course Lists

Core Courses (three credits each)
MITE 628 Instructional Design
MITE 655 Foundations of Learning Technology
MITE 661 E-Learning
MMIS 620 Management Information Systems
MMIS 630 Database Management and Applications
MMIS 660 Systems Analysis and Design
MMIS 680 Human-Computer Interaction

Additional Learning Technology Courses (three credits each)
MITE 612 Authoring Systems
MITE 613 Learning Systems and Technologies
MITE 640 Mobile Learning
MITE 641 Computer-Supported Collaborative Learning
MITE 642 Communities of Practice
MITE 643 Computer-Mediated Communication
MITE 644 Social Media
MITE 670 Learning Theories
MITE 695 Special Topics in Information Technology in Education
RESD 600 Introduction to Research Methods
RESD 610 Introduction to Statistics
RESD 620 Organizational Assessment and Evaluation
RESD 630 Digital Research and Academic Writing

Curriculum for the Degree Without Concentration (36 credit hours)

Students may earn the M.S. in Information Technology in Education without a concentration by taking all seven core courses and any other five additional learning technology courses, listed above. If the thesis

option is elected, students must take the courses as specified above but only three elective courses. Plans for the thesis option must be made with and approved by the program office.

Curriculum for the Concentration in Educational Technology Management (36 credit hours)

Students take the seven core courses, the four concentration courses listed below, and one other course from the list above of additional learning technology courses. The concentration highlights decision-making strategies regarding the selection, development, implementation, and management of technologies that support teaching and learning.

MMIS 621 Information Systems Project Management
MMIS 623 Information Privacy and Ethics
MMIS 643 Data Mining
MMIS 684 Information Security Management

Curriculum for the Concentration in Instructional Design and Development (36 credit hours)

Students take the seven core courses, the four concentration courses listed below, and one other course from the list above of additional learning technology courses. The concentration courses emphasize the instructional design and development process and how to use technology to design effective instruction.

MITE 670 Learning Theories
MMIS 681 Multimedia Systems
MITE 612 Authoring Systems
MITE 613 Learning Systems and Technologies

Curriculum for the Concentration in Information Security (36 credit hours)

Students take the seven core courses, the four concentration courses listed below, and one other course from the list above of additional learning technology courses. The concentration courses prepare students to develop, implement, and monitor information security operations, policies and procedures within their organization.

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

Curriculum for the Concentration in Social Computing and Learning (36 credit hours)

Students take the seven core courses, the four concentration courses listed below, and one other course from the list above of additional learning technology courses. The concentration courses highlight the importance of interactions and learning strategies using social computing technologies.

MITE 640 Mobile Learning
MITE 641 Computer-Supported Collaborative Learning
MITE 643 Computer-Mediated Communication
MITE 644 Social Media

Master of Science (M.S.) in Management Information Systems
Graduate Certificate in Business Intelligence / Analytics
Graduate Certificate in Information Security Management

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 16–24 months.

Students have the option to earn the M.S. in Management Information Systems with concentrations in Information Security Management and Business Intelligence / Analytics (also 36 credit hours). The concentration curricula are each also available as graduate certificates, requiring a total of 15 credit hours (five courses). The concentration and graduate certificate in Information Security Management 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 agencies may sponsor civilian and military personnel to take the school's certified graduate courses, 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 a concentration may also request the corresponding 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.

Additional Requirements to Apply Early to 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 Management and Applications; and MMIS 660 Systems Analysis and Design. Students who have not received a grade of B+ or higher in an undergraduate or graduate Introduction to Statistics or closely related course are required to take RESD 610 Introduction to Statistics and obtain a grade of B+ or above.

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 Management and Applications
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)

RESD 610 Introduction to Statistics
MMIS 623 Information Privacy and Ethics
MMIS 625 Introduction to Computer Graphics
MMIS 640 System Test and Evaluation
MMIS 650 Fundamentals of Cloud Computing
MMIS 643 Data Mining
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 Management Project
MMIS 691 Special Topics in Management Information Systems
MMIS 692 Capstone Project in Business Intelligence

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

Required courses are listed below. Students may choose any two (other) MMIS courses as electives. If the thesis option is elected, students must take the ten required courses plus six thesis credits. Plans for the thesis option must be made with and approved by the program office.

Required Courses (three credits each)

MMIS 610 Survey of Computer Languages
MMIS 623 Information Privacy and Ethics
MMIS 630 Database Management and Applications
MMIS 653 Telecommunications and Computer Networking
MMIS 660 Systems Analysis and Design
MMIS 683 Fundamentals of Security Technologies
MMIS 684 Information Security Management
MMIS 685 Information Security Governance
MMIS 686 Information System Auditing
MMIS 687 Information Security Management Project

Curriculum for the M.S. in Management Information Systems with Concentration in Business Intelligence / Analytics

Students must take all five courses listed below. Students also choose five more courses from the core course list further below. For their final two courses, students may choose any two (other) MMIS courses as electives. If the thesis option is elected, students substitute six thesis credits for the final two courses. Plans for the thesis option must be made with and approved by the program office.

Concentration Courses (three credits each)
MMIS 630 Database Management and Applications
MMIS 642 Data Warehousing
MMIS 643 Data Mining
MMIS 671 Decision Support Systems
MMIS 692 Capstone Project in Business Intelligence

Core Courses (three credits each) Select five.
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 653 Telecommunications and Computer Networking
MMIS 654 Electronic Commerce on the Internet
MMIS 660 Systems Analysis and Design
MMIS 661 Object-Oriented Applications
MMIS 680 Human-Computer Interaction

Curriculum for the Graduate Certificate in Business Intelligence / Analytics

Students must take the five courses listed below.

