

# Information Science and Technology (M.S.)

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## About The Program:

The M.S. in Information Science and Technology (IS&T) program is designed for students without a background in programming and/or computer science to gain the skills to be prepared for careers in computing and information technology. This program allows students with undergraduate degrees from non-computing fields to add technical expertise in order to pursue the interdisciplinary career paths of the future. Students learn skills applicable to computer networking, database management, information security, mobile app development, software engineering, software testing and quality assurance, and web development. As preparation for studying these advanced topics, fast-paced, rigorous, introductory classes with a strong foundation in algorithms, data structures, and programming are offered to M.S. in IS&T students.

The M.S. in IS&T program is designed for applicants with limited or no past experience in computer science. Candidates with some preparation and/or an undergraduate major in Computer Science or a closely related field should apply to the [M.S. in Computer Science](#) or [M.S. in Computational Data Science](#) programs.

**Career Options:** Graduates often find employment in computer networking, database management, information security, mobile app development, software engineering, software testing and quality assurance, and web development. Many become involved in the design and implementation of new applications software or the planning and evaluation of computer-based systems. Prospective employers include the government, universities and colleges, and non-profit agencies, as well as information technology organizations, computer centers, or computer manufacturers in industry.

**Prerequisites for Admission: Courses in relation with:** Object Oriented Programming, Data Structures using C++ or Java (2168), Component Based Programming (course in Visual Basic or C+), Computer Architecture, Operating Systems, and Networks, Databases

## Areas of Specialization:

Research interests of faculty include:

- Communication and networks
  - Data warehousing, filtering, and mining
  - Enterprise system development and resource management
  - Ethics and social issues related to technology
  - Knowledge management
  - Management information and database systems
  - Security and privacy
  - Software engineering
  - System development and process management
  - Usability engineering
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## Requirements of Programs:

- **Total Credit Hours:** 30
- **Culminating Events:** Students are required to complete three credits of [CIS 9991](#) Master's Research Projects.

## Core Courses

*Select a minimum of three of the following courses:*

**Database Design & Programming** – This course provides an in-depth understanding of the modeling, design and implementation of database systems. Students develop an appreciation of the role of data, files and databases in information systems, gain an understanding of database development activities as part of the System Development Life Cycle (SDLC), and become familiar with data modeling concepts. Students are expected to be able to create databases and pose complex SQL queries of relational databases using Oracle and Microsoft Access. Topics include the relational model, E-R and Class Diagrams, normalization, advanced SQL, Oracle Enterprise system transaction processing, concurrency control, and recovery. Also covered are aspects of database administration, data integrity, security and authorization, stored procedures and triggers, the embedding of SQL in procedural languages and scripting languages, multi-tiered architectures, middleware, ODBC web-based databases, and web application integration. Students work in teams to implement large scale information system using a DBMS. CASE tools are used for data modeling. Note: Graduate credit will not apply for CIS MS/PHD programs.

**Data Structures and Objects** – Data structures are the fundamental building blocks for organizing data. This course teaches how to build data structures and what can be done with them, as well as fundamental object oriented concepts. Topics include object oriented programming, lists, stacks, queues, trees, heaps, hash tables, graphs, sorting, and recursion. Note: Students may not receive credit for both CIS 2168 and CIS 5016. This is an MS/IST course. No credit for graduate CS programs without approval from CIS department.

**Operating Systems and Architecture** – This course provides an introduction to computer architecture and operating systems concepts to students without a background in computer systems. The objectives are to introduce the basic concepts for understanding and evaluating operating systems and the most important computer architecture issues impacting operating system design, implementation and selection. Note: Students may not receive credit for both CIS 2229 and CIS 5017. This is an MS/IST course. No credit for graduate CS programs without approval from CIS department.

**Comp Systems Security & Privacy** – Computer systems security and information privacy has become a critical area of computer science development and research. This course involves an analysis of the technical difficulties of producing secure computer information systems that provide guaranteed controlled sharing and privacy. Emphasis is on software modeling and design to better ensure the protection of resources (including data and programs) from accidental or malicious modification, destruction, or disclosure. Current systems and methods will be examined and critiqued. The possible

certification of such systems will also be investigated. Note: This is an MS/IST course. No credit for Graduate CS programs.

**Topics in Computer Science** –Current topics and issues in Computer Sciences are covered. This course is repeatable for credit.

### **Electives (18 Credits Worth)**

*Select from the following CIS courses, take courses listed above not completed for the core course requirement, or take other graduate-level CIS courses or courses outside the department with the approval of the M.S. in IS&T Program Director:*

**Knowledge Management** – Principles of knowledge management (KM) and their use in locating, evaluating, disseminating, and using information and knowledge. Application of these principles and techniques. Knowledge management incorporates data acquisition, information integrity, and management of knowledge and is crucial to everyone working in any field where information is stored, processed, and used. It places a premium on an IT-intensive organization to invest, cultivate, and fully utilize the intellect and knowledge of all staff. Note: This is an MS/IST course. No credit for Graduate CS programs.

**Seminar in Information Science and Technology** – An intermediate level graduate special topics course in current and emerging developments in information systems and technology. Note: This is an MS/IST course. No credit for Graduate CS programs. This course is repeatable for credit.

**Software Quality Assurance and Testing** – Software quality assurance consists of a means of monitoring the software engineering processes and methods used to ensure quality. The overarching goal of this class is to develop practical skills to help achieve software quality. The main objectives of this class are to understand the quality assurance process and to learn how to use testing techniques to achieve software quality. Students will learn 1) fundamental concepts in software testing, including software testing objectives, process, criteria, strategies, and methods; 2) various software testing techniques, including automated testing techniques, to support various levels of software testing: unit, integration, regression, and systems testing; 3) techniques and skills on how to use modern software testing tools to support software testing projects; 4) how to plan a test project, design test cases and data, conduct testing operations, manage software problems and defects, and generate a testing report; and 5) basic techniques in usability, performance, and security testing. Note: Students may not receive credit for both CIS 3374 and CIS 5274. This is an MS/IST course. No credit for Graduate CS programs.

