

INFORMATION TECHNOLOGY

Information Technology

College of Science, Engineering & Technology
Department of Information Systems & Technology
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Web site: www.cset.mnsu.edu/it

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Information Technology (IT) in its broadest sense encompasses all aspects of computing technology. IT, as an academic discipline, focuses on meeting the needs of users within an organizational and societal context through the selection, creation, application, integration and administration of computing technologies. The aim is to provide IT graduates with the skills and knowledge to take on appropriate professional positions in Information Technology upon graduation and grow into leadership positions or pursue research or graduate studies in the field. The IT program has five minors.

Admission to the IT program is granted by the department. Admission to the program is required before the student is permitted to take 300- and 400-level courses.

Requirements for admission to the IT program are:

- A minimum of 32 earned semester credits
- Completion of MATH 121 or MATH 181 with a grade of "C" or better
- Completion of ENG 101 with a grade of "C" or better
- Completion of IT 110 with a grade of "B" or better
- Completion of IT 210, and IT 214 with a grade of "C" or better and a GPA of 2.5 in these courses (or their equivalents).

POLICIES/INFORMATION

GPA Policy. The completion of any major or minor in the Department of Information Systems & Technology requires *both*:

- a GPA of 2.5 or higher for all *departmental* courses (ISYS or IT), or their substitutions, used to complete the major or minor, and
- a GPA of 2.5 or higher for *all* courses, or their substitutions, used to complete the major or minor. This includes all departmental courses (ISYS or IT), supporting courses, and General Education courses *required* for the major or minor.

It is recommended that students who cannot maintain a GPA of 3.0 in required 100 and 200 level courses see their advisor for a program review.

Grade Policy. All coursework used to complete a departmental major or minor, including required courses, required supporting courses, and required General Education courses, must be taken for a letter grade except for courses offered only as P/N.

No course completed with a grade of "D" can be used to complete a departmental major or minor program, or to meet a departmental prerequisite.

Registration Hold Policy. The department will place a registration hold on any student who earns a "D" or "F" in any of its courses. The department will also place such a hold on any student who drops any of its courses after the first two weeks of the semester. A student with a registration hold cannot register for courses until the hold is released, which requires filling out an appeal form and taking it to the student's advisor for discussion. Appeal forms are available from the departmental office. This hold policy does NOT apply to students who are taking 100-level ISYS or IT courses.

Dual Major Policy. Students can earn at most one undergraduate major from this department.

Administrative Drop Policy. The department will automatically drop any student enrolled in ISYS 110 or IT 110 who does not attend the first course meeting. If you cannot attend the first meeting, submit a written request to ad-computer@mnsu.edu BEFORE the first day of the course. For assistance with the process, call the departmental office at 507-389-2968.

Incomplete Policy. The department gives incomplete grades for only two conditions. The first condition is illness, which requires a doctor's written recommendation. The second condition arises when a death in the student's family has caused the student to be away from the campus for an extended period. The student must have a satisfactory grade ("C" or better) in the course at the time of the onset of the condition.

Internship Policy. The Department of Information Systems & Technology continuously strives for improvements in the academic program. Coursework, coupled with extensive laboratory experience, play an important part in the student's educational program. However, application of the concepts discussed in class to on-the-job situations is equally important. As a result, the department requires an internship or a capstone experience for all IT majors.

Excluded Courses Policy. IT 100, IT 201, IT 296, IT 321 do not count toward a major or minor in the department.

Residency Policy. Students must earn at least 50 percent of the credits required for a departmental major or minor at Minnesota State Mankato.

Prerequisite Policy. For all IT courses, an equivalent (cross-listed) ISYS course from the Department of Information Systems & Technology is accepted as a prerequisite in lieu of an IT course and vice versa.

