

2019

College of Computing and Engineering Graduate Catalog 2019-2020

Nova Southeastern University

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College of Computing
and Engineering
NOVA SOUTHEASTERN UNIVERSITY

NSU
Florida

Graduate Catalog 2019-2020

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Governing Documents

Reservation of Power

The NSU Student Handbook and the College of Computing and Engineering Graduate Catalog are not intended to be a contract or part of a contractual agreement between Nova Southeastern University and the student. The College of Computing and Engineering Graduate Catalog is available at <http://cec.nova.edu/students/catalogs.html>. Changes in the content of the College of Computing and Engineering Graduate Catalog may be made at any time, by the university, division, or college administration. Adequate notice of anticipated changes will be given to the student, whenever possible. The College of Computing and Engineering Graduate Catalog supersedes all previous catalogs, handbooks, documents, and directives where they may be in conflict. The College of Computing and Engineering Graduate Catalog is the governing document for all graduate program-related information. Please become familiar with the policies and procedures listed within. Failure to read this catalog does not excuse students from the rules, policies, and procedures contained in it. Students are expected to be familiar and comply with all the policies and procedures contained within the College of Computing and Engineering Graduate Catalog, including any revisions or modifications.

Nova Southeastern University reserves the right to amend, modify, add to, or delete its rules, policies, and procedures without notice, affecting its institutional relationship with students as deemed necessary by the administration. Any such amendment, modification, addition, or deletion shall not be considered a violation of the relationship between the university and the student. Such right includes modification to academic requirements, curriculum, tuition, and/or fees when in judgment of the administration such changes are required in the exercise of its educational responsibility.

NSU Student Handbook

The NSU Student Handbook is designed to provide all enrolled students, regardless of academic program, an overview of the universal rights and responsibilities provided and required as a member of our academic community. Through the Code of Conduct outlined in the NSU Student Handbook, information regarding academic integrity requirements, as well as behavioral expectations, are provided to all students. In addition, information

about grievance, including discrimination procedures, are provided for all students through the NSU Student Handbook. Academic programs/colleges may enforce additional policies for academic progress and/or professional standards and are outlined in the individual college's catalog/handbook.

For the purpose of promoting its educational mission, Nova Southeastern University has the inherent right to preserve order and maintain stability through the setting of standards of conduct and the prescribing of procedures for the enforcement of such standards. The foundation underlying such student standards relies on the tenet that the exercise of individual rights must be accompanied by an equal amount of responsibility. This assures that the same rights are not denied to others. By becoming a member of the university community, a student acquires rights in, as well as responsibilities to, the whole university community. These rights and responsibilities are defined within the NSU Student Handbook.

Students are required to comply with all university regulations as well as all local, city, county, state, and federal laws. All students, undergraduate, graduate, and professional, are subject to the policies and procedures as contained within the NSU Student Handbook. In addition, any student residing in university residence facilities is subject to these policies and procedures for violations occurring within those facilities. Any act that constitutes a violation or an attempt to violate any of the policies or procedures contained herein may establish cause for disciplinary and/or legal action by the university. In circumstances where this handbook defines a violation more stringently or differently than local/state law, the handbook's definition shall supersede.

Students who engage in conduct that endangers their personal health or safety or the personal health or safety of others, may be required to participate and make satisfactory progress in a program of medical evaluation and/or treatment if they are to remain at the university. The determination as to the student's participation and progress is to be made by the Student Behavioral Concerns Committee. The university reserves the right to require the withdrawal of a student from either enrollment and/or university housing, whose continuation in school, in the university's judgment, is detrimental to the health or safety of the student or others. Students who withdraw for reasons of health or safety must contact the Office of Student Conduct and Community Standards before seeking readmission to the university. Decisions made under this policy are final.

Changes in the content of the NSU Student Handbook may be made, at any time, by the university. Adequate notice of anticipated changes will be given to the student, whenever possible. The NSU Student Handbook is the governing document for all enrolled students. You are expected to become familiar with the policies and procedures within the handbook. Failure to do so does not excuse students from the rules, policies, and procedures contained in it.

The most current version of the student handbook is available at <https://www.nova.edu/studentaffairs/past-studenthandbooks.html>

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/Cyber Defense Education by the U.S. National Security Agency (NSA) and the Department of Homeland Security (DHS). The university has been awarded a chapter of Upsilon Pi Epsilon (UPE), the International Honor Society for the Computing and Information Disciplines. Most of the college's graduate programs have been certified for inclusion in the Southern Regional Education Board's Electronic Campus.

Notice of Nondiscrimination

Consistent with all federal and state laws, rules, regulations, and/or local ordinances (e.g., Title VII, Title VI, Title III, Title II, Rehab Act, ADA, Title IX, and the Florida Civil Rights Act), it is the policy of Nova Southeastern University not to engage in discrimination or harassment against any persons because of race, color, religion or creed, sex, pregnancy status, national or ethnic origin, non-disqualifying disability, age, ancestry, marital status, sexual orientation, gender, gender identity, military service, veteran status, or political beliefs or affiliations, and to comply with all federal and state nondiscrimination, equal opportunity and affirmative action laws, orders, and regulations. Any such acts are unacceptable and strictly prohibited by the university.

In addition, the law prohibits retaliation against an individual for opposing any practices forbidden under this policy, for bringing a complaint of discrimination or harassment, for assisting someone with such a complaint, for attempting to stop such discrimination or harassment, or for participating in any manner in any investigation or resolution of a complaint of discrimination or harassment.

This nondiscrimination policy applies to admissions, enrollment, scholarships, loan programs, athletics, employment, and access to, participation in, and treatment in all university centers, programs, and activities. NSU admits students of any race, color, religion or creed, sex, pregnancy status, national or ethnic origin, non-disqualifying disability, age, ancestry, marital status, sexual orientation, gender, gender identity, military service, veteran status, or political beliefs or affiliations, to all the rights, privileges, programs, and activities generally accorded or made available to students at NSU and does not discriminate in the administration of its educational policies, admission policies, scholarship and loan programs, and athletic and other school administered programs. The following person has been designated to handle inquiries and complaints regarding perceived discrimination and NSU nondiscrimination policies:

Laura Bennett
Title IX Coordinator
954-262-7858 | lbennett1@nova.edu

2019 – 2020 Academic Calendar

Fall 2019 August 19, 2019 - December 8, 2019	
Open Registration Period	May 6, 2019 – August 18, 2019
Late Registration Begins	August 9, 2019 (Late Registration Fees Applied)
Drop/Add Period	August 19 – 25, 2019
*New Student Orientation & Doctoral Meeting Date (Ph.D. Students only)	October 2, 2019
*Doctoral Meeting Date (Ph.D. Students only)	October 3, 2019
*Doctoral Meeting Date (Ph.D. Students only)	October 4, 2019
Last Day to Withdraw	November 17, 2019
Last Day to Request Incomplete	November 24, 2019
*Doctoral meeting dates are subject to change	

Winter 2020 January 6, 2020 – May 3, 2020	
Open Registration Period	October 28, 2019 – January 5, 2020
Late Registration Begins	December 27, 2019 (Late Registration Fees Applied)
Drop/Add Period	January 6 -12, 2020
*New Student Orientation & Doctoral Meeting Date (Ph.D. Students only)	February 19, 2020
*Doctoral Meeting Date (Ph.D. Students only)	February 20, 2020
*Doctoral Meeting Date (Ph.D. Students only)	February 21, 2020
Spring Break: March 3, 2020 - March 8, 2020	
Last Day to Withdraw	April 12, 2020
Last Day to Request Incomplete	April 19, 2020
*Doctoral meeting dates are subject to change	

Summer 2020 May 4, 2020 – July 26, 2020	
Open Registration Period	March 23, 2020 – May 3, 2020
Late Registration Begins	April 24, 2020 (Late Registration Fees Applied)
Drop/Add Period	May 4 – 10, 2020
Last Day to Withdraw	July 5, 2020
Last Day to Request Incomplete	July 12, 2020

NSU Holiday Calendar

NSU administrative and academic offices/departments are closed on NSU observed holidays

Holiday	NSU Observed Date
Labor Day	Monday, September 2, 2019
Thanksgiving Day	Thursday, November 28, 2019
Day after Thanksgiving Day	Friday, November 29, 2019
Winter Closure	Monday, December 23, 2019 - Wednesday, January 1, 2020
Martin Luther King Day	Monday, January 20, 2020
Memorial Day	Monday, May 25, 2020
Independence Day	Saturday, July 4, 2020

*Dates are subject to change

2019-2020 Tuition Refund Schedule

Fall 2019 August 19, 2019 - December 8, 2019	
Drop/Add Period	August 19 - 25, 2019
75%	Ends September 1, 2019
50%	Ends September 8, 2019
25%	Ends September 15, 2019
Last Day to Withdraw	November 17, 2019
No Refunds after September 15, 2019	

Winter 2020 January 6, 2020 – May 3, 2020	
Drop/Add Period	January 6 – 12, 2020
75%	Ends January 19, 2020
50%	Ends January 26, 2020
25%	Ends February 2, 2020
Last Day to Withdraw	April 12, 2020
No Refunds after February 2, 2020	

Summer 2020 May 4, 2020 – July 26, 2020	
Drop/Add Period	May 4 – 10, 2020
75%	Ends May 17, 2020
50%	Ends May 24, 2020
25%	Ends May 31, 2020
Last Day to Withdraw	July 5, 2020
No Refunds after May 31, 2020	

About Nova Southeastern University (NSU)

Located in Fort Lauderdale, Florida, NSU is a private, not-for-profit institution research institution accredited by the Southern Association of Colleges and Schools Commission on Colleges. Classified as a research university with “high research activity” by the Carnegie Foundation for the Advancement of Teaching, NSU is 1 of only 54 universities nationwide to also be awarded Carnegie’s Community Engagement Classification, and is also the largest private, not-for-profit institution in the United States that meets the U.S. Department of Education’s criteria as a Hispanic-Serving Institution. For more than 50 years, NSU has been fostering groundbreaking research and a commitment to community. The university awards associate’s, bachelor’s, master’s, specialist, doctoral, and first-professional degrees in a wide range of fields, including the humanities, biological and environmental science, business, counseling, computing and engineering sciences, conflict resolution, education, family therapy, medicine, dentistry, various health professions, law, marine sciences, performing and visual arts, psychology, and other social sciences. NSU has campuses in Fort Lauderdale, Fort Myers, Jacksonville, Miami, Miramar, Orlando, Palm Beach, and Tampa, Florida, as well as San Juan, Puerto Rico, while maintaining a global presence online. The institution also has an excellent reputation for its programs for families offered through the Mailman Segal Center for Human Development and the NSU University School. These include innovative parenting, preschool, primary, and secondary education programs, and programs across the life span for people with autism.

