

Computer and Information Sciences

Computer and Information Sciences (CISC)

College of Arts and Sciences, Department of Computer and Information Sciences
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Computer and Information Sciences is part of the liberal arts curriculum at the University of St. Thomas. Computing is constantly evolving. There is a growing family of computing related disciplines that have joined the initial discipline of Computer Science. Recognizing these many areas within the broader discipline in computing, this department offers five majors: (1) Computer Science, (2) Information Systems, (3) Information Technology, (4) Information Security, and (5) Information and Decision Theory. In addition, a track within the Computer Science major is offered for those students who wish to complete a Master of Science degree in five years through the Graduate Programs in Software (GPS) degree. Each is described in detail below.

These majors are concerned with the collection, organization, processing, storage, retrieval, communication, and use of information in today's society. The emphasis is on the core of knowledge required to become an effective user of information; to design and implement system and application software; and to understand the concepts involved in areas such as database design, systems analysis, networking, security, artificial intelligence, statistics, and operations research. Program goals can be found on the department website: www.stthomas.edu/cisc.

The department has arranged its program to prepare students to work in business, industry, education, and government as designers or users; or to pursue entrepreneurial interests in technologically supported areas; or to continue study in graduate school. Courses are arranged to encourage participation of students from other disciplines. The department encourages majors to obtain a minor in another field. Students interested in teacher licensure should see the various science and mathematics programs in the Department of Teacher Education section of this catalog. A dual degree program with Engineering is also available, which is described in the catalog section under *School of Engineering*.

Major in Computer Science

Computer Science is a foundation for many different computing careers. Computer scientists design and build software and create efficient solutions to real-world problems in such fields as robotics, computer architecture, software engineering, and computer networking.

CISC 130* Introduction to Programming and Problem Solving in the Sciences (4 credits) *or* CISC 131*

Introduction to Programming and Problem Solving (4 credits)

Note: CISC 131 is recommended for this major

CISC 210 Information Security (4 credits)

CISC 230* Object-Oriented Design and Programming (4 credits)

CISC 231 Data Structures Using Object-Oriented Design (4 credits)

CISC 310 Operating Systems (4 credits)

CISC 340 Computer Architecture (4 credits)

CISC 370 Computer Networking (4 credits)

CISC 450 Database Design I (4 credits)

IDTH 220 Statistics I (4 credits)

* *Note:* A grade of C- or above must be earned by majors in these courses.

Plus eight credits from the following:

CISC 320 Systems Analysis and Design I (4 credits)

CISC 342 Computer Applications in Experimental Sciences (4 credits)

CISC 440 Artificial Intelligence and Robotics (4 credits)

CISC 451 Database Design II (4 credits)

Allied requirements

COJO 100 Public Speaking (4 credits) *or* COJO 105 Communications in the Workplace (4 credits)

MATH 114 Calculus II (4 credits)

MATH 128 Introduction to Discrete Mathematics (4 credits)

Fast track to a Master's Degree

The following is a track within the Computer Science major for those students who want to complete a Master of Science degree in five years through the Graduate Programs in Software (GPS) department. After obtaining their Bachelor's degree in CISC, students can go on and complete one more year in the GPS department and obtain a Master's degree. The following are the requirements for that program:

CISC 130* Introduction to Programming and Problem Solving in the Sciences (4 credits) *or* CISC 131*

Introduction to Programming and Problem Solving (4 credits)

Note: CISC 131 is recommended for this major

CISC 210 Information Security (4 credits)

CISC 230* Object-Oriented Design and Programming (4 credits)

CISC 231 Data Structures Using Object-Oriented Design (4 credits)

- CISC 310 Operating Systems (4 credits)
- CISC 340 Computer Architecture (4 credits)
- CISC 370 Computer Networking (4 credits)
- CISC 605 Technical Communications (4 credits)
- CISC 610 Software Engineering (4 credits)
- CISC 625 Software Project Management (4 credits)
- CISC 630 Database Design (4 credits)
- IDTH 220 Statistics I (4 credits)
- One CISC or IDTH elective course numbered 100 through 499
- * *Note:* A grade of C- or above must be earned by majors in these courses.