INFORMATION TECHNOLOGY BS

Required General Education (27 or 28 credits)

CMST 100 Fundamentals of Communication (3)
CMST 233 Public Speaking for Technical Professionals (3)
ENG 101 Composition (4)
IT 110 Foundations of Computing (4)
MATH 180 Mathematics for Computer Science (4)
PHIL 120 Introduction to Ethics (3)
STAT 154 Elementary Statistics (3)
Choose one of the following MATH Courses
MATH 121 Calculus I (4)
MATH 181 Intuitive Calculus (3)

Required Support Courses (4 credits)

ENG 271 Technical Communication (4)

Required for Major (36 credits)

IT 210 Fundamentals of Programming (4)
IT 214 Fundamentals of Software Development (4)
IT 320 Machine Structures and Operating Systems (4)
IT 340 Introduction to Database Systems (4)
IT 350 Information Security (4)
IT 360 Introduction to Data Communication and Networking (4)
IT 380 Systems Analysis and Design (4)
IT 483 Web Applications and User Interface Design (4)
Choose one of the following
IT 497 Internship (4)
IT 498 Information Technology Capstone (4)

Required Electives (16 Credits) from Category A and B courses

Category A (12 credits)

Choose one sequence of courses from the following groups:

Database Technologies

IT 440 Database Management Systems II (4)
IT 442 Database Security, Auditing, and Disaster Recovery (4)
IT 444 Data Mining and Warehousing (4)

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Networking and Information Security

- IT 450 Information Warfare (4)
- IT 460 Network and Security Protocols (4)
- IT 462 Network, Security, Administration and Programming (4)

Software Development

- IT 414 Advanced Object-Oriented Programming w/ Design Patterns (4)
- IT 480 Software Quality Assurance and Testing (4)
- IT 484 Software Engineering (4)

Category B (4 credits)

Complete 4 credits from category A courses, but can not repeat a course if already taken OR Complete 4 credits from the following list:

- IT 310 Data Structures and Algorithms (4)
- IT 311 Business Applications Programming (4)
- IT 412 Graphics (4)
- IT 430 Intelligent Systems (4)
- IT 432 Robotics (4)
- IT 464 Applications of Wireless and Mobile Networks (4)
- IT 482 Human Computer Interaction (4)
- IT 488 Rapid Application Development (4)
- IT 495 Seminar in Information Technology (1)
- IT 496 Selected Topics in Information Technology (1-4)
- IT 499 Individual Study in Information Technology (1-2)

The following courses are not to be used in the Information Technology major:
IT 100, IT 201, IT 296, IT 321.

Required Minor: Yes, Any (Computer Science excluded)

COMPUTER INFORMATION SCIENCE MINOR

Required for Minor (Core, 20 credits)

- IT 210 Fundamentals of Programming (4)
- IT 214 Fundamentals of Software Development (4)

Choose three of the following Courses

- IT 483 Web Applications and User Interface Design (4)
- IT 320 Machine Structures and Operating Systems (4)
- IT 340 Introduction to Database Systems (4)
- IT 360 Introduction to Data Communication and Networking (4)
- IT 380 Introduction to Software Engineering (4)

COMPUTER TECHNOLOGY MINOR

Required for Minor (Core, 20 credits)

- IT 110 Foundations of Computing (4)
- IT 202W Computers in Society (4)
- IT 210 Fundamentals of Programming (4)
- IT 380 Systems Analysis and Design (4)

Choose One of the following Courses

- IT 214 Fundamentals of Software Development (4)
- IT 430 Intelligent Systems (4)

DATABASE TECHNOLOGIES MINOR

Required for Minor (20 credits)

- IT 210 Fundamentals of Programming (4)
- IT 214 Fundamentals of Software Development (4)
- IT 340 Introduction to Database Systems (4)

Choose two of the following courses:

- IT 440 Database Management Systems II (4)
- IT 442 Database Security, Auditing, and Disaster Recovery (4)
- IT 444 Data Mining and Warehousing (4)

NETWORKING AND INFORMATION SECURITY MINOR

Required for Minor (20 credits)

- IT 210 Fundamentals of Programming (4)
- IT 214 Fundamentals of Software Development (4)
- IT 350 Information Security (4)
- IT 360 Introduction to Data Communication and Networking (4)

Choose one of the following courses:

- IT 450 Information Warfare (4)
- IT 460 Network and Security Protocols (4)
- IT 462 Network Administration and Programming (4)

SOFTWARE DEVELOPMENT MINOR

Required for Minor (20 credits)

- IT 210 Fundamentals of Programming (4)
- IT 214 Fundamentals of Software Development (4)
- IT 310 Data Structures and Algorithms (4)
- IT 380 Systems Analysis and Design (4)

Choose one for the following courses:

- IT 414 Advanced Object-Oriented Programming w/Design Patterns (4)
- IT 480 Software Quality Assurance and Testing (4)
- IT 484 Software Engineering (4)

CERTIFICATE PROGRAMS

Requirements for Certificate Programs in Information Technology.

Admission Requirements

Knowledge of programming (equivalent of IT 210 and IT 214) or equivalent programming experience.

Prerequisites Requirements

For the Undergraduate Certificate Programs in IT, all of the Certificates' prerequisite requirements can be met through Minnesota State Mankato coursework, transfers, substitutions and/or waivers, as may be appropriate.

Completion Requirements

Without exception, the twelve credits of coursework required for each Certificate must all be completed in the Department of Information Systems and Technology at Minnesota State University, Mankato.

CERTIFICATE IN DATABASE TECHNOLOGIES (12 credits)

The Database Technologies undergraduate certificate provides students with the necessary knowledge to apply information technology principles and theory so they are able to address real world business and organizational challenges and opportunities. This certificate focuses on planning, designing, programming and developing secure databases, and the challenges and specific issues in maintaining, managing and securing databases. Students are introduced to the security challenges and threats in database systems and are provided an understanding of the state-of-the art security technologies, and data recovery strategies.

Prerequisites. Students must have fundamental knowledge or experience of database (equivalent of IT340). Students planning to take IT 442 must also have knowledge or experience of information security (equivalent of IT 350). Students planning to take IT 483 must have basic knowledge or experience of database (equivalent of IT 340).

Choose three of the following Courses (12 credits)

- IT 440 Database Management Systems II (4)
- IT 442 Database Security, Auditing, and Disaster Recovery (4)
- IT 444 Data Mining and Warehousing (4)
- IT 483 Web Application and User Interface Design (4)

CERTIFICATE IN INFORMATION SECURITY (12 credits)

The Information Security certificate provides students with the necessary knowledge in information security principles and practices and an understanding of how information security functions in an organization from both business and technology aspects. The program will engage students with a thorough review of viruses, worms, backdoors, Trojan horses, Rootkits, and other threats. Students will analyze malware in order to understand the infection, propagation, and deception mechanisms of these attack vectors. It will also focus on risk assess-

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ment to identify reasonably foreseeable internal and external risks to the security, confidentiality and integrity of user information and assess the sufficiency of any safeguards in place to control these risks.

Prerequisites. Students planning to take IT 460 must have basic knowledge of or experience in data communications and networking (equivalent of IT 360). Students planning to take IT 442 must have basic knowledge of or experience in databases (equivalent of IT 340).

Choose three of the following Courses (12 credits)

IT 350 Information Security (4)

IT 442 Database Security, Auditing, and Disaster Recovery (4)

IT 450 Information Warfare (4)

IT 460 Network and Security Protocols (4)

CERTIFICATE IN NETWORKING TECHNOLOGIES (12 credits)

The Networking Technologies certificate provides students with the necessary knowledge in networking principles, administration, programming, security issues and practices so that they are able to apply them in real world organizational challenges and opportunities. The students completing this certificate program will understand and evaluate current and emerging networking and security technologies and assess their applicability to address the needs of individuals and organizations.

Prerequisites. Students planning to take IT 462 must have basic knowledge of or experience in information security (equivalent of IT 350). Students planning to take IT 483 must have basic knowledge of or experience in databases (equivalent of IT 340).