The university’s library system is composed of the following four libraries: the Alvin Sherman Library, Research, and Information Technology Center; Panza Maurer Law Library; the Oceanographic Campus Library; and the Martin and Gail Press Health Professions Division Library. Through a unique agreement with Broward County, NSU’s Alvin Sherman Library, Research, and Information Technology Center serves the residents of Broward County as well as the university’s students, faculty, and staff members. This means the community at large can enjoy the resources and services this spectacular venue has to offer. NSU is also home to three additional libraries that serve students, faculty and staff in the areas of health professions, law and oceanography. Stunningly modern and towering a full five stories, the 325,000-square-foot Alvin Sherman Library is one of the largest library buildings in the state of Florida and offers full collections of research materials, specialized databases, popular fiction and nonfiction books, magazines and journals, CDs, and DVDs. Cozy reading niches, 22 study rooms, 1,000 user seats, wireless internet service, and a café. Special programs for children and teens, book discussion groups, author readings, and classes on using research tools and resources. Most importantly, you will find a professional library staff attuned and ready to serve your needs. The Alvin Sherman Library is also home to several permanent works of art, including a one-of-a-kind creation by famed glass artist Dale Chihuly, and a hand-forged Buddhist Prayer Wheel blessed by His Holiness the Dalai Lama.

The College of Computing and Engineering

Dean's Message

Congratulations on your decision to join NSU's College of Computing and Engineering (CCE). As Interim Dean of the College of Computing and Engineering, it brings me great pleasure to welcome you to NSU and to the exciting opportunities in computer science, information technology, cybersecurity, and information systems.

At CCE, we are committed to educating today's computer scientists, and technology leaders to be tomorrow's problem solvers. Through innovative curricula and research activities, our outstanding faculty engage students in a unique, interactive learning environment that facilitates academic excellence and prepares our students for their future careers while they earn a B.S., M.S., or Ph.D. degree. Companies seeking new sources of talent are looking at our college because of our commitment to our students and our program for both discipline experts and strong communication, teamwork, and life-long learning skills. At CCE, we will take your dedication and ambition to the next level of your life.

We encourage you to engage with your peers, outstanding faculty members, and the activities that the university and college offer to strengthen your experience here at NSU.

The faculty and staff all look forward to providing strong support for through your exciting journey towards personal fulfillment, career advancement, and global citizenship. We look forward to celebrating your accomplishments.

Meline Kevorkian, Ed.D

Interim Dean, College of Computing and Engineering

Mission Statement

Engaging in innovation across boundaries, the College of Computing and Engineering prepares leaders and problem solvers in engineering, computer science, information systems, and cybersecurity for application and integration of science and technology to research and design effective solutions that contribute to society and the public good.

Introduction to the College

The College of Computing and Engineering (CCE) prepares students to meet the technological challenges of today. Drawing on 40 years of institutional experience in computing education and research, and 30 years of experience in innovative program delivery, CCE offers focused and flexible programs aligned to industry's most sought-after fields to help students reach their full potential. CCE has a distinguished faculty, evolving curricula, and an alumni network that integrates 40 years of graduates from

computing disciplines at NSU. CCE has flexible online and campus-based formats for its three bachelor's, four master's, and three Ph.D. programs.

The college welcomes part-time and full-time students, whether on-campus or online. Undergraduate on-campus students participate in day and evening programs and may have the opportunity to apply to the Dual Admission program that automatically reserves a seat in one of CCE's graduate programs. Online master's degree programs require no campus attendance and are available to students worldwide. A unique hybrid Ph.D. program blends on-campus limited weekend meetings with online interaction.

CCE has facilities to support hands-on instruction for students to learn and research computing and engineering including mobile application development in the Mobile Computing Laboratory (MCL); areas of distributed systems with an emphasis on designing, implementing, and evaluating systems in the Distributed Systems (CLOUDS) and Security Robust Distributed Systems (SARDIS) laboratory; and more.

The college's research advances knowledge, improves professional practice, and contributes to understanding in the engineering and computing fields. 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 / Cyber Defense Education by the U.S. National Security Agency (NSA) and the Department of Homeland Security (DHS). NSA and DHS have certified that NSU's curriculum in information Assurance and Cybersecurity meets or exceeds the requirements and standards expected of a leader in cybersecurity research and education.

All M.S. programs employ a three-term format: Fall (16-week term starting in August), Winter (17-week term starting in January) and Summer (12-week term starting in May).

All Ph.D. programs employ a semester format. The fall semester starts in August and the winter semester starts in January.

While taking courses, students are required to attend face-to-face meetings once per semester, which are held over a three-day period, on a Wednesday through a Friday. The Wednesday and Thursday will be an all-day sessions, lasting from 8:00 a.m. to 5:00 p.m. The Friday session will last from 8:00 a.m. to 2:00 p.m. These face-to-face sessions typically take place during the seventh week of the semester on the University's main campus. Between sessions, students will work on course assignments and research, and participate in online activities that facilitate frequent interaction with the faculty and with other students. During the summer term, doctoral students can register for doctoral research and dissertation 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, videoconferences, email, and other online tools.

Degrees and Programs of the College of Computing and Engineering

Bachelor of Science (B.S.)

- ✓ Computer Science
- ✓ Engineering (Concentrations in Biomedical Engineering and Industrial Systems Engineering)
- ✓ Information Technology

Master of Science (M.S.)

- ✓ Computer Science (concentrations in artificial intelligence, software engineering, computer systems, data science, information assurance & cybersecurity, and real-world computing)
- ✓ Cybersecurity Management
- ✓ Information Assurance & Cybersecurity
- ✓ Information Systems (concentrations in business intelligence/data analytics, information assurance & cybersecurity management, and user experience (UX)/human-computer interaction,)
- ✓ Information Technology (concentrations in application development, data analytics, and information assurance & cybersecurity management)

Doctor of Philosophy (Ph.D.)

- ✓ Computer Science
- ✓ Cybersecurity Management
- ✓ Information Systems

Collaborative Efforts with other NSU Programs

- . College of Humanities, Arts, and Social Sciences
 - M.S. in Criminal Justice
 - Track in Information Systems
 - Track in Information Assurance and Cybersecurity
 - M.S. in National Security Affairs
 - Concentration in Cyber-terrorism and Security
- . College of Osteopathic Medicine
 - M.S. in Disaster and Emergency Preparedness
 - Track in Cyber Security
- . Halmos College of Natural Sciences and Oceanography
 - Graduate Certificate in Computational Molecular Biology
Shepard Broad College of Law
 - Graduate Certificate in Computational Molecular Biology
Shepard Broad College of Law

- Joint JD/MS Program
The program allows J.D. students at NSU's College of Law who are also admitted to an M.S. program at the College of Computing and Engineering to count up to 9 credits of J.D. course work as electives toward their M.S. programs. Similarly, the College of Law will provide elective credit toward the J.D. from the M.S. curriculum (as per College of Law policy).

Student Organizations

Organizations with active CCE affiliations include:

- ✓ Association for Computing Machinery (ACM)
- ✓ Association for Information Systems (AIS)
- ✓ 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.

Student government: The College of Computing and Engineering Student Government Association (CCE-SGA) provides exceptional students the opportunity to be elected to represent the college on all matters pertaining to students, and is officially chartered to speak on behalf of the student body to the university administration. The mission of the CCE-SGA is to represent the students of the College of Computing and Engineering, promote advocacy and service to the institution and community at large. Elections for CCE-SGA occur at the beginning of summer term, and elected members are announced by the start of fall. The Executive Cabinet consists of the President, Vice President, Vice President of Online Affairs, Treasurer and Secretary. There are two Representatives; one Master's Representative and one Doctoral Representative.

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 Oceanography 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 500 subscription databases and provide online access to a variety of full-text resources including 20,000 unduplicated full-text journals, over one million dissertations, 100,000's of ERIC ED documents, and over 100,000 e-books. 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 through Alvin Sherman Library's Document Delivery Department. Delivery options include:

- **Shipped Delivery:** requested items are shipped to the address listed in the student's ILLiad account. Materials may not all arrive to you on the same day. Library staff ship the items as they are ready. 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.
- **Electronic Delivery:** the DD/ILL Department now provides desktop delivery of articles to distance patrons. Through ILLiad we are able to post articles to a web site while simultaneously sending an e-mail notification to the patron. Users can select this mode of delivery in their ILLiad user account.
- **Other Options:** some of the databases found online in the NSU's Electronic Resources include the full text of newspaper and journal articles. A growing number of these databases can also provide full images of articles (pictures and graphs, along with text). See the complete list of databases. To determine whether a particular journal is available full text online, use Journal Finder.

The Document Delivery Department can be reached toll-free phone, email, or via the web. Students can request up to 50 free documents per week while they are enrolled at NSU. The website provides more information about the department: <http://sherman.library.nova.edu/sites/services/docdel/>

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 ask questions via phone, email, chat, text, and set up individual consultation appointments: <http://www.nova.edu/library/main/ask.html>

The college provides orientations for its new students before the start of their first term. Each orientation includes an introduction to library resources and pointers to where to get additional help. Librarians also provide course specific instruction and online library workshops. For a list of upcoming and recorded workshops visit: <http://sherman.library.nova.edu/sites/library-workshops/>

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 has 1,000 user seats, 20 electronic classrooms, and the 500-seat Rose and Alfred Miniaci Performing Arts Center.

Disabilities and ADA

NSU complies with the Americans with Disabilities Act (ADA). The university's policy on disabilities is contained in NSU's *Student Handbook*. Students with disabilities should discuss their needs with NSU's ADA Coordinator (see <http://www.nova.edu/disabilityservices/>) before the commencement of classes if possible.

Program Formats

M.S.

The master's degree requires 30 credit hours. Master's students may not change majors without prior approval from their academic advisor. While multiple concentrations are permitted within a master's program, master's students are not permitted to seek double majors or enroll in multiple academic programs concurrently within the CCE. 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. 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 (17 weeks) and Summer (12 weeks). On-campus students are permitted to take online courses, and online students are permitted to take on-campus courses. Each student must have an active broadband account with an Internet Service Provider (ISP) and must have his or her own personal computer.

Admitted students are able to take courses in either format (online and/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, for 16 weeks in the fall term, 17 weeks in the winter term and 12 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).

CCE 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, chat rooms, email, and multimedia presentations.

Ph.D.

The college offers Ph.D. programs with a blend of on-campus and online activities. Doctoral students may not change majors without prior approval from their academic advisor. Doctoral students are not permitted to seek double majors or enroll in multiple academic programs concurrently within CCE. 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.