Allied requirements

- COJO 100 Public Speaking (4 credits) *or* COJO 105 Communications in the Workplace (4 credits)
- MATH 114 Calculus II (4 credits)
- MATH 128 Introduction to Discrete Mathematics (4 credits)

Major in Information Systems (IS)

Information Systems majors design computing solutions that provide companies, non-profit organizations, and governments with the information they need to achieve their goals. They work with the life cycle of information systems, including efficiency and reliability, meeting customers' budgets, proper testing, and maintenance.

- CISC 130* Introduction to Programming and Problem Solving in the Sciences (4 credits) *or* CISC 131* Introduction to Programming and Problem Solving (4 credits)

Note: CISC 131 is recommended for this major

- CISC 230* Object-Oriented Design and Programming (4 credits)
- CISC 320 Systems Analysis and Design I (4 credits)
- CISC 321 Systems Analysis and Design II (4 credits)
- CISC 325 E-Commerce (4 credits)
- CISC 450 Database Design (4 credits)
- IDTH 220 Statistics I (4 credits)

* *Note:* A grade of C- or above must be earned by majors in these courses.

Plus eight credits from the following:

- CISC 110 Introduction to Information Processing (4 credits) *or* CISC 200 Introduction to Computer Technology and Business Applications (4 credits)
- CISC 210 Information Security (4 credits)
- CISC 270 Web Development (4 credits)
- CISC 370 Computer Networking (4 credits)
- CISC 419 Accounting Information Systems (4 credits)
- CISC 430 Information Technology Management (4 credits)

Allied requirements

- ACCT 210 Financial Accounting (4 credits)
- COJO 100 Public Speaking (4 credits) *or* COJO 105 Communications in the Workplace (4 credits)
- MGMT 305 Management & Organizational Behavior (4 credits)

Plus four credits from the following:

- MATH 109 Calculus with Review II (4 credits)
- MATH 111 Calculus for Business and Social Science (4 credits)
- MATH 113 Calculus I (4 credits)

Major in Information Technology (IT)

Professionals in IT are involved in solving, supporting, troubleshooting and designing everything from web sites to networks, in organizations ranging from business and government to schools and health care.

- CISC 130* Introduction to Programming and Problem Solving in the Sciences (4 credits) *or* CISC 131* Introduction to Programming and Problem Solving (4 credits)

Note: CISC 131 is recommended for this major

- CISC 230* Introduction to Object-Oriented Programming (4 credits)
- CISC 270 Web Development (4 credits)
- CISC 320 Systems Analysis and Design I (4 credits)
- CISC 370 Networks (4 credits)
- CISC 430 Information Technology Management (4 credits)
- CISC 450 Database Design (4 credits)
- CISC 460 Senior Project/Practicum (4 credits)
- IDTH 220 Statistics I (4 credits)

* *Note:* A grade of C- or above must be earned by majors in these courses.

Computer and Information Sciences

Plus eight credits from the following:

CISC 210 Information Security (4 credits)
CISC 321 Systems Analysis and Design II (4 credits)
CISC 325 E-Commerce Systems (4 credits)
IDTH 410 Operations Research I (4 credits)

Allied requirements

COJO 100 Public Speaking (4 credits) *or* COJO 105 Communications in the Workplace (4 credits)
MGMT 305 Management & Organizational Behavior (4 credits)

Plus four credits from the following:

MATH 109 Calculus with Review II (4 credits)
MATH 111 Calculus for Business and Social Science (4 credits)
MATH 113 Calculus I (4 credits)

Major in Information Security

Information security studies the problem of protecting information stored on computing systems and travelling on computer networks. The discipline has emerged from a synthesis of software engineering, network technology, sociology of computing, and the mathematics of computer science. The curriculum fulfills requirements for information security education established by the US Government. This major prepares students in the areas of computer security, network security, cryptography, and information assurance.

CISC 130* Introduction to Programming and Problem Solving in the Sciences (4 credits) *or* CISC 131*
Introduction to Programming and Problem Solving (4 credits)

Note: CISC 131 is recommended for this major

CISC 210 Information Security (4 credits)
CISC 230* Object-Oriented Design and Programming (4 credits)
CISC 310 Operating Systems (4 credits)
CISC 320 Systems Analysis and Design I (4 credits)
CISC 370 Computer Networking (4 credits)
CISC 410 Information Security Analysis (4 credits)
IDTH 220 Statistics I (4 credits)

* *Note:* A grade of C- or above must be earned by majors in these courses.