MMIS 671 Decision Support Systems OR QNT 5040 Business Modeling
MMIS 630 Database Management and Applications

MMIS 642 Data Warehousing
MMIS 643 Data Mining
MMIS 692 Capstone Project in Business Intelligence

Curriculum for the Graduate Certificate in Information Security Management

Students must take the five courses listed below.

MMIS 683 Fundamentals of Security Technologies
MMIS 684 Information Security Management
MMIS 685 Information Security Governance
MMIS 686 Information System Auditing
MMIS 687 Information Security Management 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.

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.

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.

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 662 Data Mining and Knowledge Discovery in Databases (3 credits)
Concepts, principles, and techniques of data mining and knowledge discovery. Topics include, but not limited to, classification and inductive learning, association rules mining, neural network and Bayes methods, cluster analysis, rough sets and fuzzy sets approaches for data mining, statistical methods for data mining, model and metrics for evaluating data mining results, etc. Prerequisite: CISC 660.

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.

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

CISC 681 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 682 Software Requirements Engineering (3 credits)
Focuses on the requirements phase situated within the larger development process. Specific topics include requirement gathering, specification languages, methodologies, and tools. Prerequisite: CISC 680.

CISC 683 Object-Oriented Design (3 credits)
Principles and concepts of the object-oriented paradigm. Notation and techniques for the analysis, design, and implementation of object-oriented systems. Mechanisms for reuse, including composition, inheritance, design patterns, and application frameworks. Object-oriented programming.

CISC 684 Software Testing and Verification (3 credits)
Focuses on the testing phases situated within the larger development process. Students will learn and practice various ways of testing for correctness as well as secondary factors such as performance, robustness, reliability, security, and others.

CISC 685 Interaction Design (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 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 665 Web Services (3 credits)
Concepts and principles of web application development are presented. The focus of this course is on distributed application design and implementation. Topics include the role of the GUI and front-end development tools, HTTP, HTML, web services, and database interaction. Discussions include the various relationships between web applications and business processes along with concerns for meeting customer requirements. Prerequisites: MSIT 650 and 660 or equivalent.

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 630 or CISC 660, CISC 640, and CISC 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), CISC 640, and CISC 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 630 or CISC 660, and CISC 640.

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: CISC 640, 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. Upon request, the course may be taken concurrently with one of the prerequisite courses. Such a request will only be approved in the last term of a student's matriculation, and students taking a prerequisite concurrently are subject to the same expectations as those who have completed all prerequisites.

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.

MITE 612 Authoring Systems (3 credits)
The goal of this course is to provide the student with both the practical application and theoretical background necessary to author computer-based products to promote learning. While using a current instructional authoring system such as Articulate or CourseLab to develop a computer-based educational product, the student will also examine applicable standards such as SCORM and basics of multimedia instructional design.

MITE 613 Learning Systems and Technologies (3 credits)
The course provides an overview of Web-based learning and technology support, the development and adoption of technical and managerial information systems standards and practices applied to learning management systems, and exploration of open source technologies as learning systems.

MITE 628 Instructional Design (3 credits)
The goal of this course is to help students develop instructional design competencies that are appropriate for the development of e-learning products. Students will experience both theory and best practices from the areas of education and training and will apply instructional design concepts and procedures to design an e-learning artifact.

MITE 640 Mobile Learning (3 credits)
Mobile learning is learning that happens any time and any place through the use of mobile technologies such as mobile phones, tablets, notebooks, handheld computers, and MP3 players. This course focuses on how mobile technologies can be used for various forms of learning both formal and informal. Students will examine various types of portable technologies and how they can be used to accommodate and increasingly mobile population. Trends and techniques for designing and consuming digital learning assets will also be explored.

MITE 641 Computer-Supported Collaborative Learning (3 credits)
The course provides an overview of principles, models, methods and effective practices of collaborative and participatory learning, including the impacts of technologies supporting team and group work. The course explores both the theoretical foundations of collaborative learning and pragmatic implementation considerations such as overcoming student resistance, evaluating collaboration, and leveraging computer mediated communication capabilities to support team-based learning.

MITE 642 Communities of Practice (3 credits)
The course focuses on Communities of Practice (CoP), primarily theoretical and conceptual foundations of online communities for learning. Topics may include defining and assessing needs for building community and evaluating sense of community. Also examined are the design, creation, and evaluation of knowledge domains and CoP environments to support engagement and learning.

MITE 643 Computer-Mediated Communication (3 credits)
The course introduces students to computer-mediated communication (CMC) research foundations, including history, theory, concepts and current issues. Students explore CMC practices, various CMC tools, and their effects in education and industry settings. Topics may include CMC modes, the changing nature of communication through CMC advancements, public and private digital participation, digital identity, control attention and critical consumption of information using CMC, and cultivating network-savvy communication skills and conveying meaning accurately through CMC.

MITE 644 Social Media (3 credits)
Students will explore key issues in social media as used in learning technology. Topics may include the value of social media for distributed education, current and future trends in social software, delivering content using specific applications (blogs, wikis, podcasts, webcasts, etc.), the impact of social media tools to transform teaching and learning, and issues of course design to support learner engagement and online social media use in distributed and mobile environments.