Choose three of the following Courses (12 credits)

IT 360 Introduction to Data Communication and Networking (4)

IT 460 Network and Security Protocols (4)

IT 462 Network Administration and Programming (4)

IT 483 Web Application and User Interface Design (4)

CERTIFICATE IN SOFTWARE DEVELOPMENT (12 credits)

The software development certificate provides the students with an understanding of the successful delivery of software projects that support organizational goals. Students gain knowledge in the use of tools necessary to organize project objectives, create realistic plans, and build and manage an accomplished team through every phase of the software development project. Students gain practical skills needed to meet today's demands for faster and more efficient development.

Prerequisites: Students must have fundamental knowledge of or experience in systems analysis and design (equivalent of IT 380). Students planning to take IT 414 must also have basic knowledge of or experience in data structures and databases (equivalent of IT 310 and IT 340). Students planning to take IT 483 must have basic knowledge of or experience in databases (equivalent of IT 340).

Choose three of the following Courses (12 credits)

IT 414 Advanced Object-Oriented Programming w/ Design Patterns (4)

IT 480 Software Quality Assurance and Testing (4)

IT 482 Human Computer Interaction (4)

IT 483 Web Applications and User Interface Design (4)

IT 484 Software Engineering (4)

COURSE DESCRIPTIONS

IT 100 (4) Introduction to Computing and Applications

Basic foundations in computer concepts. Topics include: hardware, software ethical, and social issues. Lab work covers various systems and applications software including word processing, email, the Internet, spreadsheets, databases, and presentation software. Cannot be counted toward any major or minor offered by IT.

Fall, Spring

GE-9, GE-13

IT 110 (4) Foundations of Computing

A comprehensive introduction to information systems and technology.

Includes algorithms, hardware, software, and social issues. Labs cover both hardware and software. The course provides knowledge and skills applicable to all disciplines.

Pre: MATH 112 or MATH 115 or MATH 121 or MATH 181

Fall, Spring

GE-13

IT 201 (2) Introduction to Assistive Technology

This course introduces students to assistive technology and its applicability to people with various disabilities. Hardware and software demonstrations with an emphasis placed on inexpensive and readily available solutions. Extensive use of the Internet will be employed to keep current with latest technology and to facilitate a continuing dialogue with instructor.

Variable

IT 202W (4) Computers in Society

Complex social and ethical issues associated with computers. Through thoughtful questions, informative readings, and the analysis of opposing viewpoints, participants gain insight into the complexity of technology-related issues in a world without clearly defined borders.

Variable

GE-1C, GE-9, GE-13,

IT 210 (4) Fundamentals of Programming

This is the first course for students planning to major or minor in Information Systems or Information Technology. Programming in a high-level language, abstraction and problem-solving skills are emphasized.

Pre: IT 110 or ISYS 110 with at least 2.50 equivalent grade.

Fall, Spring

IT 214 (4) Fundamentals of Software Development

A continuation of IT 210, IT 214 introduces object-oriented concepts, programming techniques, lists, stacks, queues, and trees. Students are expected to produce larger applications, utilizing multiple compilation units.

Pre: IT 210 or ISYS 210, MATH 121 or MATH 180 or MATH 181

Fall, Spring

IT 219 (2) Java for C/C++ Programmers

Designed for students who already know C++. Topics: data types, operators, functions, arrays, string operations, records, pointers, structures, classes, constructors, destructors, pointers as class members, static classes, operator functions, data type conversions, inheritance, polymorphism, and dynamic binding.

Pre: Consent

Variable

IT 296 (1-2) Introduction to Selected Topics

Special topics not covered in other 100- and 200-level courses. May be repeated for each new topic.

IT 310 (4) Data Structures & Algorithms

Study of trees, hashing, and graph algorithms. Analysis of algorithms, memory management, and proof techniques.

Pre: IT 214 or ISYS 215

Variable

IT 311 (4) Business Application Programming

Large-scale application development using the COBOL programming language. Emphasis on principles of application programming such as control breaks, table manipulations, file manipulations, sorting, interactive programming, sub-programming, index-sequential file handling, structure charts, and program documentation.