Plus eight credits from the following:

CISC 270 Web Development (4 credits)
CISC 321 Systems Analysis and Design II (4 credits)
CISC 325 E-Commerce Systems (4 credits)

Allied requirements

COJO 100 Public Speaking (4 credits) *or* COJO 105 Communications in the Workplace (4 credits)
MATH 128 Introduction to Discrete Mathematics (4 credits) *or* ENGR 230 Digital Design (4 credits)

Plus four credits from the following:

MATH 109 Calculus with Review II (4 credits)
MATH 111 Calculus for Business and Social Science (4 credits)
MATH 113 Calculus I (4 credits)

Major in Information and Decision Theory

This quantitative program includes introductory statistics, applied statistics, how to collect data with a purpose, how to extract information from data, how to warehouse large quantities of data, how to make business decisions based on a collection of data, and how to make optimal decisions. As such, it includes the fields of statistics, operations research, and computer science.

CISC 130* Introduction to Programming and Problem Solving in the Sciences (4 credits) *or* CISC 131*
Introduction to Programming and Problem Solving (4 credits)

Note: CISC 131 is recommended for this major

CISC 230* Object-Oriented Design and Programming (4 credits)
IDTH 220 Statistics I (4 credits)
IDTH 320 Statistics II (4 credits)
IDTH 400 Data Mining and Machine Learning (4 credits)
IDTH 410 Operations Research I (4 credits)
IDTH 411 Operations Research II (4 credits)
IDTH 460 Senior Project/Practicum (4 credits)
IDTH 489 *or* 490 Topics (4 credits)

* *Note:* A grade of C- or above must be earned by majors in these courses.

Allied requirements

COJO 100 Public Speaking (4 credits) *or* COJO 105 Communications in the Workplace (4 credits)
 MATH 113 Calculus I (4 credits)
 MATH 114 Calculus II (4 credits)
 MATH 128 Introduction to Discrete Mathematics (4 credits)

Teacher Licensure

Elementary Education with a co-major in Science and Mathematics for Elementary Education
See Education

Minor in Computer and Information Sciences

Required: Five courses

CISC 130 Introduction to Programming and Problem Solving in the Sciences (4 credits) *or* CISC 131 Introduction to Programming and Problem Solving (4 credits)

Note: CISC 131 is recommended for this minor

Four additional CISC courses, at least two of which must be numbered 300 or above.

Note: One of these four may be chosen from IDTH numbered 300 or above.

Students should choose courses appropriate to their major field of study in consultation with the department chair or a member of the CISC department faculty.

Minor in Information and Decision Theory

CISC 130 Introduction to Programming and Problem Solving in the Sciences (4 credits) *or* CISC 131 Introduction to Programming and Problem Solving (4 credits)

Note: CISC 131 is recommended for this minor

IDTH 220 Statistics I (4 credits)

IDTH 320 Statistics II (4 credits)

IDTH 460 Senior Project/Practicum (4 credits)

Plus one elective IDTH course taken from this list:

IDTH 400 Data Mining and Machine Learning (4 credits)

IDTH 410 Operations Research I (4 credits)

One approved IDTH Topics Course (IDTH 489 or 490)

Allied requirements

MATH 113 Calculus I (4 credits)

Plus, depending on the IDTH Course choice, either:

MATH 114 Calculus II (4 credits) *or* MATH 128 Introduction to Discrete Mathematics (4 credits)

Computer and Information Sciences (CISC)

CISC 110 Introduction to Information Processing (4 credits) (CISC 200 or 216) (formerly QMCS 110)

Introduction to basic concepts of hardware, software and information processing systems. Introduction to computer programming concepts. Use of microcomputer application packages, including spreadsheets and database packages. Introduction to the Internet and World Wide Web. Investigation of the impact of the computer and future trends. This course fulfills the second-level Computer Competency requirement in the core curriculum.
 NOTE: Students who receive credit for CISC 110 may not receive credit for CISC 200 or 216.