The student enters doctoral candidacy upon completion of (1) course requirements with a cumulative GPA of at least 3.25 through all 700-level courses, (2) at least two registrations of Doctoral Research, and (3) a dissertation idea approved by the student's dissertation advisor and two readers. When all conditions are met, the student becomes a candidate, the advisor and readers become the candidate's dissertation committee, and the student registers for dissertation to begin working on the dissertation proposal. The student registers for one year (three terms) of dissertation, at eight credits per term. Students who have not completed the dissertation after one year of dissertation registrations must register for Continuing Dissertation, three terms per year, until they have satisfied the dissertation requirement. Students not on approved leave register for each term following the one in which they enter candidacy until the dissertation has been completed.

Financial Information

Academic, program, and online services are provided only to CCE 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.

Tuition and Fees

Master of Science (M.S.)	\$820 per credit hour
Doctor of Philosophy (Ph.D.)	\$1150 per credit hour
Admission Application Fee	\$50 (non-refundable)
Readmission Fee	\$50 (non-refundable)
Student Services Fees	\$225 (3 credit hours)
	\$450 (4 or more credit hours)
Registration Fee	\$30 (non-refundable)
Late Registration Fee	\$100 (non-refundable)
Degree Application Fee	\$100

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.

Payments 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 954-262-2000 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. See <http://www.nova.edu/sap>.

Tuition Payment

The Bursar's Office is responsible for collecting university tuition and fees, issuing student refunds from financial aid funds, sending invoices and receipts, and distributing student educational tax data.

NSU accepts payment via credit card using Visa, Master Card, or American Express. Other a CCE acceptable forms of payment are personal checks, cashier's checks, money orders in US Dollars made payable to NSU, and wire transfers. Always be sure to include your full name and student ID number on your method of payment.

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: Payment is due at the time of registration and considered past due 30 days after the start of the semester. An email will be sent to the student 20 after the first day of the semester reminding you of the approaching late fee date.
2. NSU Payment Plan: The Nova Southeastern University (NSU) Payment Plan is a payment option designed to provide budgetary assistance in meeting a student's semester education expenses. NSU students, excluding international students, who wish to split their payments for the semester, may request to enroll in an NSU Payment Plan. While payment for tuition, fees, and other institutional charges is due in full at the time of registration, we recognize that sometimes students and families may need extra time to meet their financial obligations. Please see the Office of the University Bursar for more information http://www.nova.edu/bursar/payment/payment_plans.html. (international students are not eligible for this option)

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.

Admission

Admission is competitive; consequently, applicants who meet the minimum requirements specified herein are not assured admission. There is no formula, yardstick or scoring, the college qualitatively and quantitatively evaluates applicants and makes selections based on performance, personal qualifications, and evidence of potential for success. Newly admitted students must begin the program in the term to which they were admitted. An appeal to defer matriculation may be requested one-time only. Appeals for deferment must be submitted to the Admissions Office within one year from the term of acceptance.

For students who do not begin the program per their offer of admission or deferment, the offer is withdrawn within one year from the term of acceptance; subsequent enrollment will require a new application. Applicants must meet the requirements specified below, as well as the program-specific admission requirements contained in the individual program sections of this catalog. For instructions on applying, visit the college's admissions page: <http://cec.nova.edu/admissions/>.

For additional information, contact:

College of Computing and Engineering

Nova Southeastern University
3301 College Avenue
Carl DeSantis Building, 4th Floor
Fort Lauderdale, Florida 33314-9918

800-986-2247 or

954-262-2031

Email: cecinfo@nova.edu

Website: cec.nova.edu

Admission Information and Minimum Requirements (M.S.)

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 sealed official transcripts. To ensure evaluation for the desired starting term, applications and all required documents must be ready for review at least one month prior to the start of the term. Late applications that cannot be processed in time for the desired starting term will be considered for the next term.

M.S. Minimum Requirements are as follows:

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

The college may request additional documentation to support the application. In addition, applicants may submit standardized test scores or any additional documentation to strengthen their application.

Admission is not guaranteed, even if an applicant meets all minimum requirements.

Admission Information and Minimum Requirements (Ph.D. Program)

Applications will be reviewed by the Admissions Committee after the following items have been received by the admissions office: application form, application fee, essay, resume/curriculum vitae, three letters of recommendation, 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 at least two months prior to the start of the term. Late applications that cannot be processed in time for the desired starting term will be considered for the next term.

Ph.D. Minimum Requirements are as follows:

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).
2. Online application form and application fee.
3. Essay.
4. Sealed official transcripts from all institutions attended.
5. Three letters of recommendation from three people who are familiar with your academic and/or professional capabilities and able to assess your intellectual abilities, maturity, and motivation. Recommendations from your professors are preferred.

Recommendations 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.

6. A Résumé/Curriculum vitae (CV) that provides a short account of your academic background and professional experience.
7. 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 applying to any of the college's programs.

The college may request additional documentation to support the application. In addition, the applicants may submit standardized test scores or any additional documentation to strengthen their application.

Admission is not guaranteed, even if an applicant meets all minimum requirements.

Additional Admission Requirements for International Students

1. The applicant must have a university-level education equivalent to a regionally-accredited United States bachelor's or master's degree in a related field (see program-specific admission requirements in this catalog) with an equivalent GPA meeting the stated minimum. A course-by-course evaluation with a GPA calculation is required. To enable CCE to determine equivalencies, applicants must have their degrees evaluated by an agency that is a member of the National Association of Credential Evaluation Services (NACES). For current information on evaluation agencies visit <http://www.naces.org/members.html>.
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): 80 on the Internet-based test; (2) International English Language Testing System (IELTS) (www.ielts.org): 6.0 on the Academic test module; and (3) Pearson Test of English – (PTE-Academic) (<https://pearsonpte.com/>): 54 on the computer-based test. Official test results must be sent directly from the testing agency to Nova Southeastern University. An applicant can qualify for an exemption from taking an English proficiency examination if one of the following criteria is met: (1) successful completion of at least a bachelor's degree at a regionally approved U.S. institution of higher education; (2) passing Level 9 at [Talk International Language School](#); (3) completion of a degree at an institution in one of the following countries: Australia, English-speaking Canada, Ireland, New Zealand, or the United Kingdom.
3. Applicants for the M.S. programs may complete their degrees entirely online and do not have to travel to the United States.

4. Pursuant to U.S. Citizenship and Immigration Services (USCIS) regulations, international students who are granted full admission to a M.S. program requires an I-20 in order to obtain a student (F-1) visa for study in the U.S. for the length of their programs. Our Ph.D. programs do not qualify for an I-20. Detailed instructions are provided on the website of the Office of International Students and Scholars: <http://www.nova.edu/internationalaffairs/students/>. 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 provisionally admitted student. Interested international applicants should contact the university's Office of International Students and Scholars.
5. The application fee must be in U.S. dollars.

Transfer Credit Policy (M.S. only)

A maximum of six credit hours of graduate-level work will be considered for transfer if (1) the graduate credit was earned within five calendar years of course completion, (2) the credit was earned from a regionally accredited university, (3) the content of the courses requested for transfer is equivalent to an NSU course in the program of study (4) the courses were not used toward a prior awarded degree, and (5) a grade equivalent to B or higher in each of the courses requested for transfer. A grade of P (Pass) or CR (Credit) or other such grade will not be accepted. Upon admission into one of the master's degree programs, the student may request approval of transfer of credits in writing to an academic advisor. Official transcripts are required to process requests for transfer credits.

Administrative Withdrawal (M.S. Only)

Any student who fails to register or enroll in any courses at the College of Computing and Engineering for a period of one year (3 consecutive full terms/semesters) or more will be considered administratively withdrawn from the program/college. Any administratively withdrawn student wishing to reenroll in the college/program, must contact their academic advisor to petition for readmission. Any student who is granted readmission will be subject to the requirements established under the current catalog in effect at the time of their readmission. Petitions for readmission are evaluated on a case-by-case basis and approval is not guaranteed.

Provisional Admission

Applicants are provisionally admitted based on a review of unofficial transcripts and/or unofficial test scores. This initial status of provisional admission allows students to register for one term only (the term of acceptance). All 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).

Readmission

Any student who has been withdrawn or dismissed and wishes to re-enter the program must apply for readmission. The application for readmission cannot be submitted until after one (1) year has elapsed 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 for completion of the program.

Degree Works

Degree Works is the University's online degree evaluation system. Degree Works is designed to help students achieve their academic goals efficiently. The system is used to compare your completed and in progress coursework against degree requirements published in the college catalog. Degree Works is not meant to replace your academic advisor/program office or the college catalog, but is a reference tool to help you track your progress toward degree completion.

Degree Works enables students and advisors to measure academic progress toward degree requirements at any time through WebSTAR.

Degree Works evaluation is not official. You should consult your academic advisor/program office for detailed program requirements and course options. To obtain additional information regarding Degree Works, please visit the Registrar's website: <http://www.nova.edu/registrar/instructions.html>

Academic Standards and the Code of Student Conduct

The university is a community of scholars in which the ideals of freedom of inquiry, freedom of thought, freedom of expression, and freedom of the individual are sustained. However, the exercise and preservation of these freedoms and rights require a respect for the rights of all in the community to enjoy them to the same extent. It is clear that in a community of learning, willful disruption of the educational process, destruction of property, and interference with the orderly process of the university as defined by the university administration or with the rights of other members of the university cannot be tolerated. Students enrolling in the university assume an obligation to conduct themselves in a manner compatible with the university's function as an educational institution.

To fulfill its functions of imparting and gaining knowledge, the university retains the power to maintain order within the university and to exclude those who are disruptive to the educational process.

In support of the Code of Student Conduct, any violations of the Code of Student Conduct and Academic Responsibility and/or university policies and procedures may result in disciplinary action and/or criminal prosecution. Violations of

academic and/or supplementary standards will be handled through the College of Computing and Engineering. Violations of conduct standards, university policies, and/or procedures will be handled by the Office of the Vice President of Student Affairs. Violations of sexual misconduct/discrimination will be handled by the University Title IX coordinator or his/her designee.

Students are required to be familiar with the rules, policies, and Code of Student Conduct and Academic Responsibility. The NSU Student Handbook is available on the Office of Student Conduct Website, <http://www.nova.edu/studentconduct/index.html>.

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* (2013) 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 otherwork. 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.).

Academic Misconduct

The university is an academic community and expects its students to manifest a commitment to academic integrity through rigid observance of standards for academic honesty. The university can function properly only when its members adhere to clearly

established goals and values. Accordingly, the academic standards are designed to ensure that the principles of academic honesty are upheld. The NSU Code of Student Conduct and Academic Responsibility can be viewed in its entirety online in the NSU student Handbook at <https://www.nova.edu/studentaffairs/past-studenthandbooks.html>.