MITE 655 Foundations of Learning Technology (3 credits)
In this course students look to the past, study the present, and explore the future to inform their individual

perspectives and views about how technology can be used to improve teaching, learning, and training. Through a variety of learning activities, students will develop a basic awareness of learning technology concepts and the trends and issues that are shaping the future.

MITE 661 E-Learning (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.

MITE 670 Learning Theories (3 credits)
Students will explore the intersection of learning theory and technology by investigating how learning technologies can be used to facilitate effective online learning environments with learners of all ages, in all settings. Three major frameworks including behaviorism, cognitivism, and constructivism will be examined. Students will also consider new theoretical perspectives that frame learning and teaching in the 21st century.

MITE 688 Continuing Thesis in Information 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.

MITE 695 Special Topics in Information Technology in Education (3 credits)
This course focuses on the professor's current research interests. Requires consent of course professor and program director.

MITE 699 Master's Thesis in Information 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 MITE 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 620 Management Information Systems (3 credits)
The application of information system concepts to the collection, retention, and dissemination of information for management planning and decision making. Issues such as personnel selection, budgeting, policy development, and organizational interfacing are discussed. Conceptual foundations and planning and development of management information systems. The role of MIS in an organization and the fit between the system and the organization.

MMIS 621 Information Systems Project Management (3 credits)
Practical examination of how projects can be managed from start to finish. Life-cycle models/paradigms. Life-cycle phases. Project planning and risk analysis. Project control including work breakdown structures, project scheduling, activities and milestones. Software cost estimation techniques and models. Software quality assurance and metrics

for software productivity and quality. Inspections, walkthroughs, and reviews. Documentation and configuration management. Automated project management tools. Software maintenance. Procurement of software services and systems and development of IS project specifications. Project management skills including leadership, team building, planning, time management, resource allocation, conflict management, and using IS project management in strategic planning. Ethics in project management. Case studies are used throughout the course to support concepts, principles, and problem solving.

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

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

MMIS 627 Enterprise Information Systems, Technologies, and Infrastructures (3 credits)
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 Management and Applications (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. Prerequisite: MMIS 630.

MMIS 650 Fundamentals of Cloud Computing (3 credits)
Students will learn the basic concepts and terminologies of cloud computing via lectures and hands-on laboratory examples. Topics to be discussed include the definition of cloud computing, evolution of cloud computing, virtualization, cloud computing delivery models (SaaS, PaaS, IaaS), and the various cloud computing deployment methods (public, private, hybrid, and community).

MMIS 643 Data Mining (3 credits)
This course emphasizes the fundamental concepts and techniques of data mining. Concepts will be illustrated with case studies of real data mining examples. The focus is to find knowledge from huge amounts of data being handled

electronically. Students will gain hands on experience using data mining tools on real data. Prerequisite: MMIS 671 or QNT 5040 or RESD 610, and MMIS 630.

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.

MMIS 654 Electronic Commerce on the Internet (3 credits)
This course examines the foundation, operation, and implications of the Internet economy. Topics include Internet technologies, online market mechanisms, interactive customers, knowledge-based products, smart physical products and services, pricing in the Internet economy, online auctions and e-marketplaces, digital governance, policies for the Internet economy and an outlook for the new economy.

MMIS 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.

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.

MMIS 683 Fundamentals of Security Technologies (3 credits)
An overview of the technical aspects of information security. Issues discussed include authentication, confidentiality, access control, trust and non-repudiation. Investigation of fundamental assurance technologies that can be applied to interface specifications, architectures, and implementations of information security mechanisms. The selection of appropriate security applications, security lifecycles, and interoperability issues will also be covered. Students who do not have prior exposure to computer networking are recommended to take MMIS 653, Telecommunications and Computer Networking, prior to taking this course.

MMIS 684 Information Security Management (3 credits)
Provides an understanding to implement effectively the information security vision and strategy set forth by the executive management. The emphasis will be on the management of an information security program. Focus is on the implementation of information security policy, information security planning, development of information security processes, and establishment of information security measures. Concepts and techniques from the management and organizational behavior disciplines will be integrated in order to identify and propose solutions to the problems of information security administration.

MMIS 685 Information Security Governance (3 credits)
Challenges and opportunities of effectively governing an organization's information security requirements and resources. Information security governance lays out the vision for the information security program. Discussions include what constitutes good information security governance, and development of an effective information security strategy and policy. Also focuses on how to improve information security accountability, regulatory compliance, and maturity. Prerequisite: MMIS 684.

MMIS 686 Information Systems Auditing (3 credits)
Fundamental concepts related to an information systems audit. Principles and practices related to secure operation of existing information technology. Information security accountability, development of internal control objectives and framework, and identification of appropriate audit procedures for a secure information system. Prerequisites: MMIS 683, 684.

MMIS 687 Information Security Management 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. Upon request, the course may be taken concurrently with one of the prerequisite courses. Such a request will only be approved in the last term of a student's matriculation, and students taking a prerequisite concurrently are subject to the same expectations as those who have completed all prerequisites.

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 692 Capstone Project in Business Intelligence (3 credits)
This capstone project requires students to employ the knowledge and skills assimilated in the prerequisite courses to design and develop a business intelligence application that leads to direct and measurable value for the students' organizations. Prerequisites: MMIS 630, 642, and 643.

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.

MSIT 500 Foundations of Systems (3 credits)
Concepts and foundations of the key aspects of computer systems and networks are presented. Topics include computer architecture, data storage, data manipulation, program execution, operating systems, networking, internetworking, data abstractions, and database systems.