CISC 120 Computers in Elementary Education (4 credits) (formerly QMCS 120)

This course is intended for elementary education majors. Topics include the role of the computer in elementary and middle-school education, computer applications in science and mathematics, data analysis, software packages for use in elementary and middle-school classrooms, Computer-Assisted-Instruction (CAI), multimedia, electronic portfolios, telecommunication and software creation using MicroWorlds and HTML. This course fulfills the third course in the Natural Science and Mathematical and Quantitative Reasoning and the second-level Computer Competency requirements in the core curriculum.

Prerequisite: Elementary Education or SMEE major

CISC 130 Introduction to Programming and Problem Solving in the Sciences (4 credits) (CISC 131) (formerly QMCS 130 and 230)

Introduction to problem solving with computers, using programming languages common to science and engineering disciplines; logical thinking, design and implementation of algorithms; and basic programming structures. Introduction to hardware and software: how computers acquire, store, process, and output information; how computer systems are designed, programmed, and tested. Students will use both a scientific programming language and an application package designed to implement programming features at a level more accessible to non-programmers. This course is designed for students majoring in Engineering or the sciences. Majors in the Department of Computer and Information Sciences should take CISC 131. Please see your academic adviser to ensure you select the appropriate class. This course fulfills the second-level Computer Competency requirement in the core curriculum. Lab included.

NOTE: Students who receive credit for CISC 130 may not receive credit for CISC 131.

Computer and Information Sciences

CISC 131 Introduction to Programming and Problem Solving (4 credits) (CISC 130) (formerly QMCS 130 and 230)

Introduction to problem solving with computers: logical thinking, design and implementation of algorithms, and basic programming structures. Problems will be motivated by the computer science and management information science disciplines. Introduction to hardware and software: how computers acquire, store, process, and output information; how computer systems are designed, programmed, and tested. Students will use both a programming language and an application package designed to implement programming features at a level more accessible to non-programmers. This course is designed for students with majors the Department of Computer and Information Sciences. Engineering and science majors should take CISC 130. Please see your academic adviser to ensure you select the appropriate class. This course fulfills the second-level Computer Competency requirement in the core curriculum. Lab included.

NOTE: Students who receive credit for CISC 131 may not receive credit for CISC 130.

CISC 200 Introduction to Computer Technology and Business Applications (4 credits) (CISC 110 or 216) (formerly QMCS 200)

This course will prepare students to use computers in a business environment and in daily life. Through application of basic computing fundamentals, students will be better prepared to purchase computers, diagnose and solve computer problems, use and build local area network/home networks, use and build common software applications, and design simple web pages. Student teams will transfer concepts and skills learned in the course as they assist organizations in the community with their technology needs. This course fulfills the second-level Computer Competency requirement in the core curriculum.

NOTE: Students who receive credit for CISC 200 may not receive credit for CISC 110 or 216

CISC 210 Information Security (4 credits)

An introductory course in computer and network security including desktop security, LAN security, and large-scale system security. Topics include authentication, host-based access control, encryption, network access control, and network security protocols. These topics will be analyzed in the context of system requirements, security policy, and risk assessment.

Prerequisites: 1) MATH 128 or ENGR 230 or IDTH 220 (may be taken concurrently), and 2) CISC 130 or 131

CISC 216 Quantitative Techniques in Business (2 credits) (CISC 200) (formerly QMCS 216)

The use of microcomputer spreadsheet software to aid in solving quantitative business problems. This course is to be taken by students who have been given transfer credits for the equivalent of some part but not all of CISC 200 and who are required to take CISC 200.

NOTE: Students who receive credit for CISC 216 may not receive credit for CISC 110 or 200.

CISC 230 Object-Oriented Design and Programming (4 credits) (formerly QMCS 281)

Programming and problem solving using an object-oriented approach. Builds on the procedural language foundation developed in CISC 130 or 131. Topics include: how procedural design differs from object-oriented design, modeling, algorithms, classes, objects, behavior, state, class associations and hierarchies, polymorphism, inheritance, design requirements and representation, Uniform Modeling Language specification, testing and verification, file processing. This course fulfills the second-level Computer Competency requirement in the core curriculum. Lab included.