The following acts violate the academic honesty standards:

1. **Cheating in any form:** intentionally using or attempting to use unauthorized materials, information, or study aids in any academic exercise, or having others complete work or exams and representing it as one's own.
2. **Fabrication:** intentional and unauthorized falsification or invention of any information or citation in an academic exercise.
3. **Facilitating academic dishonesty:** intentionally or knowingly helping or attempting to help another to violate any provision of this code.
4. **Conspiracy to commit academic dishonesty:** assisting others to commit acts of academic misconduct
5. **Misrepresentation:** intentionally making false statements or omissions of facts in a contract. Examples include, but are not limited to portfolios, cover sheets, and clinic, training station, and practicum agreements.
6. **Bribery:** offering of goods, services, property or money in an attempt to gain an academic advantage.
7. **Forging or altering documents or credentials:** examples include, but are not limited to signatures, dates and other information on portfolios, cover sheets, and clinic, training station, and practicum agreements.
8. **Knowingly furnishing false information to the institution.**
9. **Plagiarism:** the adoption or reproduction of ideas, words, or statements of another person as one's own without proper acknowledgment.
 - a. Students are expected to submit tests and assignments that they have completed without aid or assistance from other sources. Using sources to provide information without giving credit to the original source is dishonest. Students should avoid any impropriety or the appearance thereof in taking examinations or completing work in pursuance of their educational goals.

Students in violation will be subject to disciplinary action.

Penalties for academic misconduct can range from reduced grades on assignments or in courses, to failing grades on assignments or in courses, as determined by the course professor. Academic misconduct may also result in dismissal from the College of Computing and Engineering without the possibility of re-enrolling at any time. Students may not withdraw from a course in progress to avoid a failing grade upon receiving notice that academic misconduct may have occurred.

Note: If a charge of academic misconduct is determined in a course, any student initiated withdrawal for that course may be administratively reversed and a grade of "F" may be entered on the student's transcript for that course.

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 *Student Handbook*, <http://www.nova.edu/studentaffairs>. Each student is responsible for maintaining academic integrity and intellectual honesty in his or her academic work. It is the policy of the college 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* (2003) 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 *Plagiarism* below)

Plagiarism

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* (2007) defines paraphrase as "A rewording of something written or spoken by someone else, esp. with the aim of making the sense clearer...". 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 college 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.

Penalties for plagiarism may range from reduced grades on assignments or in courses, to failing grades on assignments or in courses, as determined by the course professor. A subsequent determination of plagiarism in a future course (i.e., a second violation) may result in dismissal from the College of Computing and Engineering without the possibility of re-enrolling to the college at any time.

Any determination of plagiarism on a practicum or an applied dissertation (concept paper, proposal, final report), also may result in dismissal from the College of Computing and Engineering without the possibility of re-enrolling at any time.

Course assignments and dissertations submitted in partial fulfillment of degree requirements may be checked for plagiarism. Students may not withdraw from a course in progress to avoid a failing grade or other consequence upon receiving notice that plagiarism may have occurred. If a charge of plagiarism is determined in a course, any student initiated course withdrawal for that course may be administratively reversed and a grade of F entered on the student's transcript for that course [see Academic Misconduct]. Student access to online courses, and attendance at site-based courses, will be discontinued following a determination of plagiarism that results in an "F" for the course. All students are entitled to process pursuant to the College of Computing and Engineering policies and procedures.

Student Misconduct

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

Procedures for Resolving Allegations of Student Misconduct

Allegations of student misconduct must be made in writing to an advisor, faculty member,

Dean, or member of the Dean's executive staff, by a faculty member, staff member, or student. Pertinent factors, witnesses, events, and evidence related to the alleged misconduct should be included. Non-academic violations will be handled by the Office of the Dean of Student Affairs. Alleged violations of academic standards will be examined by the Department Chair of the student's program who will determine if an inquiry should be conducted into the allegations. If the Department Chair determines that an inquiry should be conducted, the accused will be notified of the inquiry and the nature of the allegations by the Department Chair. The Department Chair may appoint a faculty designee to conduct the investigatory phase of the inquiry. As part of the inquiry, all pertinent documentary evidence and statements from witnesses will be assembled by the Department Chair or his/her designee. The accused will be given an opportunity to provide the Department Chair with a written response to the allegations within seven days of receipt of the notice. After reviewing the findings of the inquiry, if the Department Chair determines that misconduct has been committed, the Department Chair will identify an appropriate sanction (see NSU's Student Handbook). A report of the inquiry's findings and penalty will be provided to the accused student, who may acquiesce in the findings of the report or appeal in writing to the Director of Academic Affairs, or his/her designee as indicated in the report provided to the student, setting forth the grounds for appeal. Failure of the accused to appeal to the Director of Academic Affairs, or his/her designee, in writing within 20 days from the date of receipt of the report shall be construed as acquiescence of the findings of the report and the proscribed penalty. If the Director of Academic Affairs, or his/her designee, receives an appeal from the accused student, an appeal of an academic violation will be conducted by the College's Academic Review Board, while appeals of non-academic violations will be conducted by the Office of the Dean of Student Affairs. If, after appeal, the accused is found guilty of misconduct, the Dean of the College or the Dean of Student Affairs will decide on the final action to be taken, depending on the nature of the misconduct."

Orientation and Advisement

New Ph.D. students must attend New Student Orientation Day on the main campus in Fort Lauderdale at their first meeting dates. The orientation includes an introduction to the relevant resources such as college personnel, library services, and financial aid, as well as a reminder about academic integrity. Students are offered dissertation counseling throughout the program.

Registration

Students must be officially registered prior to the start of courses in order to participate in and receive credit for those courses. Students can register and confirm their registration status by accessing NSU SharkLink (sharklink.nova.edu). Prior to registration, students must complete the Nova Southeastern University Student Enrollment Agreement (SEA) each semester or risk being dropped from their courses. To avoid late fees, students should register during the open registration period before the registration deadline. Students should register for all courses they intend to complete within a semester and not wait until the semester has started to register for part of a term. Petitions for changes to course registrations will not be accepted beyond 20 days after each semester ends. Registering early for the entire semester ensures availability of seats in required classes and allows the NSU Office of Student Financial Assistance to properly process and

disburse the Student's financial aid. Students must be fully admitted in order for financial aid funds to disburse. An official grade will not be recorded and credit will not be given for anyone who attends class as an unregistered student.

All holds must be cleared at the time of registration, and all registrations must be completed by the last date of the registration period. Late registration will not be accepted if due to a financial hold that was not cleared prior to the close of registration period.

Registration after the close of the published registration period, when permitted, may incur a late registration fee. Registration materials are available on the school's website.

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.

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 request. Course withdrawal requests must be submitted to the program office in writing via postal mail or NSU email by 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). 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. International students must be aware that their immigration status can be affected by changes in their course schedule.

Attendance Policy

Students are required to be present at each meeting of their classes on campus. Exceptions to this rule may be made in the case of illness or in other hardship situations 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 and hybrid courses, participation/attendance policies will be covered in the syllabus of each course. In particular, each course requires substantial participation in the first week of each term.

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. CCE 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 CCE representative guides students regarding the level of review required and assists with any paperwork and procedures that might be required. Most research at CCE 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 CCE IRB representative by the time they start working on their dissertation proposals. Additional information can be found at cec.nova.edu/research/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 <http://www.nova.edu/irb/index.html>.

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. CCE 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 CCE 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 CCE IRB representative.

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.

The Dissertation

Students will have qualified for doctoral candidacy and be permitted to register for Doctoral Dissertation after they have completed their required course work with a

minimum cumulative GPA of 3.25, completed at least two sections of Doctoral Research, and submitted a dissertation idea approved by a faculty advisor and two readers. Three registrations of Doctoral Dissertation are required, to be taken over three 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 Doctoral Dissertation cannot occur until doctoral candidacy is established, 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* (http://cec.nova.edu/documents/diss_guide.pdf). Students are required to present an oral defense of the dissertation.

Grading 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.
P	Pass. Indicates successful completion in a course. Carries credit hours but no grade points
W	Withdrawn from course
PR	Progress. May be assigned to thesis or dissertation. 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 Carries no credit hours. Indicates insufficient progress toward completion of a thesis or dissertation. Repeated NPR grades will result in probation (see section Evaluation of Research Progress).
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 an "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 subject to dismissal 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.

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, 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. If the student is not in agreement with the course professor's decision, the student can choose to appeal, in writing, to the department chair. The chair will review the appeal and return a decision in writing. 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 Grievance Procedure

This section describes the procedure for student grievances regarding academic matters other than grades. If the issue concerns the fairness of a grade, the procedure described in the section Challenge of Course Grade must be followed. Grievance procedures for nonacademic disputes are contained in NSU's *Student Handbook*. First, the student should attempt to resolve the matter at the level at which it occurred, e.g., the appropriate

faculty member or staff member. This attempt must be in writing. The student may wish to use certified mail to verify receipt of correspondence. In the correspondence, the student must present a rationale for his or her position based on factual information. The

student will receive a reply from the recipient, in writing, that addresses the complaint. If the reply is not acceptable, the student is encouraged to submit the complaint, in writing, to the next higher level, usually the department chair. If the department chair 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 College of Computing and Engineering who will attempt resolution. If appropriate, the dean may assign the matter to the Academic Review Board. The committee will meet, carefully review the case, hold a hearing if necessary, and make a written recommendation, including rationale, to the dean to either accept or reject the appeal, or may propose an approach to resolve the complaint. The dean will review the Academic Review Board's findings and recommendation, and will notify the student in writing of his or her decision. The dean's decision is final and cannot be appealed.

Communication by Email

Students must use their NSU email accounts when sending email to faculty and staff and must clearly identify their names and other appropriate information, e.g., course or program. When communicating with students via email, faculty and staff members will only send email to students' NSU email accounts. Students who forward their NSU-generated email to other email accounts do so at their own risk. CCE 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.

Academic Progress, Grade Requirements, and Academic Standing

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

The following regulations apply to M.S. students:

- ✓ 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 subject to dismissal.
- ✓ Students who receive a grade of "F" have the right to repeat the course. Students who receive a second grade of F in any course will be subject to dismissal

(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 B– 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 earn passing grades. The transcript will show both the original and repeat grades; however, only the higher grade will be counted in the student’s cumulative GPA. Students repeating a course must pay course tuition and fees.