MSIT 501 Foundations of Programming, Data Structures, and Algorithms (3 credits)
Concepts and foundations of computer science, including procedural and object-oriented programming, data structures, algorithms, and algorithm design, are introduced through programming in Python.

MSIT 638 Database Capstone Project (3 credits)
Students will apply the concepts of data organization, data mining, and decision tasks in a project that parallels a real-world deployment. The project will provide Information Technology database design, deployment, monitoring, mining and decision support experience. Prerequisites: MMIS 671 and MMIS 643

MSIT 650 Platform and Network Technologies (3 credits)
An information technology application development and administration perspective of operating systems and networks. Operating system and network concepts of interfacing, virtual machines, process management, storage management, protection, security, network infrastructure, communication protocols, configuration, and administration are presented.

MSIT 652 System Integration and Administration (3 credits)
The conceptualization and application of operating system and networking integration, administration, and maintenance tasks are presented. Topics include installation, configuration, and maintenance of application and system software, virtual machines, file systems, file servers, web systems, and monitoring tools. Administration tasks such as system documentation, policies, procedures, and user support are discussed. Prerequisite: MSIT 0650

MSIT 654 Database Integration and Administration (3 credits)
The conceptualization and application of database integration, administration, and maintenance tasks are presented. Topics include installation, configuration, and maintenance of database software, and monitoring tools. Administration tasks such as system documentation, policies, procedures, and user support are discussed along with data deployment schemes. Prerequisites: MCIS 0630 and MSIT 0652

MSIT 658 System and Database Administration Capstone Project (3 credits)
Students will apply the concepts of system and database integration, administration, and maintenance tasks in a project that parallels a real-world deployment. The project will provide Information Technology system and database design, deployment, monitoring, and maintenance experience. Prerequisites: MSIT 652 and MSIT 654

MSIT 660 Software Development (3 credits)
The development of application software in support of Information Technology deployments; software quality factors; software development principles; life-cycle models; requirements definition and analysis; behavioral specification; software design; implementation; software testing; verification and validation; maintenance; software project management; and programming language impacts on information technology application development.

MSIT 662 Mobile Application Development in iOS (3 credits)
Study of the development of real-world iOS applications using a variety of software engineering techniques. Topics include data management, persistence mechanisms, user-interface design, and application lifecycles. Students may be able to deploy their work on the Apple AppStore at the completion on the course. Prerequisite: MCIS 665.

MSIT 664 Mobile Application Development in Android (3 credits)
Study of the development of real-world Android applications. Significant focus on UI design as well as activities, services, intents, web services, local database storage, and security. Students may be able to deploy their work on the Apple AppStore at the completion on the course. Prerequisite: MCIS 665

MSIT 668 Application Development Capstone Project (3 credits)
Students will apply the concepts of application requirements, specification, development, integration, and maintenance tasks in a project that parallels a real-world deployment. The project will provide Information Technology application design, deployment, monitoring, and maintenance experience. Prerequisite: MCIS 665 and (MSIT 662 or MSIT 664)

MSIT 670 Fundamentals of Information Security (3 credits)
A thorough overview of the principles of information security, security architectures and models, physical security control, operations security, access control, systems and programs security, cryptography, network and internet security, and threats and vulnerabilities. Students will also learn how to plan and manage security, security policies, business continuity plans, disaster recovery plans, and social and legal issues of information security.

RESD 600 Introduction to Research Methods (3 credits)
A basic, cross-disciplinary introduction to research planning and design, and decision making. Students will be guided from problem selection to completed research report with concrete examples and practical, how-to suggestions. Close attention is paid to quantitative research methods, qualitative research methods, and mixed-methods research. Students are prepared to conduct hypothesis testing using both parametric and nonparametric data analysis procedures. Students are also introduced to meta-analysis, and other strategies for interpreting research findings.

RESD 610 Introduction to Statistics (3 credits)
An introduction to the basic quantitative tools needed to support problem solving and decision making in the information systems environment. There is an emphasis on application of these tools in a case-based, real-world environment. Topics include basic numeric and descriptive statistics, and hypothesis testing using basic non-parametric and parametric statistics.

RESD 620 Organizational Assessment and Evaluation (3 credits)
This course focuses on the knowledge and skills needed to effectively assess organizational training, educational and developmental efforts. Topics include evaluation needs analysis, development of valid evaluation instrumentation, gathering information in a reliable and valid manner, data analysis and communicating assessment results.

RESD 630 Digital Research and Academic Writing (3 credits)
This service course will guide students through the components of writing a graduate-level paper. The initial steps include selection of resources, analysis of content, and preparation of annotations, the foundation sources needed for the content. Next, are the creation of a working outline and the synthesis of the annotations into meaningful sections. Last, is the discussion that makes the paper meaningful and adds something to current literature. A set of writing specifications for APA style, use of quotations, and writing and language issues will be distributed to be used as guidelines. Students will write within content areas that match their professional interests.

Ph.D. Programs

The school offers a unique Ph.D. program, called the *cluster format,* that includes a blend of on-campus and online activities. While taking courses, students attend two or four cluster sessions each year (depending on program), held quarterly over an extended weekend at the university. Terms are 16 weeks long and there are two terms for course work each year, beginning in August and January. (Both terms as well as a 14-week summer term are used by students registering for dissertation or one of the Directed Research sections.) Cluster weekends bring together students and faculty for participation in classes, seminars, and dissertation counseling, and provide ample opportunity for student-faculty and student-student interaction. Students are required to attend all of their scheduled class sessions. Between sessions, students work on course assignments and research, 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. Each student must have an active broadband account with an Internet Service Provider (ISP) and must have his or her own personal computer.