Pre: IT 214 or ISYS 215

Spring

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IT 320 (4) Machine Structures and Operating Systems

Introduction to computer hardware, Boolean logic, digital circuits, data representations, digital arithmetic, digital storage, performance metrics, pipelining, memory hierarchy, and I/O; Operating System concepts, interface, multi-tasking, threads, memory and file management, tools.

Pre: IT 214 or ISYS 215, MATH 180

Fall

IT 321 (4) Micro Configuration & Maintenance

Provides a working knowledge and hands-on experience with configuring, upgrading, optimizing, troubleshooting and repairing personal computer hardware, networks and system software. Preventative maintenance and emergency recovery techniques. Does not satisfy requirements for any department major.

Pre: Jr/Sr status or consent

Variable

IT 340 (4) Introduction to Database Systems

Introduction to database systems, models, management systems, file organization, database design, data modeling, normalization, conversion of data model into relational model, and SQL. Implementation of a relational database application in a team environment.

Pre: IT 210 or ISYS 210

Fall, Spring

IT 350 (4) Information Security

Security concepts and mechanisms; security technologies; authentication mechanisms; mandatory and discretionary controls; cryptography and applications; threats; intrusion detection and prevention; regulations; vulnerability assessment; information assurance; forensics; anonymity and privacy issues; disaster recovery planning, legal issues and ethics.

Pre: IT 210 or ISYS 210

Fall, Spring

IT 360 (4) Introduction to Data Communication and Networking

This course covers basic concepts related to data communication and networking. Topics addressed will include the OSI model, the Internet model, network management, network protocols and data security.

Pre: IT 210 or ISYS 210

Fall, Spring

IT 380 (4) Systems Analysis and Design

This course explores both structured as well as object oriented systems analysis and design. Use of upper and lower CASE tools are employed in the analysis, design and implementation of a team oriented term project.

Pre: IT 214 or ISYS 215

Fall, Spring

IT 412 (4) Graphics

Concepts and algorithms used in computer graphics, including polygonal and curved images in both 2 and 3 dimensions, representation of solid objects, and color and illumination models.

Pre: IT 214 or ISYS 215, MATH 121 or MATH 181

Variable

IT 414 (4) Advanced Object-Oriented Programming with Design Patterns

This course provides student with a solid understanding of the principles, techniques and design patterns involved in advanced object-oriented programming. Successful students should have a distinct advantage in the marketplace.

Pre: IT 340 or ISYS 340, IT 310

Variable

IT 430 (4) Intelligent Systems

This course offers an overview of intelligent systems. Emphasis is placed on rule-based systems, fuzzy rule-based systems, neural networks, evolutionary computation and uncertainty management.

Pre: IT 214 or ISYS 215 or CS 230, STAT 154

Variable

IT 432 (4) Robotics

This course is a survey of robotics including: current practice, future directions, robot anatomy, kinematics, sensors, sensor interfacing and fusion, mobile robotics, real-time programming, vision and image processing algorithms, and subsumption architecture.

Pre: IT 320

Variable

IT 440 (4) Database Management Systems II

Extensive coverage of query processing and optimization; concurrency control and recovery, and security and integrity in centralized/distributed environments. Team-oriented projects in a heterogeneous client server environment

Pre: IT 214 or ISYS 215, IT 340 or ISYS 340

Variable

IT 442 (4) Database Security, Auditing, and Disaster Recovery

Covers science and study of methods of protecting data, and designing disaster recovery strategy. Secure database design, data integrity, secure architectures, secure transaction processing, information flow controls, inference controls, and auditing. Security models for relational and object-oriented databases.

Pre: IT 350 or ISYS 350, IT 440 or ISYS 441

Variable

IT 444 (4) Data Mining and Warehousing

The course details data mining and warehousing. Emphasis is placed on data mining strategies, techniques and evaluation methods. Various data warehousing methods are covered. Students experiment with data mining and warehousing tools.

Pre: IT 440 or ISYS 441

Variable

IT 450 (4) Information Warfare

Covers information warfare principles and technologies. Information warfare concepts; Protocols, Authentication, and Encryption; Network attack techniques, methodologies, and tools; Network defense; Malware: trojans, worms, viruses, and malicious code; Electronic crimes and digital evidence.