Prerequisites: CISC 130 or 131

CISC 231 Data Structures Using Object-Oriented Design (4 credits) (formerly QMCS 350)

Presents the fundamental suite of data structures and the algorithms used to implement them. Topics include: abstract data types, algorithm development and representation, searching, sorting, stacks, queues, lists, trees, measuring algorithm complexity, object-oriented design and implementation of moderately large and complex systems. Course assumes the student has proficiency in object-oriented specification, design, and implementation.

Prerequisites: CISC 230 and MATH 128

CISC 238 Software Design Using Business Languages (4 credits) (formerly QMCS 238)

Introduction to software development using current and other business languages. Topics include algorithm development, sequential and direct-access file processing, tables, sorting, structured programming and software validation. This course fulfills the second-level Computer Competency requirement in the core curriculum.

CISC 270 Web Management (4 credits) (formerly QMCS 310)

This course will introduce students to the many technical and non-technical issues related to designing and constructing an effective World Wide Web (WWW) site. Students will be introduced to the Internet and the WWW, how they function, and what they do. The course will cover basic relational database principles and introduce the various tools necessary to implement an electronic commerce (e-commerce) WWW site. Students will work in small teams, using their own WWW server, and develop a fully functional site using many of the tools introduced in the course.

Prerequisite: CISC 230

CISC 295, 296 Topics (2 credits)**CISC 297, 298 Topics (4 credits)**

The subject matter of these courses will vary from year to year, but will not duplicate existing courses. Descriptions of these courses are available in the Searchable Class Schedule on Murphy Online,
<https://banner.stthomas.edu/pls/banner/prod/bwckschd>.

CISC 310 Operating Systems (4 credits) (formerly QMCS 360)

The basic principles of designing and building operating systems. Sequential versus concurrent processes, synchronization and mutual exclusion, memory management techniques, CPU scheduling, input/output device handling, file systems design, security and protection. Primary focus on uniprocessors, with some coverage of multi-processor operating systems.

Prerequisite: MATH 128 or ENGR 230 or IDTH 220 (may be taken concurrently), and CISC 230

CISC 320 Systems Analysis and Design I (4 credits) (formerly QMCS 420)

A study of systems analysis methodologies used in the analysis and design of information systems. Emphasis on data, process, and modeling by use of a CASE tool: entity relationship diagrams and data normalization, data flow diagrams, use case diagrams, and data dictionaries. This is a “hands on” course where students form teams to analyze the needs of a business client in the community.

Prerequisite: CISC 130 or 131; junior standing

CISC 321 Systems Analysis and Design II (4 credits) (formerly QMCS 421)

Continuation of CISC 320. Concentration on user-centered design (UCD), physical design, low- and high-fidelity prototyping, and agile methods. Emphasis on managerial problems in systems development. Continued use of CASE and project-management tools. A “real world” design and prototyping project is an integral part of this course.

Prerequisite: CISC 320

CISC 325 E-Commerce (4 credits) (formerly QMCS 425)

A study of relevant technologies and how they are used in today’s modern organizations to help manage the information resource of the organization. Emphasis is placed on the use of the Internet and World Wide Web and how they have changed organizational operations and strategies. This is an “active learning” course in which students will be researching current information systems technologies (such as Electronic Commerce [e-commerce]) and will be participating in the design and development of an e-commerce website for a fictitious organization.

Prerequisite: CISC 130 or 131; junior standing

CISC 340 Computer Architecture (4 credits) (formerly QMCS 300 and 340)

Structure and organization of computer systems and components, including the design of central processors, memory, and input/output systems. Instruction sets and basic machine language programming. Interfacing with simple external devices including switches, A to D, D to A, and communications. This course fulfills the second-level Computer Competency requirement in the core curriculum.

Prerequisites: CISC 130 or CISC 131; and MATH 128

CISC 342 Computer Applications in Experimental Sciences (4 credits) (formerly QMCS 342)

Introduction to the use of computers in the collection and analysis of scientific information. The course is designed to meet the needs of both natural science majors with an interest in scientific computing and computer science majors with an interest in laboratory science. Emphasis is placed on application of concepts and techniques in addition to LabVIEW programming. Topics include laboratory device interfacing, analog-signal acquisition and processing, frequency transformations, data analysis, image processing, and math modeling and simulation. This course fulfills the second-level Computer Competency requirement in the core curriculum.