The following regulations apply to Ph.D. students:

- . 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 subject to dismissal. 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 subject to dismissal.
- . Students may repeat a doctoral course to replace the earned grade (whether it was passing or failing). At most two courses may be repeated. Students repeating a course must pay course tuition and fees.
- . Students may not repeat a master’s course taken to fulfill requirements specified on admission to the doctoral program.
- . Students who receive two failing grades will be subject to dismissal (independent of whether the first F was repeated with a passing grade).
- . Doctoral courses taken to satisfy prerequisite requirements must be completed with a grade of B or better.
- . Registered but inactive dissertation students risk losing their advisors/committees, especially if their inactivity has not been coordinated with their advisors.
- . Students who make sustained unsatisfactory progress toward the completion of a dissertation will be placed on probation, and are subject to dismissal (see the section Evaluation of Research Progress).
- . Doctoral Research courses can be taken a maximum of four times (regardless of NPR or PR grade). Students who do not complete their Idea Paper within such timeframe will be subject to dismissal.

Evaluation of Research Progress (Doctoral Students Only)

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

Students are evaluated each term by their dissertation committee regarding their research progress. The purpose of such evaluations is to provide students with relevant and timely feedback concerning their overall performance in the dissertation process. Students that

receive a total of three NPR grades may be subject to dismissal from the Ph.D. program. 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 fails to express ideas clearly and may result in a NPR grade. 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.)

Administrative Withdrawal/Leave of Absence (Doctoral Students Only)

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 notify the Academic Advising department in the Office of Academic Affairs, in writing, of their intent to take a leave of absence. The leave should be coordinated with the student's dissertation chair, if such a relationship exists, before approval by the Office of Academic Affairs. 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. Any Doctoral student who fails to register for courses or dissertation credits continuously and is not on a leave of absence will automatically be administratively withdrawn from their academic program. Any administratively withdrawn doctoral student who wishes to resume their academic program must contact their academic advisor to petition for readmission. Petitions for readmission are evaluated on a case-by-case basis and approval is not guaranteed.

Student who wish for a leave of absence from his/her program of study must follow the procedure outlined below:

All students must send their request to the Office of Academic Affairs (cecadvising@nova.edu) via their NSU email account. Students submit a completed Leave of Absence Request Form: <https://cec.nova.edu/students/documents/phd-leave-of-absence.pdf> to the Office of Academic Affairs at least two weeks prior to the beginning of the term. An email notification will be issued from the Office of Academic Affairs to the student's NSU email account to acknowledge his/her request for a leave of absence.

Please note that students may not accumulate more than three terms of leave of absence during their studies. 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 subject to dismissal from the program.

Time Limit for Degree Completion Masters

Students must complete requirements for the master's degree within five (5) years from the initial term of registration. Students unable to complete the program within this five-year timeline may be subject to dismissal.

Students who experience unexpected extenuating circumstances that inhibit their ability

to complete all program/degree requirements within five years may request an extension of time of up to one (1) year (maximum). Requests must be received during the last term prior to the expiration of the five-year timeframe for program/degree completion, for consideration. Students must be in good academic and financial standing to be eligible for an extension.

Doctoral

Students must have an approved dissertation proposal within eight (8) years of the date of their first registration and have completed all requirements for the Ph.D. degree within ten (10) years from the initial term of registration. Students unable to complete the program within this ten-year timeline may be subject to dismissal.

Students who experience unexpected extenuating circumstances that inhibit their ability to complete all program/degree requirements within the ten-year timeframe, may request an extension of time of up to one (1) year (maximum). Extension requests must be received prior to the expiration of the ten-year timeframe for program/degree completion, during students last term of enrollment, for consideration. Students must be in good academic and financial standing to be eligible for an extension.

Independent-Study Basis and Taking a Course in Another Program

Each of these requires the student to submit a request for approval to the relevant department chair 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 programs in which the student is not enrolled. For each of these cases, the department chair 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 department chair will consult with the appropriate faculty member for possible approval and will notify the student of the decision and any requirements.

Student Services

(For additional services see the NSU website and the NSU 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 (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 available online. 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 university bookstore 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 in the event that e-texts are not available. 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 assist with making 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/travel/index.html or via email: travel@nova.edu.

Alumni Association

For information, visit NSU's Alumni Association at www.nova.edu/alumni/.

Graduation Requirements

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

- ✓ Satisfaction of program and academic 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).
- ✓ Complete and submit the *Application for Degree* form and submit payment of the degree application fee: <http://www.nova.edu/registrar/instructions.html>
 - 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.

Note: Existing holds and outstanding balances will not prevent degree conferral, but failure to complete and submit a degree application in a timely manner will affect your degree conferral date. Understand, however, that no diploma, transcripts or degree verification will be released until all financial obligations have been satisfied.

Degree Conferral

Nova Southeastern University will recommend the candidate to the Board of Trustees for the degree *only* upon completion of all program requirements for the degree. Degrees are typically awarded at the end of the official term of the candidate's last term of enrollment. All financial obligations with the university must be cleared at the time of degree conferral.

Commencement

The graduate commencement ceremonies are held annually in June. All graduating students are encouraged to participate in this important ceremony; however, students are not required to attend the ceremony to have their degrees awarded.

Commencement participation eligibility requirements:

- **Masters students:** Scheduled to have all coursework completed by the end of the summer term of the same year.
- **Doctoral students:** completion of all coursework and degree requirements by the end of the winter term of the same year.

Department of Computing and Engineering

Programs: B.S., Computer Science; B.S., Information Technology; B.S., Engineering; M.S., Computer Science; M.S. Cybersecurity Management., M.S., Information Assurance & Cybersecurity M.S., Information Systems; M.S., Information Technology; Ph.D.; Computer Science, Ph.D., Cybersecurity Management; Ph.D., Information Systems

**Undergraduate curricula are detailed in the NSU Undergraduate Catalog.*

Master of Science in Computer Science

The Master of Science in Computer Science is a 30 credit-hour degree program designed to give students a thorough knowledge of the field and to provide an enduring foundation for future professional growth. Offered online and on-campus in South Florida, the Master of Science in Computer Science degree program blends theory and practice into a learning experience that develops skills applicable to complex real-world problems.

Students take five core courses covering the theory of programming languages, the design and analysis of algorithms, operating systems, database management systems, and software engineering. Three or more courses are then taken in one of the following concentrations of the student's choosing: software engineering; artificial intelligence, computer systems; data science; information assurance and cybersecurity; and real-

world computing. Students can elect a no concentration option. Remaining courses are electives drawn from computer science course offerings.

The security concentration in the M.S. in Computer Science is part of the Center for Information Protection, Education, and Research (CIPhER) that is recognized as a Center of Academic Excellence (CAE) in Cyber Defense Education (CDE) by the U.S. National Security Agency (NSA) and the Department of Homeland Security (DHS).

Learning Outcomes

A graduate with a M.S. in Computer Science will have the ability 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 Admission.)

This program is designed for students with undergraduate majors in computer science, engineering, mathematics, or physics, or a closely related field, 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 (courses are 3 credits each):

- CISC 500 Java Programming Language
- CISC 501 Computer Organization and Architecture
- CISC 502 Mathematics in Computing
- CISC 503 Data Structures and Algorithms

These are in addition to the required 30 credit hours of courses at the 600 level. Courses at the 500 level, when required, must be successfully completed prior to taking courses at the 600 level. All 500-level courses must be completed with a grade of B or higher to continue in the program. CISC 500 is a prerequisite to CISC 503.

Curriculum for the M.S. in Computer Science

The M.S. in Computer Science is offered with five concentrations along with a no concentration option. Students must complete a total of 30 credits. Core courses, concentrations and electives are listed below. If the thesis option is elected, a thesis will replace two of the elective courses. Plans for the thesis option must be made with and approved by the program office.

Core Courses (3 credits each)

CISC 610 Programming Languages
CISC 615 Design and Analysis of Algorithms
CISC 640 Operating Systems
CISC 660 Database Management Systems
CISC 680 Software Engineering

Artificial Intelligence Concentration (4 courses, 3 credits each)

CISC 662 Data Mining and Knowledge Discovery in Databases
CISC 664 Information Retrieval and Web Search Engine Technology
CISC 670 Artificial Intelligence
CISC 685 Interaction Design

Computer Systems Concentration, Courses (3 credits each)

ISEC 660 Advanced Network Security
CISC 650 Computer Networks
CISC 665 Distributed Systems

Data Science Concentration Courses (3 credits each)

CISC 662 Data Mining and Knowledge Discovery in Databases
CISC 664 Information Retrieval and Web Search Engine Technology
CISC 672 Data Visualization
MMIS 671 Fundamentals of Data Analytics and Business Intelligence

Information Assurance and Cybersecurity Concentration Courses (3 credits each)
(Choose four)

ISEC 615 Fundamentals of Security Technologies
ISEC 620 Applied Cryptography
ISEC 640 Database Security
ISEC 650 Computer and Network Forensics
ISEC 660 Advanced Network Security

Real-World Computing Concentration Courses (3 credits each)

CISC 665 Distributed Systems
CISC 668 Mobile Application Development
CISC 670 Artificial Intelligence
CISC 681 Computer Graphics

Software Engineering Concentration Courses (3 credits each)

CISC 682 Software Requirements Engineering
CISC 683 Object-Oriented Design
CISC 684 Software Testing and Verification
CISC 685 Interaction Design

No Concentration Option (5 courses, 3 credits each)

Select a mix of course from Concentrations and/or Electives.

Elective Courses (3 credits each)

Any course in the concentrations aforementioned is also an elective course in the program. Additionally, any offerings of CISC 631-Theory of Computation or CISC 690-Special Topics in Computer Science, will count as an elective.

Master of Science in Cybersecurity Management

The M.S. in Cybersecurity Management is a 30 credit-hour degree program designed for individuals who want to focus on security policy development and compliance by obtaining the necessary skills and abilities for the development of organizational policies related to information assurance/cybersecurity defense and the analysis of operational systems for compliance with applicable related laws and policies.

The M.S. is recognized by the National Security Agency (NSA) and the Department of Homeland Security (DHS) who have certified that NSU's curriculum in information security meets or exceeds the requirements and standards expected of a leader in cybersecurity research and education. NSA and DHS recognized that NSU's graduate curriculum met the additional requirements for educational specializations in network security engineering and security policy development and compliance. As a result of this certification, Federal agencies may sponsor civilian and military personnel to take the school's certified graduate courses

Learning Outcomes

A graduate with an M.S. in Cybersecurity management will have the ability to (1) communicate cybersecurity management concepts professionally, (2) develop of organizational policies related to cybersecurity for effective solutions, (3) apply knowledge of information security compliance with applicable polices to perform cyber risk management analysis using recognized cybersecurity standards; (4) demonstrate knowledge, skills, and abilities (KSAs) to apply security control measures to mitigate cyber risks.

Program-Specific Admission Requirements

(For general requirements, see the section Admission.)

This program is designed for students with undergraduate majors in computer science, information systems, information technology, engineering, mathematics, or physics. Applicants must have knowledge of data structures and algorithms and structured programming in a modern high-level language.