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. Applications will be reviewed by the Admissions Committee after the following items have been received by the admissions office: application form, application fee, essay, curriculum vitae, three evaluation forms, and all sealed official transcripts (unofficial copies are acceptable pending receipt of sealed official transcripts). To ensure evaluation for the desired starting term, applications and all required documents must be received by the deadlines specified on the school's website (see below). Late applications that cannot be processed in time for the desired starting term will be considered for the next term. Newly admitted students must begin the program within two years of the date of their first possible registration. If the student has not begun within two years, the offer of admission is withdrawn; subsequent enrollment will require a new application.

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: http://www.scis.nova.edu/admissions/. For additional information, contact:

Graduate School of Computer and Information Sciences
Nova Southeastern University
3301 College Avenue, Carl 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. Online application form, application fee, and essay.
3. Sealed 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 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 with a GPA calculation 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.
2. 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): 550 on the paper-based test, 213 on the computer-based test, or 80 on the Internet-based test; and (2) International English Language Testing System (IELTS) (www.ielts.org): 6.0 on the test module. Official test results must be sent directly from the testing agency to Nova Southeastern University.
3. 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. An I-20 cannot be issued to a provisionally admitted student. Students traveling to the U.S. only to attend cluster meetings should contact the university's Office of International Students and Scholars (see below).
4. The application fee must be in U.S. dollars.

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 students in certain programs 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. 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

With the exception of students in the computing technology in education program, students taking courses attend four cluster sessions per year, held quarterly over an extended weekend (Friday, Saturday, and half-day Sunday) at the university. Students in the computing technology in education program attend two four-day sessions (Thursday, Friday, Saturday, and Sunday) per year. These sessions bring together students and faculty for participation in classes, seminars, and dissertation counseling, and provide ample opportunity for student-faculty and student-student interaction. Students are required to attend all of their scheduled class sessions. Between sessions, students work on course assignments and research, and participate in online activities that facilitate frequent interaction with the faculty and with other students. There are two 16-week terms and one 14-week term a year. The fall 16-week term starts in August and the winter 16-week term starts in January. The 14-week summer term is for dissertation or Directed Research registrations only. The academic calendar for the program is contained on page ii of this catalog and is also posted on the school's website.

The student enters doctoral 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, three terms per year, until they have satisfied the dissertation requirement. Students not on recognized leave 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.

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 include threaded discussion boards, white boards, chat rooms, email, and multimedia presentations. 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 available on the school's website. Students can confirm their registration status by accessing NSU SharkLink (sharklink.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 withdrawal deadline specified on the Academic Calendar on p. ii. Failure to attend class or participate in class activities will not automatically withdraw a student from the class. The amount of refund, if any, will be calculated as a percentage of the course tuition, as published on the school's website. 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 be present at each on-campus meeting of their classes. Failure to attend may result in withdrawal from courses and suspension or dismissal from the Ph.D. program. Exceptions to this policy regarding individual class meetings may be made in the case of illness and possibly in other hardship situations. Such absences must be approved first by the course professor(s) and then by the program director, and must be made in advance of any anticipated absences. Participation requirements 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 automatically be 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.

- 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).

Leave of Absence

Doctoral students are expected to register for courses or dissertation credits continuously from acceptance in the program until graduation. In the event of circumstances that preclude registration for course or dissertation credit, the student must apply for a leave of absence to avoid dismissal from the program. A leave application must include the reason for and expected duration of the leave. The leave should be coordinated with the student's dissertation chair, if such a relationship exists, before approval by the program director. Note that coordination with the dissertation chair does not guarantee that the dissertation committee will continue to work with the student upon the student's return.

Students may request a minimum of one term's leave. Leave requests for greater than one year are discouraged. Students may not accumulate more than 5 terms of leave of absence during their studies. Multiple leave extensions would be approved only under extraordinary circumstances. Students requiring long or repeated absences are recommended to consider withdrawing from the program, retaining the right to apply for readmission. (Upon readmission, completed course work may or may not count toward the degree.)

Time spent on leave **does** count toward a student's total time limit in the program.

At leave expiration, students must re-enroll or request a leave extension. Absent an approved leave extension or re-registration, students will be dismissed from the program.

To initiate a leave request, contact the program office.

Time Limitation

Students must complete requirements for the Ph.D. degree within 10 years from the date of their first registration.

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 cannot occur until after course requirements have been met, 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 major journal. 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/documents/diss_guide.pdf). The student will be required to present an oral defense of the dissertation.

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. 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, faculty, computing, online, and other university services are provided only to students who are currently registered.

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. Rates are subject to change.

