M.S. Computer Science Program

Pre-requisite Courses

The following courses may be challenged by sitting for the placement examination.

**CSC 500: Discrete Structures (3 credits)**
Mathematics needed for Computer Science. Topics covered include: functions, relations, propositional and first order predicate logic, set theory, proofs and their construction, counting and elementary probability. The course will use a declarative language as a tool to support concrete implementations of the mathematical ideas.

This is an intensive, one-semester two-course sequence intended to provide students with the necessary background in programming for the graduate program. The use of the computer to solve problems. Students will learn general principles of program design at first by using libraries of predefined program units, and later by constructing complete programs. Emphasis is on developing techniques for program design that lead to correct, readable and maintainable programs. Intermediate programming techniques including the use of recursion. An introduction to encapsulated data structures. Lists and list sorting will be used to introduce a discussion of algorithm efficiency.

Core Required Courses

**CSC 550: Object Oriented Design and Data Structures (3 credits)**
The course combines a strong emphasis on Object-Oriented Design principles and design patterns with the study of data structures. Fundamental Abstract Data Types, their implementations and techniques for analyzing their efficiency will be covered. Students will design, build, test, debug and analyze medium-size software systems and learn to use relevant tools.

*Prerequisite: CSC 502 Intermediate Computer Programming or permission of the Graduate Director Corequisite: CSC 500 Discrete Structures*

Core Electives – (Please see concentrations to choose electives)

**CSC 551: Design and Analysis of Algorithms (3 credits)**
Concepts of program complexity; basic approaches to complexity reduction: data structures and techniques; worst cases and expected complexity. Topics to be covered may include sorting, set manipulation, graph algorithms, matrix multiplication, and finite Fourier transforms, polynomial arithmetic, and pattern matching.
Prerequisite: CSC 550 Object Oriented Design and Data Structures

CSC 552: Computer Architecture (3 credits)
Overview of computer system organization, hardware components, and communications. Introduction to boolean algebra, combinational and sequential logic, arithmetic, the CPU, memory, microprocessors, and interfaces. CISC vs. RISC processors. Practical assembly language programming will be the emphasis with an introduction to micro architecture and microprogramming on a variety of processors.

CSC 553: Computer Systems (3 credits)
An overview of the software required to integrate computer hardware into a functional system. The following topics are covered. Operating systems a resource managers and as virtual machines. System calls, in particular those required for process and file management; interrupt driven systems; concurrency; memory management; file systems and security.

Prerequisite: CSC 550 Object Oriented Design and Data Structures or permission of the Graduate Director

CSC 554: Theory of Computation (3 credits)
Formal languages, formal grammars, abstract machines; models of computation (e.g. Turing machines); computational complexity (NP completeness).

Prerequisite: CSC 500 Discrete Structures

CSC 610: Software Engineering (3 credits)
The purpose of this class is to teach the process of developing software. It combines a study of methods, tools, and techniques for creating and evolving software products, with the practical skills needed to deliver high-quality software products on schedule. The methods that are studied include requirements, specification, design, implementation, testing, and maintenance. The course includes a substantial group project.

Prerequisite: CSC 550 Object Oriented Design and Data Structures

CSC 621: Database Systems (3 credits)
This course covers the concepts and structures necessary to design and implement a database management system. Topics to be covered: data models (entity-relationship and relational), SQL, normalization, storage structures, enterprise applications and database integrity.

Prerequisite: CSC 550 Object Oriented Design and Data Structures

CSC 627: Introduction to Security (3 credits)
Topics include fundamental concepts in confidentiality, integrity, and availability, access control methods, cryptographic concepts, physical security, malware, computer viruses, privacy-invasive software, malware detection, network security, web security, security models, software vulnerability assessment.
CSC 680: Artificial Intelligence (3 credits)

The course covers fundamental concepts such as role of logic in reasoning, deductive proofs, and blind and informed search techniques. Additional topics may include inductive learning, genetic algorithms, decision trees, planning, natural language processing, game trees and perceptron learning. Course includes programming projects in a suitable language.

Prerequisite: CSC 500 Discrete Structures

CSC 681: Programming Paradigms (3 credits)

An exploration of the relationships between computational paradigms and the computer languages that support them. The Lambda calculus and functional programming, resolution and logic based languages, machine based models and imperative languages. The impact of the computational model on program structure and language design. Mid-sized programming project will be used to illustrate the concepts.

Prerequisite: CSC 550 Object Oriented Design and Data Structures

Web & Database Technologies (WDBT) Concentration

The Web & Database Technologies option exposes students to the XML technologies and Web services that are fast becoming the basis for virtually all Web-based and database-centric applications, coupled with datamining and data warehousing, and Web security. Students will be prepared for careers in Web and database management, Web security, and declarative data preprocessing in distributed and heterogeneous computing environments.

CSC 620: Internet Application Development (3 credits)

This course will attempt to give you experience in designing Internet applications. A student finishing this course should be able to design, implement, and maintain a large community or e-commerce web site. They should leave the course with an understanding of a variety of Internet protocols and markup languages, a knowledge of at least one common scripting tool, an understanding of how to implement a database back-end into a large-scale site, and the ability to critically assess the usability of both their design and the design others.