Applicants who do not have an adequate background may be required to take the following 500-level graduate course during the first term of the program:

MSIT 501 Foundations of Programming, Data Structures, and Algorithms (3 credits)

This course is 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. All 500-level courses must be completed with a grade of 'B' or higher to continue in the program.

Curriculum for the M.S. in Cybersecurity Management

Students must take all 10 required courses in the list that follows. Students who wish to take an elective (above the 10 required courses) must request approval from the program office before registration. Students who opt to complete a thesis must first take 9 required courses (not including ISEC 695) and take 6 thesis credits (total 33 credits). Plans for the thesis option must be made in conjunction with, and approved by, the program office.

Core Courses (3 credits each)

MMIS 621 Information Systems Project Management
MMIS 623 Information Privacy and Ethics
MMIS 630 Database Management and Applications
MMIS 653 Telecommunications and Computer Networking
MMIS 680 Human-Computer Interaction
ISEC 615 Fundamentals of Cybersecurity
ISEC 635 Information Security Operations Management
ISEC 655 Information Security Governance
ISEC 675 Information System Auditing
ISEC 695 Information Security Management Project

Master of Science in Information Assurance and Cybersecurity

The Masters of Science in Information Assurance and Cybersecurity is a 30 credit-hour degree program designed for someone who wants to focus on network security engineering by obtaining the necessary skills and abilities for the design of secure network infrastructures and security analysis of network traffic.

This program was developed to address the rapidly growing global problems of maintaining and securing computer information. Offered online and on-campus in South Florida the master of Science in Information Assurance and Cybersecurity degree program addresses important topics such as, 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 National Security Agency (NSA) and the Department of Homeland Security (DHS) has certified that NSU's curriculum in information security meets or exceeds the requirements and standards expected of a leader in cybersecurity research and education. In particular, NSA and DHS recognized that NSU's graduate curriculum met the additional requirements for educational specializations in network security engineering and security policy development and compliance. As a result of this recognition federal agencies may sponsor civilian and military personnel to take the school's certified graduate courses.

NSU is designated as a national Center of Academic Excellence in Cyber Defense (CAE/CD) education, and NSU's College of Computing and Engineering is hosting the Center for Information Protection, Education, and Research (CIPhER).

Learning Outcomes

A graduate with an M.S. in Information Assurance & Cybersecurity will have the ability to (1) describe the primary types of access control and the potential applications of each type; (2) demonstrate an understanding of the fundamental concepts, technologies, and challenges of telecommunications and network security; (3) demonstrate an understanding of the key concepts of information security

governance and risk management, including current best practices in business continuity and disaster recovery planning; (4) describe the components of effective security architecture and the various security models that can be used in the design of secure architectures; (5) possess an understanding of the major cryptographic algorithms used in information security and how each can be effectively integrated into a secure information infrastructure; (6) understand the common techniques to achieve effective physical security of protected information systems.

Program-Specific Admission Requirements

(For general requirements, see the section Admission.)

The Master of Science in Information Assurance & Cybersecurity degree is designed for students with undergraduate majors in computer science, information systems, information technology, engineering, mathematics, or physics. Applicants must have knowledge of data structures and algorithms, assembly language and computer architecture, 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 (Courses are 3 credits each)

- CISC 500 Java Programming Language
- CISC 501 Computer organization and Architecture
- CISC 502 Mathematics in Computing
- CISC 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. All 500-level courses must be completed with a grade 'B' or higher to continue in the program. CISC 500/501 is prerequisite to CISC 503.

Students must take all 10 required courses. Students who wish to take an elective (above the 10 required courses) must request approval from the program office before registration. Students who opt to complete a thesis must take all 10 required courses aside from ISEC 690, and take 6 thesis credits (total 33 credits). Plans for the thesis option must be made in conjunction with, and be approved by, the program office.

Core Courses (10 courses, 3 credits each)

CISC 640 Operating Systems

CISC 650 Computer Networks
CISC 680 Software Engineering
ISEC 615 Fundamentals of Cybersecurity
ISEC 620 Applied Cryptography
ISEC 640 Database Security
ISEC 650 Computer and Network Forensics
ISEC 660 Advanced Network Security
ISEC 690 Information Security Project
MSIT 630 Database Systems

Master of Science in Information Systems

The M.S. in Information Systems is a 30 credit-hour degree 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 concentrates on areas such as project management, database systems and data warehousing, user experience (UX) and human-computer interaction, information assurance and cybersecurity management, and data analytics/business intelligence.

Offered online and on-campus in South Florida, The Masters of Science in Information Systems degree 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.

Students have the option to earn the M.S. in Information Systems following one of the concentration options, listed below. The concentration in Cybersecurity Management is recognized by the National Security Agency (NSA) based on its certification of the college's curriculum under NSA national training standards and is also designated by NSA for the training of System Security Administrators. Graduates possess the necessary skills and abilities for the secure configuration, operation and maintenance of a computer system. As a result of this certification, Federal agencies may sponsor civilian and military personnel to take the college's certified graduate courses. These programs are available online or on-campus.

Learning Outcomes

A graduate with a M.S. in Management Information Systems will have the ability 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 Admission.)

These programs are designed for students with undergraduate majors in information systems, information technology, business administration, or a related field, and having knowledge and significant experience in computer applications.

Applicants who do not have adequate backgrounds may be required to take the following 500- level graduate course during the first term of the student's program:

MSIT 501 Foundations of Programming, Data Structures, and Algorithms (3 credits)

This course is in addition to the required 30 credit hours at the 600 level. The Master of Science in Information systems has three concentrations options, along with a no concentration option. Students must complete 30 credits. Core courses, concentrations and electives are listed below.

Curriculum for the M.S. in Information Systems

All students, regardless of concentration, must complete the core courses listed below. Students may pursue the no concentration option or select one of three concentrations. For each, the required courses are listed.

Core Courses (3 credits each)

ISEC 615 Fundamentals of Cybersecurity
MMIS 621 Information Systems Project Management
MMIS 623 Ethics in Computing
MMIS 630 Database Management and Applications
MMIS 653 Telecommunications and Computer Networking
MMIS 671 Fundamentals of Analytics and Business Intelligence
MMIS 680 Human-Computer Interaction

Business Intelligence / Data Analytics Concentration Courses (3 credits each) MMIS

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

Information Assurance and Cybersecurity Management Concentration Courses (3 credits each) I

SEC 675 Information System Auditing
ISEC 695 Information Security Management Project

Take one:

ISEC 635 Information Security Operations Management

ISEC 655 Information Security Governance

User Experience (UX)/Human-Computer Interaction Concentration Courses

(3 credits each)

CISC 685 Interaction Design

MMIS 636 Computer-Supported Cooperative Work

MMIS 644 Social Media

No Concentration (3 credits each)

Select a mix of courses from Concentrations aforementioned and/or any offerings of 600-level courses prefixed MMIS, RESD, or ISEC as electives.

Electives (3 credits each)

The following are sample elective courses that are not part of concentrations, but will count as electives:

MMIS 627 Enterprise Technologies and Infrastructures MMIS

628 Enterprise Systems and Business Processes MMIS 646

Information Visualization

MMIS 650 Fundamentals of Cloud Computing

MMIS 654 Electronic Commerce on the Internet

MMIS 665 Information Systems Strategy

MMIS 691 Special Topics in Information Systems

RESD 600 Introduction to Research Methods and Statistics

Master of Science in Information Technology

The Master of Science in Information Technology is a 30 credit-hour degree designed to provide students with a thorough knowledge of organizational information systems, application 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.

Students take five core courses covering database systems, platform technologies, telecommunications and networking, software development, and security technologies. Three courses are then taken in one of the following three concentrations of the student's choosing: application development, data analytics, or information assurance and cybersecurity management. Students taking the no concentration option will need to take five elective courses. For students taking a concentration option, remaining courses are electives drawn from information technology, information security, or information systems course offerings.

Learning Outcomes

A graduate with a 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) identify, analyze, and synthesize professional literature relating to the field of information technology; and (4) use current technologies, tools, software systems, modern computing platforms, and apply best practices to develop real-world solutions for specific problems (e.g., applications, deployments, etc.)

Program-Specific Admission Requirements

(For general requirements, see the section Admission.)

The Masters of Science in Information Technology degree 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.

Applicants who do not have an adequate background may be required to take the following 500-level graduate course during the first term of the program:

MSIT 501 Foundations of Programming, Data Structures, and Algorithms (3 credits)

This course is in addition to the required 30 credit hours at the 600 level. Courses at the 500 level, when required, must be completed prior to taking courses at the 600 level. All 500-level courses must be completed with a grade of 'B' or higher to continue in the program.

Curriculum for the M.S. in Information Technology

The M.S. in Information Technology is offered with three concentrations. Student must complete a total of 30 credits.

Core Courses (3 credits each)

MSIT 630 Database Systems
MSIT 650 Platform Technologies
MMIS 653 Telecommunications and Computer Networking
MSIT 660 Software Development
ISEC 615 Fundamentals of Security Technologies

Application Development Concentration Courses (3 credits each)

CISC 668 Mobile Application Development
CISC 685 Interaction Design
MMIS 665 Web Services

Data Analytics Concentration Courses (3 credits each)

MMIS 642 Data Warehousing
MMIS 643 Data Mining
MMIS 671 Fundamentals of Analytics and Business Intelligence

Information Assurance and Cybersecurity Management Courses (3 credits each)

ISEC 635 Information Security Operations Management
ISEC 655 Information Security Governance

ISEC 675 Governance System Auditing

No Concentration (3 credits each) Select a mix of courses from Concentrations and/or Electives.

Elective Courses (3 credits each)

Students select any 600-level courses at the college with prefix MMIS, MSIT, or ISEC (Except MMIS 630, or ISEC 600, 620, 640, 650 or 660).

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. The program 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 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.

Curriculum for the Ph.D. in Computer Science

This program requires a minimum of 64 credit hours for degree completion; 32 credits of Cores Courses and 32 credits are for research and dissertation.

Core Courses (4 credits each) (Choose Eight)

CISD 700 Theory and Principles of Programming

CISD 730 Operating Systems

CISD 740 Data Communications and Computer Networking

CISD 750 Database Management Systems

CISD 760 Artificial Intelligence

CISD 770 Software Engineering
CISD 792 Computer Graphics
CISD 794 Knowledge Discovery in Databases
ISEC 740 Secure Systems Analysis and Design

Research Registrations: 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. The student must complete a 700-level course with the requested professor with a grade of B+ or higher.

Dissertation Registrations: Students must make three consecutive registrations (eight credits each) for CISD 901, Doctoral Dissertation, to total the 24 credits of dissertation required. Students, whose dissertations are not completed within three registrations (one year), must continue to register for CISD 920 Continuing Dissertation (four credits) each term until the dissertation is complete.