Application Fee	$50 nonrefundable
Tuition (2013–2014)	$945 per credit hour
Dissertation I or II (2013–2014)	$9,900 per term
Continuing Dissertation (2013–2014)	$3,780 per term
Student Services Fee (per term)	$300 (4 or more credit hours)
Registration Fee	$30 nonrefundable
Late Registration Fee	$100 nonrefundable
Degree Application Fee	$100

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. Its cluster format 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 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. In addition to holding a relevant master's degree, 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, or information security 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 at least 64 credit hours, of which 40 are for courses and at least 24 are for the dissertation. Courses and dissertation registrations are listed below:

Core Courses (four credits each) (Select eight of these.)
DISS 710 Decision Support Systems
DCIS 720 Human-Computer Interaction
DCIS 730 Network Security and Cryptography
DISS 735 Knowledge Management
CISD 740 Data Communications and Computer Networking
Either
DISS 750 Database Systems
or
CISD 750 Database Management Systems
CISD 760 Artificial Intelligence
CISD 770 Software Engineering
DCIS 791 Distributed Systems
CISD 794 Knowledge Discovery in Databases

Research Registrations Students are required to complete two sections (four credits each) of DCIS 898, Directed Research, before entering candidacy. Students must register for the course with a particular faculty member as directed in the course description. Students are advised to register for the two sections

of Directed Research in sequence, not in parallel. Students are further advised to wait for the second year of study before registering for Directed Research. Students may repeat Directed Research with the same faculty member only with permission of that faculty member.

Dissertation Registrations
DCIS 910 Dissertation I (12 credits)
DCIS 915 Dissertation II (12 credits)
DCIS 920 Continuing Dissertation (4 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 at least 64 credit hours, of which 40 are for courses and at least 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 and Cryptography
Either
DISS 750 Database Systems
or
CISD 750 Database Management Systems
DCIS 765 Secure Systems Analysis and Design
CISD 770 Software Engineering
DISS 775 Privacy
DCIS 791 Distributed Systems

Elective Core Courses (four credits each) (select two of these)
DISS 710 Decision Support Systems
DCIS 720 Human-Computer Interaction
DISS 735 Knowledge Management
CISD 740 Data Communications and Computer Networking
CISD 760 Artificial Intelligence
CISD 794 Knowledge Discovery in Databases

Research Registrations Students are required to complete two sections (four credits each) of DCIS 898, Directed Research, before entering candidacy. Students must register for the course with a particular faculty member as directed in the course description. Students are advised to register for the two sections of Directed Research in sequence, not in parallel. Students are further advised to wait for the second year of study before registering for Directed Research. Students may repeat Directed Research with the same faculty member only with permission of that faculty member.

Dissertation Registrations
DCIS 910 Dissertation I (12 credits)
DCIS 915 Dissertation II (12 credits)
DCIS 920 Continuing Dissertation (4 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. Its cluster format 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 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 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. In addition to holding a relevant master's degree, 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 at least 64 credit hours, of which 40 are for courses and at least 24 are for the dissertation. Courses and dissertation registrations are listed below:

Core Courses (four credits each) (Select eight of these.)
CISD 700 Theory and Principles of Programming
CISD 730 Operating Systems
CISD 740 Data Communications and Computer Networking
CISD 750 Database Management Systems
CISD 760 Artificial Intelligence
CISD 770 Software Engineering
CISD 775 Network Security
CISD 792 Computer Graphics
CISD 794 Knowledge Discovery in Databases
CISD 799 Special Topics in Computer Science

Research Registrations Students are required to complete two sections (four credits each) of CISD 898, Directed Research, before entering candidacy. Students must register for the course with a particular faculty member as directed in the course description. Students are advised to register for the two sections of Directed Research in sequence, not in parallel. Students are further advised to wait for the second year

of study before registering for Directed Research. Students may repeat Directed Research with the same faculty member only with permission of that faculty member.

Dissertation Registrations
CISD 910 Dissertation I (12 credits)
CISD 915 Dissertation II (12 credits)
CISD 920 Continuing Dissertation (4 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. Its cluster format combines 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 courses, and a dissertation. 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. Entering students who do not have a statistics course on their master's transcripts must take RESD 610. The requirement must be met before or during the first doctoral registration. GSCIS master's students in information technology in education or information technology with the educational technology concentration 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 at least 64 credit hours, of which 40 are for courses and at least 24 are for the dissertation. DCTE 700 and DCTE 710 are required. However, these courses may be taken at any point and in any order during the coursework component of the program.

Courses and dissertation registrations are listed below:

Required Core Courses (four credits each)
RESD 700 Quantitative Research Methodology in Learning Technology

RESD 710 Qualitative Research Methodologies

Elective Courses (Select six of these.)
DCTE 720 Human-Computer Interaction
DCTE 730 Online Learning Environments
DCTE 732 Online Program Administration
DCTE 740 Broadband Networks
DCTE 747 Learning Theories
DCTE 750 Management of Data, Information, and Knowledge in Education
DCTE 760 Instruction Delivery Systems
DCTE 770 Instructional Design and Development
DCTE 775 Field Studies in Assistive Technology
DCTE 780 Frontiers in Educational Technology

Research Registrations Students are required to complete two sections (four credits each) of DCTE 898, Directed Research, before entering candidacy. Students must register for the course with a particular faculty member as directed in the course description. Students are advised to register for the two sections of Directed Research in sequence, not in parallel. Students are further advised to wait for the second year of study before registering for Directed Research. Students may repeat Directed Research with the same faculty member only with permission of that faculty member.

Dissertation Registrations
DCTE 910 Dissertation I (12 credits)
DCTE 915 Dissertation II (12 credits)
DCTE 920 Continuing Dissertation (4 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. Its cluster format combines 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 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. In addition to holding a relevant master's degree, 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 or information security 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 at least 64 credit hours, of which 40 are for courses and at least 24 are for the dissertation. Courses and dissertation registrations are as follows:

Required Core Course (four credits)
RESD 705 Quantitative Research Methodology in Information Systems

Elective Courses (four credits each) (Select seven of these.)
RESD 710 Qualitative Research Methodology
RESD 720 Multivariate Research Methodology
DISS 710 Decision Support Systems
DISS 720 Human-Computer Interaction
DISS 725 The System Development Process
DISS 735 Knowledge Management
DISS 740 Broadband 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

Research Registrations Students are required to complete two sections (four credits each) of DISS 898, Directed Research, before entering candidacy. Students must register for the course with a particular faculty member as directed in the course description. Students are advised to register for the two sections of Directed Research in sequence, not in parallel. Students are further advised to wait for the second year of study before registering for Directed Research. Students may repeat Directed Research with the same faculty member only with permission of that faculty member.