Prerequisites: CISC 130 or 131; MATH 109 or 111 or 113; one course in a laboratory science

CISC 370 Computer Networking (4 credits) (formerly QMCS 370)

An introduction to computer networking. Covers communication protocol concepts, local area networks, Internet protocols, network equipment, configuration, firewalls, and network security.

Prerequisites: MATH 128 or ENGR 230 or IDTH 220 (may be taken concurrently); and CISC 130 or 131

CISC 410 Information Security Analysis (4 credits)

A capstone course that investigates the current state of the art in information security policy, technology, and assessment techniques.

Prerequisite: CISC 210, and previous or concurrent enrollment in CISC 310 and CISC 370

CISC 419 Accounting Information Systems (4 credits) (formerly QMCS 419)

This course will provide an understanding of the conceptual framework and practices of accounting information systems and the ability to work effectively with computer specialists and management to design, implement and audit such systems. Examples of subjects included are: systems development life cycle (SDLC), systems analysis phase of the SDLC, data and process models, operations of a corporate data center, including internal controls, database integrity, audit considerations for both internal and external auditors, unit integration, and system testing.

Prerequisites: CISC 110 or 200, and previous or concurrent enrollment in ACCT 316

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CISC 430 Information Technology Management (4 credits)

Issues and topics surrounding the management of an Information Technology (IT) department within an organization: issues surrounding IT personnel and IT clients or customers; trade offs regarding IT – time versus money, technological elegance versus real-world applicability, use of new technologies versus organizational success; IT controls; and other current issues.

Prerequisites: CISC 320 and senior standing

CISC 440 Artificial Intelligence and Robotics (4 credits) (formerly QMCS 380)

Theory and implementation techniques using computers to solve problems, play games, prove theorems, recognize patterns, create artwork and musical scores, translate languages, read handwriting, speak and perform mechanical assembly. Emphasis placed on implementation of these techniques in robots. Lab included.

Prerequisites: CISC 230 and IDTH 220

CISC 450 Database Design I (4 credits) (formerly QMCS 450)

Introduction to database management systems design philosophy. Design considerations for satisfying both availability and integrity requirements. Data models used to structure the logical view of the database. Schema, sub-schemas, and database administration. Emphasis on general purpose relational database management systems using SQL.

Prerequisite: CISC 231 or 320 or 325

CISC 451 Database Design II (4 credits)

Advanced database analysis, design, and implementation including data warehousing, distributed databases, materialized views, grid computing, and replication. Storage and efficient retrieval of temporal data, objects, and non-textual information.

Prerequisite: CISC 450

CISC 460 Senior Project (4 credits)

Work on a software analysis, design, and implementation project or on a computer support project under the direction of a faculty member.

Prerequisite: Senior standing and permission of the instructor

CISC 475, 476 Experiential Learning (2 credits)

CISC 477, 478 Experiential Learning (4 credits)

See the description of these courses at the beginning of the “Curricula” section of this catalog.

CISC 483, 484 Seminar (2 credits)

CISC 485, 486 Seminar (4 credits)

See the description of these courses at the beginning of the “Curricula” section of this catalog.

CISC 487, 488 Topics (2 credits)

CISC 489, 490 Topics (4 credits)

The subject matter of these courses will vary from year to year, but will not duplicate existing courses. Descriptions of these courses are available in the Searchable Class Schedule on Murphy Online,

<https://banner.stthomas.edu/pls/banner/prod/bwckschd>.

CISC 491, 492 Research (2 credits)

CISC 493, 494 Research (4 credits)

See the description of these courses at the beginning of the “Curricula” section of this catalog.

CISC 495, 496 Individual Study (2 credits)

CISC 497, 498 Individual Study (4 credits)

See the description of these courses at the beginning of the “Curricula” section of this catalog.