Pre: IT 350 or ISYS 350

Fall

IT 460 (4) Network and Security Protocols

Advanced coverage of data communication, networking and security protocols. Topics: transmission methods, error detection and recovery, flow control, routing, security issues and performance analysis of existing and emerging protocols for secure communication.

Pre: IT 214 or ISYS 215, IT 360

Variable

IT 462 (4) Network, Security, Administration and Programming

Network and server systems administration. Domain administration; file system management; networked printers; user management; workstation configuration. Network programming assignments/ projects in Layered Software Systems, HTTP Server, UDP (TFTP or DNS), CGI program, IPV6, RPC/SCTP.

Pre: IT 350 or ISYS 350, IT 460

Variable

IT 464 (4) Applications of Wireless and Mobile Networks

Existing and emerging mobile and wireless data networks with emphasis on digital data communications. Gain an understanding of the unique considerations that must be given to network protocols for wireless and mobile communication and their applications.

Pre: IT 460

Variable

IT 480 (4) Software Quality Assurance and Testing

Topics include software quality assurance, software quality metrics, software configuration management, software verification and validation, reviews, inspections, and audits, configuration control boards and software process improvement models, black-box and white-box testing models.

Pre: IT 380 or ISYS 380

Spring

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IT 482 (4) Human Computer Interaction

Concepts and techniques for user interface design and human computer interaction. Emphasizes user-centered design, interface development techniques, and usability evaluation. Various interface devices and metaphors. Visual development environments and other development tools. Project work.

Pre: IT 380 or ISYS 380 or CS 110

Fall

IT 483 (4) Web Applications and User Interface Design

HTTP Protocol; Web-markup languages; Client-side, Server-side programming; Web services; Web servers; Emerging technologies; Security; Standards & Bodies; Web interface design techniques; User-centered design; Visual development environments and development tools; Interface design effectiveness.

Pre: IT 340 or ISYS 340, IT 380 or ISYS 380

Fall, Spring

IT 484 (4) Software Engineering

An introduction to all important aspects of software engineering. The emphasis is on principles of software engineering including project planning, requirements gathering, size and cost estimation, analysis, design, coding, testing, implementation, and maintenance.

Pre: IT 380 or ISYS 380

Fall, Spring

IT 486 (4) Organizational Informatics

An introduction to information, technology and social behavior in the organizational context. Concepts of organization theory, organization behavior, knowledge and information management, and organizational intelligence provide a critical foundation for managing information, people, and technologies in rapidly changing environments.

Pre: IT 380 or ISYS 380

Variable

IT 488 (4) Rapid Application Development

Low and high CASE tools and rapid application development. CASE tools ranging from traditional SDLC to object-oriented client/server environments. Extensive team-oriented applications will be developed using tools such as SYNON, OBSYDIAN, Power Builder, and MSSQL server.

Pre: IT 340 or ISYS 340, IT 380 or ISYS 380

Variable

IT 495 (1) Seminar in Information Technology

Provides Information Technology majors an opportunity, in a small group setting, to explore a topic not normally covered in the curriculum.

Pre: Consent

Variable

IT 496 (1-4) Selected Topics in Information Technology

Special topics not covered in other courses. May be repeated for credit on each new topic.

Pre: Consent

Variable

IT 497 (1-12) Internship

Provides students with opportunity to utilize their training in a real-world business environment working under the guidance and direction of a faculty. (At most 4 hours toward a major in this department.)

Pre: Permanent admission to IT and consent

Fall, Spring, Summer

IT 498 (4) Information Technology Capstone

Develop high quality software application researching and applying fundamental software engineering techniques, several advanced development and test tools, human factors of interface design and a team approach, each student controlling only a part of the system.

Pre: Senior Standing and consent

Fall, Spring

IT 499 (1-2) Individual Study

Problems on an individual basis.

Pre: Consent

Fall, Spring