Dissertation Registrations
DISS 910 Dissertation I (12 credits)
DISS 915 Dissertation II (12 credits)
DISS 920 Continuing Dissertation (4 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 at least 64 credit hours of which 40 are for courses and at least 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)
RESD 705 Quantitative Research Methodology in Information Systems
DISS 735 Knowledge Management
DISS 750 Database Systems
DISS 755 Information Security Management
DISS 770 Information Policy

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

Research Registrations Students are required to complete two sections (four credits each) of DISS 898, Directed Research, before entering candidacy. Students must register for the course with a particular faculty member as directed in the course description. Students are advised to register for the two sections of Directed Research in sequence, not in parallel. Students are further advised to wait for the second year of study before registering for Directed Research. Students may repeat Directed Research with the same faculty member only with permission of that faculty member. In addition, students in the concentration must choose a research area (and faculty member) in information science.

Dissertation Registrations
DISS 910 Dissertation I (12 credits)
DISS 915 Dissertation II (12 credits)
DISS 920 Continuing Dissertation (4 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 at least 64 credit hours, of which 40 are for courses and at least 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)
RESD 705 Quantitative Research Methodology in Information Systems
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

Elective Core Courses (four credits each) (select two of these)
RESD 720 Multivariate Research Methodology
DISS 710 Decision Support Systems
DISS 720 Human-Computer Interaction
DISS 740 Broadband Networks
DISS 745 Electronic Commerce
DISS 770 Information Policy

Research Registrations Students are required to complete two sections (four credits each) of DISS 898, Directed Research, before entering candidacy. Students must register for the course with a particular faculty member as directed in the course description. Students are advised to register for the two sections of Directed Research in sequence, not in parallel. Students are further advised to wait for the second year of study before registering for Directed Research. Students may repeat Directed Research with the same

faculty member only with permission of that faculty member. In addition, students in the concentration must choose a research area (and faculty member) in information security.

Dissertation Registrations
DISS 910 Dissertation I (12 credits)
DISS 915 Dissertation II (12 credits)
DISS 920 Continuing Dissertation (4 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.

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)
Recent advances and trends in data communication and computer network research are explored with a focus on design and analysis. Included in the course topics are network structure, protocols, layering, wireless communication, ad-hoc and mobile networking, resource discovery and management, and network management. 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. 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 applications of artificial intelligence. Topics include knowledge representation, search, machine learning, and reasoning under uncertainty. Recent research and current trends are explored.

CISD 770 Software Engineering (4 credits)
Covers advanced topics in areas of current research interest in the development of software-intensive systems. Topics may include metrics, requirements definition, development life cycles, software engineering processes, reuse, formal methods, verification and validation, and project management.

CISD 775 Network Security (4 credits)
This course will focus on 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 computer networks.

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. Prerequisite: CISD 750 or DCIS 750.

CISD 799 Special Topics in Computer Science (4 credits)
Covers advanced topics in areas of current research interest in computer science. May include topics in advanced computer architecture, artificial intelligence, distributed database management systems, advanced computer graphics, object-oriented technology, and parallel computation. Topics will vary depending on student and faculty interest. Depending on interest, several special topics courses may be offered concurrently.

CISD 898 Directed Research (4 credits)
The student pursues research under the direction of a faculty member. To register, students contact their advisor with the name of the faculty member under whose direction they would like to work and a brief explanation of the research area to be explored. Recommended prerequisite: completion of a 700-level course with the requested professor with a grade of B+ or higher.

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 (4 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 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 and Cryptography (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 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 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 898 Directed Research (4 credits)
The student pursues research under the direction of a faculty member. To register, students contact their advisor with the name of the faculty member under whose direction they would like to work and a brief explanation of the research area to be explored. Recommended prerequisite: completion of a 700-level course with the requested professor with a grade of B+ or higher.

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 (4 credits)
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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.

DCTE 732 Online Program Administration (4 credits)
The course provides a research-based, timely, in-depth investigation into the multiple administrative roles in online programs and schools. Policies, procedures and responsibilities to students and teachers will be delineated. The evolution of online learning from the individual course to the greater entity will be examined as will qualifications for an online program administrator at different levels of learning.

DCTE 740 Broadband Networks (4 credits)
This course examines major developments in the expanding field of broadband technologies and their impacts on e-learning network applications and initiatives. Distinctive attributes of current and next-generation research and education networks such as GEANT 2/3 and Internet2 are examined. The increasingly important role of wireless technologies and ubiquitous devices such as smartphones and tablets in supporting anytime and anywhere access to e-learning applications is reviewed. Capabilities of grids in facilitating e-collaborative research in the e-learning space are examined. Factors contributing to the popularity of social media in the e-learning space are explored. Approaches for ensuring the security of broadband e-learning networks are examined.

DCTE 747 Learning Theories (4 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 constructivism.