Ph.D. in Cybersecurity Management (formerly Information Assurance)

This program offers a course of study leading to the degree of Doctor of Philosophy (Ph.D.) in Cybersecurity Management, recognized by the U.S. National Security Agency and the Department of Homeland Security. The program combines traditional and online instruction to provide professionals the opportunity to pursue graduate study while continuing to work in their current positions. The Ph.D. in Cybersecurity Management is a comprehensive, multidisciplinary, research program that prepares graduates for key positions in academia, in federal, state and local government agencies, and in business and industry. The curriculum combines both technically intensive and management-focused security courses to provide a comprehensive approach to the study of information assurance/information security. Each student must complete eight core courses, at least two research courses, and a dissertation.

A graduate with a Ph.D. in Cybersecurity Management will have the ability to: (1) acquire advanced knowledge and deeper understanding of the field of information assurance; (2) communicate professionally and ethically about information assurance research issues identify, analyze, and synthesize scholarly literature related to information assurance; 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 assurance/information security.

Program-Specific Admission Requirements

(For general requirements, see the section Admission.)

This program is designed for individuals with experience in information assurance/information security. At admission, students may be recommended to follow a “managerial” or “technical” track, as described below. Applications are recommended to possess a master’s degree in Information Assurance (or closely associated degree) from a current Center of Academic Excellence (CAE) or a master’s in Computer Science/Information Technology/Information Systems, with some coursework in

information security fundamentals. Additionally students should have professional experience in information security and have a strong research potential in the areas of information security.

Curriculum for the Ph.D. in Cybersecurity Management

The program requires at least 67 credit hours, of which 35 are for courses and at least 24 are for research and dissertation.

Core Courses (5 credits each)

ISEC 700 Research Seminar in Cybersecurity Management

ISEC 740 Secure Systems Analysis and Design

ISEC 750 Information Protection

ISEC 765 Information Security Risk Management

ISEC 775 Information Policy

RESD 700 Research Methods

Elective Courses (5 credits each)

(Select one courses)

DISS 720 Human-Computer Interaction

DISS 735 Knowledge Management

Research Registrations

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. The student must complete two doctoral research sections of ISEC 885 Doctoral Research with the requested professor with a grade of B+ or higher.

Dissertation Registrations

Students must make three consecutive registrations (eight credits each) for ISEC 901, Doctoral Dissertation, to total the 24 credits of dissertation required. Students whose dissertations are not completed within three registrations (one year) continue to register for ISEC 920 Continuing Dissertation (four credits) each term until the dissertation is complete.

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. The program 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, at least two research courses, and a dissertation. 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, refer to the Admission section.)

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, telecommunications and computer networks, and statistics. Students may be admitted without course work in statistics, but will be required to complete RESD 600, Introduction to Research Methodology and Statistics, and obtain a grade of B+ or above.

Curriculum for the Ph.D. in Information Systems

The program requires at least 67 credit hours, of which 32 are for courses and at least 32 are for research and dissertation. Courses, research, and dissertation registrations are as follows.

Degree Program Courses (5 credits each)

DISS 710 Analytics and Business Intelligence
DISS 720 Human-Computer Interaction
DISS 735 Knowledge Management
DISS 750 Database Systems
RESD 700 Quantitative Research Methods
ISEC 765 Information Security Risk Management
ISEC 775 Information Privacy

Research Registrations

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. The student must complete a 700-level course with the requested professor with a grade of B+ or higher.

Dissertation Registrations

Students must make three consecutive registrations (eight credits each) for DISS 901, Doctoral Dissertation, to total the 24 credits of dissertation required. Students whose dissertations are not completed within three registrations (one year) continue to register for DISS 920 Continuing Dissertation (four credits) each term until the dissertation is complete. Students who are pursuing the Concentration in Information Security must complete a dissertation in an area of information security / assurance.

Graduate Course Descriptions

CISC 500 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.

CISC 501 Computer Organization and Architecture (3 credits)

A comprehensive examination of the fundamental concepts, organization, and architectural structures of contemporary computers. Topics include: logic design, fundamental structure of computer hardware systems (CPU/ALU, memory, cache, registers, I/O), instruction sets, assembly language programming, computer arithmetic, pipelining, and memory hierarchy.

CISC 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.

CISC 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: CISC 500 or equivalent.

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 664 Information Retrieval and Web Search Engine Technology (3 credits)

Topics would include, but not be limited to, fundamentals of search engine architecture and crawling techniques, text processing and link analysis, retrieval models, indexing and ranking, indexing construction and query processing, evaluating and optimizing of search engine. **Prerequisite:** CISC 662.

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 668 Mobile Application Development (3 credits)

Study of the development of real-world mobile applications using a variety of software engineering techniques and platforms. Topics include data management, persistence mechanisms, user-interface design, and application lifecycles.

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 672 Data Visualization (3 credits)

Information visualization focuses on visualization techniques to help people understand, analyze, and make decisions based on data. This course will examine principles and techniques for developing effective visualizations, and provide experience in manipulating data and producing visualizations using tools such as Tableau and Python with related libraries such as pandas, NumPy, and matplotlib.

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. Students from other programs may be able to take this course as an elective; contact your academic advisor to register. Note that the course expects students to have academic or professional experience in software development.

CISC 685 Interaction Design (3 credits)

The course provides fundamentals of interaction design (ID) with a focus on user experience (UX). Topics include aspects of interaction design and design thinking, user-centered design (UCD) lifecycle, user experience research, UI guidelines, personas, walkthroughs and journey maps, wireframes and sitemaps, prototyping, and web-based or mobile design evaluations. Students will integrate software engineering design and testing processes into interface design approaches. Students will produce a redesign prototype concept of an interactive technology.

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.

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 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.

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 885 Doctoral 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. The student must complete a 700-level course with the requested professor with a grade of B+ or higher.

CISD 901 Doctoral Dissertation (8 credits)

The student develops an accepted proposal for the study, conducts the research as proposed, submits an acceptable report, and successfully defends the dissertation.

CISD 920 Continuing Dissertation (4 credits)

Students who have not completed the dissertation after three registrations of Doctoral Dissertation must register for Continuing Dissertation each term in order to receive faculty and administrative advice and support related to the dissertation. **Prerequisite:** 24 credits of Doctoral Dissertation

DISS 710 Analytics and Business Intelligence (4 credits)

Principles and techniques relating to applications of analytics for organizational problem solving. The focus is on current research in analytics and business intelligence. Topics include optimization models for prescriptive analytics, machine learning techniques for predictive analytics, and analysis and design of business intelligence applications.

DISS 720 Human-Computer Interaction (4 credits)

The course investigates the field of HCI and user experience (UX) research, centering on the opportunities to study focused problems related to impacts of technology innovations and designs on the user experience and quality of life. Issues related to effective HCI are presented, such as current trends in the field, user-centered design, user experience processes, ubiquitous interactions and usability, usability engineering and evaluation, and applications areas such as usable security and privacy and other areas of current emphasis in the HCI research community.

DISS 725 Information Systems Development (4 credits)

This course presents research related to information systems (IS) development. Students will review both classic and current research in a representative set of topics including design science, agility of IS, adoption and diffusion of IS. Moreover, we will discuss the meaning of good research and how to get started with quality research activities such as authoring and reviewing articles in various conference and journal outlets by analyzing the work of others and learning from critiques of our work.

DISS 726 Social Perspectives of Information Systems (4 credits)

This is a doctoral seminar on the foundations of information systems (IS) research. The course is intended to generate an understanding of some major streams of research in information systems. It will emphasize the value of using different perspectives and methodologies in IS research. The course involves reading and discussion of the research literature on the development, use, and impact of information systems at individual, group, organizational, and societal levels.

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 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 e-commerce research in the IS field and to develop academic research proposals.

DISS 750 Database Systems (4 credits)

Applications of database theory and data management. Selected topics in data models, data modeling, and database design theory for traditional and nontraditional database systems to retrieve and store various types of data. Current issues, trends, future directions, and research topics in the areas will be explored.

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, e-commerce, 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 885 Doctoral 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. The student must complete a 700-level course with the requested professor with a grade of B+ or higher.

DISS 901 Doctoral Dissertation (8 credits)

The student develops an accepted proposal for the study, conducts the research as proposed, submits an acceptable report, and successfully defends the dissertation.

DISS 920 Continuing Dissertation (4 credits)

Students who have not completed the dissertation after three registrations of Doctoral Dissertation must register for Continuing Dissertation each term in order to receive faculty and administrative advice and support related to the dissertation. Prerequisite: 24 credits of Doctoral Dissertation.

ISEC 600 Secure Computer Systems (3 credits)

This course will focus on design principles of secure computer systems. Issues regarding authentication, access control and authorization, discretionary and mandatory security policies, secure operating systems, secure databases, and network security will be covered. Prerequisites: MSIT 630 or CISC 660, CISC 640, and CISC 650.

ISEC 615 Fundamentals of Cybersecurity (3 credits)

An overview of the technical aspects of cybersecurity. Issues discussed include confidentiality, integrity, and availability (CIA), as well as authentication, access control, trust, and non-repudiation. Furthermore, topics covered include the threat types and attack vectors used for compromising computer and network security. Investigation of fundamental cybersecurity and assurance technologies that can be applied to mitigate threat vectors. The selection of appropriate information security applications, security lifecycles, as well as controls utilized to protect computers and networks from the variety of threat vectors 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.

ISEC 620 Applied Cryptography (3 credits)

Fundamental concept, principle, and theory of cryptography and its applications. Topics include, but not necessarily limited, CIA triad, symmetric encryption/decryption techniques such as DES and AES, asymmetric encryption/decryption technique such as RSA, cryptographic theory and data integrity algorithms such as cryptographic hash functions, message authentication codes (MAC), digital signatures, cryptographic protocols, cryptanalysis, key management and distribution, etc. Students who do not have prior exposure to operating systems and computer networks are highly recommended

to take CISC640 - Operating Systems & CISC650 - Computer Networks, prior to taking this course. Prerequisites: CISC 502 (or equivalent).

ISEC 635 Information Security Operations 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. **Prerequisite:** ISEC 615.

ISEC 640 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:** MSIT 630 or CISC 660, and CISC 640.

ISEC 650 Computer and Network Forensics (3 credits)

This course is designed to provide an overview of the techniques and technologies that are being applied to the practice of digital and network forensics. The knowledge of computer and network forensics has become essential in securing today's network-centric computing environment. This new course will give the students both the fundamental knowledge and hands-on practice on computer and network forensics.

ISEC 655 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.

ISEC 660 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, and CISC 650.

ISEC 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.