**Software Project Management** – Project management knowledge and skills are critical to the success of every Information Technology project. This course will use IT project case studies to examine basic components of time, scope and resources within the project management processes defined by the Project Management Institute. At the completion of this course, students will be able to create project plans for software development projects as well as for IT infrastructure projects. They will know how to manage a team, how to write effective status reports, and make compelling presentations to management. This course exposes students to practical examples and tools that are used in typical IT projects in industry today. Note: Students may not receive credit for both CIS 3775 and CIS 5275. This is an MS/IST course. No credit for Graduate CS programs.

**Advanced Database Management Systems** – This course provides an in-depth understanding of the modeling, design and implementation of database systems. Topics include the relational model, E-R Diagramming and Class Diagrams, normalization, advanced SQL, Oracle Enterprise system transaction processing, concurrency control, and recovery. Also covered are aspects of database administration, security and authorization, stored procedures and triggers, the embedding of SQL in procedural languages and scripting languages, multi-tiered architectures, middleware, ODBC web-based databases, and web application integration. Students work in teams to implement large scale information system using a DBMS. CASE tools are used for data modeling. Note: This is an MS/IST course. No credit for Graduate CS programs.

**Usability Engineering** – This course focuses on the principles of usability engineering to design effective interfaces. In parallel with functional specification development, usability engineering identifies the usability specifications of the system, which includes information and interface design. In some modern day information systems, usability can be paramount and require as much or more effort and programming as functional requirements, i.e., information systems may provide relevant functionality, but if the system is not easy to learn and use, it may fail. Using theories and principles from software engineering and psychology, students learn to analyze usability requirements to improve user interface development. Note: Students may not receive credit for both CIS 3603 and CIS 5303. This is an MS/IST course. No credit for Graduate CS programs.

**Network Technologies** – Focuses on the design, construction and use of modern networks and inter-networks, including Internet, intranet, firewalls, VPN, e-mail, and wireless technologies. Prepares students to successfully create and operate modern secure networks. Key concepts and technologies include LAN design and construction, Internet architecture, internetworking (with an emphasis on the Internet), WAN connectivity, firewalls, Application Layer protocols, virtual private networks, wireless and network operation in real-world environments. Note: This is an MS/IST course. No credit for Graduate CS programs.

**Software Engineering** – A project-based course focusing on current methodologies employed in software design and development. The core material covers the key components of software engineering, including requirements analysis, specification development, detailed design, program development, quality control (verification and validation), configuration management, testing, and post-development maintenance. Emerging software development techniques - security engineering, service-oriented architecture (SOA), and aspect-oriented development are also introduced. Note: This is an MS/IST course. No credit for Graduate CS programs.

**Advanced Seminar in Information Science and Technology** – An advanced level graduate special topics course in current and emerging developments in the field of information systems and technology. Note: This is an MS/IST course. No credit for Graduate CS programs. This course is repeatable for credit.

## **Capstone Course**

**Master's Research Projects** – Short-term, limited research project or laboratory project in the field. This course is not the capstone project course, nor can it be used for thesis based research. The course is for master's students only, including PSM, MA or MS. This class will not confer full-time program status unless nine credits are taken.

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## Courses:

Click [HERE](#) for more information on the courses below.

- Comp-Based Appl Prog
- Database Design & Programming
- Networking & Operating Systems
- Programming and Data Structure
- System Software and Operating Systems
- Discrete Structure of Computer Science
- Scripting for Sciences and Business
- Data Structures and Objects
- Operating Systems and Architecture
- IT Process Management
- System Development Processes
- Comp Systems Security & Privacy
- Emerging Technologies
- Knowledge Management
- Seminar in Information Science and Technology
- Software Quality Assurance and Testing
- Software Project Management
- Advanced Database Management Systems
- Usability Engineering
- Network Technologies
- Software Engineering
- Introduction to Digital Forensics
- Advanced Seminar in Information Science and Technology
- Ethical Hacking and Intrusion Forensics
- Audit and Compliance for Security and Digital Forensics
- Programming Techniques
- Operating Systems
- Automata and Formal Languages
- Design and Analysis of Algorithms
- Principles of Data Management
- Data-Intensive and Cloud Computing
- Knowledge Discovery and Data Mining
- Analysis and Modeling of Social and Information Networks
- Neural Computation
- Machine Learning
- Data Warehousing, Filtering and Mining
- Probabilistic Graph Models
- Text Mining and Language Processing
- Computer Vision
- Topics in Computer Science
- Artificial Intelligence
- Computer Networking and Communication
- Energy Management in Data Centers and Beyond
- Security in Cyber-Physical Systems
- Ad Hoc Networks
- Network & Information Security
- Wireless Network and Communication
- Computer Architecture
- Emerging Storage Systems and Technologies
- Distributed Systems
- Independent Study
- Seminars in Computer and Information Science
- Independent Study
- Seminar in Advanced Topics in Computer Science
- Computer Graphics and Image Processing
- User Interface Design and Systems Integration
- Web Applications Development
- Artificial Intelligence, Heuristic Models, and Education

- Advanced Topics in Data Base Systems
- Advanced Networks and Client-Server Computing
- Design and Development of E-Commerce Systems

- Distributed and Parallel Computer Systems
- Master's Research Projects
- Preliminary Examination Preparation
- Capstone Project
- Master's Thesis Research