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 social, creative, and innovative exploration and development in teaching and learning in the 21st century. Course content combines theory, design, development, delivery, tests and measurement. Synchronous and asynchronous delivery systems in buildings and in cyberspace will enable the best possible matches between societal needs and instruction delivery. The purpose of the course is to reengineer education to meet the needs of society, to experiment with multiple technologies to devise the best possible learning experiences for learners of all ages.

DCTE 770 Instructional Design and Development (4 credits)
A systematic instructional design process will be used to solve a real-world instructional problem. Students will identify an instructional problem, goal and learning objectives. They will use appropriate technologies to develop an instructional solution. Evaluation plans will be developed.

DCTE 775 Field Studies in Assistive Technology (4 credits)
The course will integrate a broad, theoretical overview of assistive technology with a thorough exploration of a particular disability addressed with a technology solution within a school setting. Each participant will conduct a set of field observations in support of the literature foundation and will record the observations in a class forum using web 2.0 tools. It is the responsibility of the student to secure the observation site.

DCTE 780 Frontiers in Educational Technology (4 credits)
This course will synthesize projections of the future of education by combining a solid foundation in learning theory and best educational practices with innovations in computer hardware and software, data communications, and effective technology applications from other fields.

DCTE 898 Directed Research (4 credits)
The student pursues research under the direction of a faculty member. To register, students contact their advisor with the name of the faculty member under whose direction they would like to work and a brief explanation of the research area to be explored. Recommended prerequisite: completion of a 700-level course with the requested professor with a grade of B+ or higher.

DCTE 910 Dissertation I (12 credits)
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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 (4 credits)
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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 Broadband 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)
This course examines the philosophical and theoretical foundations of information systems security. The focus is on understanding distinctive research orientations regarding effectively securing information systems in organizations. The goal of the course is to provide an intellectual foundation for students to develop an appropriate research program in this area.

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 898 Directed Research (4 credits)
The student pursues research under the direction of a faculty member. To register, students contact their advisor with the name of the faculty member under whose direction they would like to work and a brief explanation of the research area to be explored. Recommended prerequisite: completion of a 700-level course with the requested professor with a grade of B+ or higher.

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RESD 700 Quantitative Research Methodology in Learning Technology (4 credits)
The course focuses on the fundamental concepts of research design with consideration of historical, descriptive, correlational, causal-comparative, and experimental studies. Emphasis is placed on data collection and statistical analysis using common software packages.

RESD 705 Quantitative Research Methodology in Information Systems (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.

RESD 710 Qualitative Research Methodologies (4 credits)
This course provides a comprehensive introduction to the theory and use of qualitative methods in educational and professional settings. Emphasis on application level experiences such as identifying and developing research problems appropriate for qualitative investigation, study design, data collection, analysis, interpretation, and presentation of findings.

RESD 720 Multivariate Research Methodology (4 credits)
This data-driven doctoral seminar will provide the skills needed to perform advanced multivariate data analysis by incorporating current techniques. Topics covered will include assumptions and limitations, multivariate data collection, pre-analysis data screening, factorial and multivariate analysis of variance and covariance, linear and

non-linear multiple regressions, path analysis, exploratory factor analysis, confirmatory factor analysis, and structural equation models (SEM). Students will be provided with datasets for data analyses of the multivariate methods discussed in seminar along with scholarly articles that make use of the multivariate methods discussed. Students will be introduced to the use of SPSS and other advanced multivariate tools. Prerequisite: RESD 700 or RESD 705.

RESD 730 Mixed-Methods Research (3 credits)
This course provides an overview of mixed methods research. It is recommended that students have completed overview of qualitative and quantitative research methods courses. Students are first introduced to its' nature and foundations and, from those theoretical and philosophical perspectives, various mixed methods designs are discussed with an emphasis placed on the reading and evaluation of prior studies. The course continues from an applied perspective with discussions and exercises focused on the identification of research problems or opportunities, the development of purpose and research questions and the choice, design and implementation of an appropriate methodological approach. The course concludes with consideration given to data analysis, reporting and presentation of conclusions. Students will have the opportunity to apply assignments from this course towards completion of an NIH R03 grant that uses a mixed methods design.

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

The Faculty

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

Eric S. Ackerman, Ph.D., Nova Southeastern University. Associate Professor and Dean. Management information systems, project management, computer space hardware design, microgravity research.

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

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

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

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

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. Security and ethical issues with Web-based and e-learning systems, cyber-security skills, value of information systems and e-learning systems.

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

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

Marlyn Kemper Littman, Ph.D., Nova Southeastern University. Professor. Broadband communications technologies, next-generation networks, ad hoc networking, grid computing, enterprise network solutions, eLearning, network security.

Thomas MacFarland, Ed.D., Nova Southeastern University. Associate Professor. Institutional research, assessment of student learning outcomes, Federal data resources, K-12 computer science education.

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

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

James Parrish, Ph.D., University of Central Florida. Assistant Professor. Knowledge management systems, social engineering, decision support systems, IT strategy.

Souren Paul, Ph.D., University of Wisconsin - Milwaukee. Associate Professor. Virtual teams, computer-supported collaborative work, organizational knowledge management, technology-mediated collaborations in healthcare.

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.

Marti Snyder, Ph.D., Nova Southeastern University. Associate Professor. Instructional design theory and model building and validation, communities of practice, and workplace learning.

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

Gurvirender Tejay, Ph.D., Virginia Commonwealth University. Associate Professor. Information systems security, data quality, information systems project management.

Steven R. Terrell, Ph.D., Florida International University. Professor. Information systems, research methodology and statistics.

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

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