ISEC 675 Information Systems Auditing (3 credits)

This course will evaluate 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 information systems audit procedures covering security, compliance, risk mitigation, and business continuity

ISEC 690 Information Security Project (3 credits)

This project course focuses on integrating best practices for protecting critical information infrastructures through national cybersecurity standards and systems assessments in order to help students develop a final information security project focusing on Network Security Engineering. Students may enroll in this class only after completing all of the information security core courses. 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. Students will work in teams to enhance their team building and communication skills, along with working on a real-life organizational project focus on Network Security Engineering.

ISEC 695 Information Security Management Project (3 credits)

This project course focuses on integrating best practices for protecting critical information infrastructures through national cybersecurity standards and systems assessments in order to help students develop a final information security project focusing on Information Security Policy Development and Compliance. Students may enroll in this class only after completing all of the information security core courses. 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. Students will work in teams to enhance their team building and communication skills, along with working on a real-life organizational project focus on Information Security Policy Development and Compliance.

ISEC 700 Research Seminar in Information Assurance

This course is designed to provide PhD students with a review of current viable research topics in information security/information assurance that can be aligned with current CCE faculty expertise and research interests. The topics will include both technical and human-centric research topics. The course will be structured as a doctoral seminar course. Based on the current research being conducted by CCE faculty and new areas of potential investigation, a series of current refereed papers will be provided to the students for detailed review, discussion, and further exploration of relevant literature. The course will also include discussions of the various research methodologies that could be employed to investigate the problem presented and applied novel solutions.

ISEC 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.

ISEC 740 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.

ISEC 750 Information Protection (4 credits)

This course will discuss the current and emerging technologies that enable the protection of information resources on host-based, networked, and mobile systems. The course will focus on methods to identify malicious activity and software and on approaches to harden systems that may be subject to attack.

ISEC 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.

ISEC 765 Information Security Risk Management (4 credits)

Study of the theory and practice of information security risk management. This course will focus on the research related to current tools, best practices, theories, and frameworks available in mitigating system vulnerabilities and the accepted methodologies for managing residual risks. Topics include exploring risk management theories in information security, the role of risk management theories from other fields on research in this field, understanding quality research in risk management, techniques to develop stronger research proposals in the context of cybersecurity and information security risk management with emphasis on developmental research. An emphasis will be placed on current issues and future directions of research related managing information systems security risks.

ISEC 775 Information Privacy (4 credits)

This course examines the privacy issues regarding information systems. The focus is on understanding distinctive research orientations regarding information privacy. Discussions will emphasize critical evaluation of theoretical foundations of privacy in our modern technologically based society. The goal of the course is to provide an intellectual foundation for students to develop an appropriate research program in this area.

ISEC 885 Doctoral 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. The student must complete a 700-level course with the requested professor with a grade of B+ or higher.

ISEC 901 Doctoral Dissertation (8 credits)

The student develops an accepted proposal for the study, conducts the research as proposed, submits an acceptable report, and successfully defends the dissertation. Repeated twice.

ISEC 920 Continuing Dissertation (4 credits)

Students who have not completed the dissertation after three registrations of Doctoral Dissertation must register for Continuing Dissertation each term in order to receive faculty and administrative advice and support related to the dissertation. **Prerequisite:** 24 credits of Doctoral Dissertation.

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 628 Learning Design (3 credits)

The goal of this course is to help students develop 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 design concepts, principles, and procedures to create an e-learning artifact.

MITE 642 Online Communities (3 credits)

The course focuses on online communities, 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 online environments to support engagement and learning.

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 online learning environment (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, 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.

MMIS 520 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)

This course provides a socio-technical perspective to the management of projects within the field of information systems. Course content includes planning, scheduling, organizing, and implementing projects and exploring current trends and issues in information systems project management.

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; whistleblowing; computer crime; copyrights, patents and intellectual property; privacy; and risk management. Students analyze case studies and write a research paper.

MMIS 627 Enterprise 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 628 Enterprise Systems and Business Processes (3 credits)

Students will learn about business processes and how those processes are supported by and enhanced through the use of enterprise systems. The course is designed to give students experience supporting business processes using enterprise technologies and ERP concepts. Specifically, students will learn the role that enterprise systems play in the procurement, fulfillment, production, inventory and warehouse management, and material planning processes of an organization. Other topics include process integration and accounting fundamentals.

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 636 Computer-Supported Cooperative Work (3 credits)

The scope of the CSCW field will be examined, including theoretical, practical, technical, and social issues and future directions of the field. Focus will be on challenges people face working in online groups and core dimensions of online cooperative work. Students will examine theoretical CSCW models, review and critique innovations in collaborative technologies, and address social and organizational challenges of CSCW environments. Various group interactions and concerns in online collaborative activities are addressed such as awareness, communication, decision-making, shared writing and editing, coordination, meeting and meeting spaces, information management, and other contextual factors in the workplace.

MMIS 638 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 various work contexts. 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.

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 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, and MMIS 630.

MMIS 644 Social Media (3 credits)

The course provides an overview of the social media ecology and strategy planning for content creation and content sharing in industry, education, and other professional arenas. The focus is on research, application, effective practices and uses, and emerging technology platforms in social media, online communication, and social computing. Topics may cover social media ecology platforms, social media content sharing; curating content, user activity metrics and analytics such as actions metrics and web data; measuring the value of the impact of social media; infotention; information credibility, computer-mediated/online communication; security and privacy; social media planning.

MMIS 646 Information Visualization (3 credits)

The course focuses on principles and techniques of information visualization. Students will learn information visualization techniques to understand and analyze data, and make decisions based on data. Students will gain hands on experience using data visualization tools on real data. This course provides experiences using some information visualizations.

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 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, development, and implementation of Websites. The course provides an overview with hands-on examples for Web design and development, including database-backed dynamic content generation and emerging technologies in Internet content delivery. Topics include fundamentals of Web design and development technologies, including technologies such as XHTML, cascading style sheets, JavaScript, XML, Flash, PHP, Ajax, Java Web Software, [ASP.NET](#), and Ruby. Students are expected to have a fundamental knowledge of at least one programming language. Prerequisite: MMIS 654.

MMIS 660 Systems Analysis and Design (3 credits)

This course examines concepts, methods, techniques, and tools of systems analysis and design. The topic includes analysis of requirements, elicitation/fact-finding, problem analysis, decomposition, process modeling, data modeling, prototyping, structured analysis and object oriented analysis. Design principles and project management principles are addressed to understand how they are related to processes of systems analysis and design. Students will learn the roles of project managers and role of the systems analyst in an organization.

MMIS 665 Information Systems Strategy (3 credits)

Students will learn the basic concepts and issues related to the formulation and execution of IS strategy in organizations. Topics to be discussed include the IS strategy triangle, business/IT strategic alignment, strategic architecture and infrastructure issues, IS governance, and the ethical use of information.

MMIS 671 Fundamentals of Analytics and Business Intelligence (3 credits)

This course examines concepts and methods central to analytics and business intelligence systems. The focus is on the application of management science and artificial intelligence techniques for prescriptive and predictive analytics. 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 prototype systems for business intelligence applications.

MMIS 680 Human-Computer Interaction (3 credits)

The course examines the dynamics of human-computer interaction (HCI) pertaining to the study of user interactions with modern technology platforms. Provides an overview of user-centered approaches in the design and evaluation of technology applications. Areas to be addressed include user experience (UX) and design concepts and strategies, user experience levels, interaction concepts, user interface inspections and heuristic evaluation, usability and user experience observation and testing, web site usability, and usable security and privacy.

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 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 Information Systems (3 credits)

This course allows students to leverage their coursework by working on a project for a real world organization.

MMIS 692 Capstone Project in Business Intelligence (3 credits)

This capstone project requires students to employ the knowledge and skills assimilated in the pre-requisite courses to design and develop a business intelligence application that leads to direct and measurable value for an organization. Prerequisite: MMIS 630, MMIS 642, and MMIS 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 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.

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 650.

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. Prerequisite: MSIT 652

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. Prerequisite: 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: MSIT 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: MSIT 665.

MSIT 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 MSIT 660.

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: MSIT 665 and (MSIT 662 or MSIT 664).

MSIT 691 Special Topics in Information Technology (3 credits)

This seminar focuses on the professor's current research interests. Requires consent of course professor and program director.

RESD 600 Introduction to Research Methods and Statistics (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 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.

RESD 705 Quantitative Research Methods (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 Methods (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 the hands-on lab 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 705.

RESD 730 Mixed Methods Research (3 credits)

This course provides an overview of mixed methods research. Prior to registration, it is recommended that students have completed coursework in qualitative and quantitative research methods. Students are first introduced to the nature and foundations of mixed methods research 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, the statement of hypotheses 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.

The College of Computing and Engineering Faculty

Charmaine Barreto, Ph.D., Syracuse University. Associate Professor. Human computer interaction, telecommunications and network management, web design, management information systems, systems analysis and design, project management, business statistics, survey design, research methods, library and information science, knowledge management.

Travis J.A. Craddock, Ph.D., University of Alberta. Assistant Professor. Molecular systems neuroscience, computational and theoretical studies of subatomic radioactive decay, subneural biomolecular information processing, nanoscale neuroscience descriptions of memory, consciousness and cognitive dysfunction.

Laurie P. Dringus, Ph.D., Nova Southeastern University. Professor. Human-computer interaction, information systems, computer-mediated communication, computer-supported collaborative work, interaction design, user experience and usability evaluation, and online learning.

Inkyoung Hur, Ph.D., Florida International University. Assistant Professor. Social media technology, patient engagement, visualization, and business analytics in healthcare domain.

Ajoy Kumar, Ph.D., Florida Atlantic University, Assistant Professor. Program languages, data structures and cybersecurity.

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

Yair Levy, Ph.D., Florida International University. Professor. Cybersecurity skills and competencies, social engineering, cybersecurity awareness and cyber threat prevention, as well as experimental research design.

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

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

Thomas W. MacFarland, Ed.D., Associate Professor (on Administrative Leave). 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, machine learning, analytics, business intelligence, database security, data management.

Ali Panahi, Ph.D. Southern Illinois University. Assistant Professor. Muscle fatigue and motion analysis, Recurrence Quantification Analysis (RQA), ergonomics, Powder Injection Molding (PIM).

José A. Ramos, Ph.D., Georgia Institute of Technology. Professor. Control systems, mechatronics, system identification, signal processing, stochastic processes, multivariate statistics, optimization theory.

Manuel Salinas, Ph.D., Florida International University. Assistant Professor. Vascular tissue engineering, artificial organs, and cardiovascular biomechanics.

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

Marti Snyder, Ph.D., Nova Southeastern University. 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.

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, learning systems and technologies, information privacy, computing ethics.