CSC 621: Database Systems (3 credits)

This course covers the concepts and structures necessary to design and implement a database management system. Topics to be covered: data models (entity-relationship and relational), SQL, normalization, storage structures, enterprise applications and database integrity.

Prerequisite: CSC 550 Object Oriented Design and Data Structures

CSC 622: Advanced Database Concepts (3 credits)
Topics include stored procedures, triggers, query processing and optimization, web-based enterprise database applications, transaction management, concurrency control, distributed databases, data mining and web mining. The course includes programming projects involving SQL.

*Prerequisite: CSC621 Database Systems*

**CSC 623: Data Communications and Networking (3 credits)**
Topics include mathematical foundations of data communications, logical and physical organization of computer networks, the ISO and TCP/IP models, communication protocols, circuit and packet switching, the Internet, LAN/WAN, client/server communications via sockets, routing protocols, data encryption/decryption and network security issues.

*Prerequisite: CSC 550 Object Oriented Design and Data Structures*

**CSC 626: Web Technologies (3 credits)**
Topics include organization of Meta-Markup languages, Document Type Definitions (DTDs), document validity and well-formedness, style languages, namespaces, Transformations, XML parsers, Web Services, and Web Security Specifications. Course includes programming projects.

*Prerequisite: CSC 550 Object Oriented Design and Data Structures*

**CSC 627: Introduction to Security (3 credits)**
Topics include fundamental concepts in confidentiality, integrity, and availability, access control methods, cryptographic concepts, physical security, malware, computer viruses, privacy-invasive software, malware detection, network security, web security, security models, software vulnerability assessment.

**CSC 628: Advanced Security (3 credits)**
Topics include classical cryptosystems, public and symmetric cryptography, key management, digital signatures, cipher techniques, authentication and federated identity management. Course also covers concepts relating to cryptovirology, malware, viruses, Trojan horses, worms and other types of infectors as they relate to network security. Course includes programming projects.

*Prerequisite: CSC 550 Object Oriented Design and Data Structures*

**CSC 791: Research Project I (3 credits)**
Supervised independent research mentored by a graduate faculty member.
Prerequisite: GPA of 3.5 and permission of the Graduate Director
CSC 792: Research Project II (3 credits)
Supervised independent research mentored by a graduate faculty member.
Prerequisite: GPA of 3.5 and permission of the Graduate Director

Information Sciences

The Information Sciences option builds a strong technical understanding of modern information systems. Students will gain an understanding of the importance of information systems to the organization as well as understanding the underlying technical requirements of the design, implementation, and maintenance of the system. This program will prepare students for highly technical managerial positions.

ACC 550 Creating and Measuring Shareholder Value (3 credits)

This course employs a case-based approach for assessing the value of the firm and demonstrating how shareholder value is increased. Coverage includes a description of value creation fundamentals and a discussion of contemporary value metrics such as cost-profit-volume analysis, economic value added, and activity-based measurement of management effectiveness. Using financial databases, students work in teams to apply the analytic tools of managerial decision making and prepare comprehensive reports (e.g., the Balanced Scorecard) that measure managerial performance in enhancing firm value.

Prerequisites: ACC 500 and FIN 503.

MGT 551 Empowering Human Potential at Work (3 credits)

This course focuses on an organization’s most salient resource—its human capital. It investigates the foundation of, and strategies for, empowering organizational members to manage organizational transformation processes in a national and global environment. Empowering human potential requires an understanding of how to manage one’s self, other individuals, and groups effectively, creatively, legally, and ethically in work organizations. Done well, empowered workers can help to achieve both personal and organizational objectives. To accomplish this goal, the course investigates strategies for enhancing individual performance (e.g., perceptions and motivation) and facilitating interpersonal processes (e.g., leadership and power). We will also explore ways of managing human resource issues (e.g., recruitment, selection, employee development), especially from a legal perspective.

Prerequisite: Completion or waiver of MGT 500.

DSS 600 Foundations for Business Intelligence (3 credits)

This course is intended to provide an integrative foundation in the field of business intelligence at the operational, tactical, and strategic levels. Topics such as value chain, customer service
management, business process analysis and design, transaction processing systems, management information systems, and executive information systems will be covered, along with other topics relevant to the field of business intelligence.

**DSS 610 Business Analytics for BI (3 credits)**

The aim of this course is to provide the student with an understanding of several management science techniques and to provide some insight into how these tools may be used to analyze complex business problems and arrive at a rational solution. The techniques to be studied are forecasting, linear programming, simulation and modeling. Cases of increasing complexity will be used to emphasize problem description, definition, and formulation. The computer will be used extensively throughout this course, primarily by using available programs to perform the calculations after the problem has been correctly formulated. In addition, we will examine the future of analytics. Emphasis will be placed on the interpretation and implementation of results. Prerequisite: DSS 600.

**General Concentration**

- CSC 550: Object Oriented Design and Data Structures
- CSC 551: Design and Analysis of Algorithms
- CSC 552: Computer Architecture
- CSC 553: Computer Systems
- CSC 554: Theory of Computation
- CSC 610: Software Engineering

and four electives.