CISC 605 Technical Communications (4 credits)

Instructors present the fundamentals of technical communication as practiced in industry, emphasizing clarity and organizational skills. Students engage in exercises that focus on technical writing, editing, public speaking and graphic design, and apply their skills across a broad range of activities, including critique of presentations and writing of proposals, reports, memoranda, user manuals, instructional modules, and specifications. The course includes techniques that assist an understanding of the structure of the language, and an appreciation for format and content, to better prepare students for project documentation.

Note: This course can only be taken by students who have been admitted to the *Fast Track to a Master's Degree* within the Computer Science major (see *Major in Computer Science*)

CISC 610 Software Engineering (4 credits)

This is a survey course covering software engineering concepts, techniques, and methodologies. Topics covered include software engineering; software process and its difficulties; software life-cycle models; project planning including cost estimation; design methodologies including structured design, data-structure oriented design, object-oriented design; and software testing. A brief review of data structures is included.

Note: This course can only be taken by students who have been admitted to the *Fast Track to a Master's Degree* within the Computer Science major (see *Major in Computer Science*)

CISC 625 Software Project Management (4 credits)

Students gain a management perspective and a development process for planning, estimating, and controlling software development. They learn to develop a well-defined plan before beginning any software development effort; how to handle changes during the execution of the plan; how to incorporate quality criteria in the development cycle; and how to use methods to keep the project on track. Included in the course is the use of project management software and simulation software in the development and control of the project plan.

Note: This course can only be taken by students who have been admitted to the *Fast Track to a Master's Degree* within the Computer Science major (see *Major in Computer Science*)

CISC 630 Database Design (4 credits)

This course focuses on relational database design and system concepts. Database design includes database concepts, data models, conceptual (EER) and relational schema designs, query languages (SQL), physical data storage and access methods, and physical schema designs. Database systems includes query processing, transaction concepts and management such as concurrency control and recovery from failure, and database security and authorization. Students will complete a relational database design project.

Note: This course can only be taken by students who have been admitted to the *Fast Track to a Master's Degree* within the Computer Science major (see *Major in Computer Science*)

Information and Decision Theory (IDTH)**IDTH 201 Introductory Statistics II (2 credits) (IDTH 220) (formerly QMCS 201)**

This course is for students desiring to satisfy the coverage of IDTH 220 (a full semester of statistics) when less than one full semester of statistics has been taken. Review of inferential statistics; sampling distribution of the sample mean and sample proportion, central limit theorem, confidence intervals and hypothesis tests for one and two means and one and two proportions. Introduction to basic applications: tests of independence, analysis of variance and linear regression. A statistical package must be used as tool. This course fulfills the second-level Computer Competency requirement in the core curriculum.

Prerequisite: IDTH 206 or at least .35 semester, but less than one semester, of statistics

NOTE: Students who receive credit for IDTH 201 may not receive credit for IDTH 220.

IDTH 220 Statistics I (4 credits) (IDTH 201) (formerly QMCS 220)

Introductory applied statistics. Work environment; population, sampling frame, random sample, type of variables and studies. Descriptive statistics: collecting, displaying, summarizing, and interpreting data to extract information. Probability; relative frequency definition of probability, conditional probability, independence, discrete and continuous random variables, probability distribution and probability density, binomial, normal, standard normal, t , chi-square, and F distributions. Inferential statistics; sampling distribution of the sample mean and sample proportion, central limit theorem, confidence intervals and hypothesis tests for one and two means and one and two proportions. Basic applications: tests of independence, analysis of variance and linear regression. A statistical package must be used as tool. This course fulfills the third course in the Natural Science and Mathematical and Quantitative Reasoning and the second-level Computer Competency requirement in the core curriculum

Prerequisites: Math placement at level of MATH 111 or above; or MATH 100, or 101, or 105, or 108, or 109, or 111, or 113

NOTE: Students who receive credit for IDTH 220 may not receive credit for IDTH 201.

IDTH 295, 296 Topics (2 credits)**IDTH 297, 298 Topics (4 credits)**

The subject matter of these courses will vary from year to year, but will not duplicate existing courses. Descriptions of these courses are available in the Searchable Class Schedule on Murphy Online,

<https://banner.stthomas.edu/pls/banner/prod/bwckschd>.

IDTH 320 Statistics II (4 credits) (formerly QMCS 320)

Applied linear regression models. Simple linear regression: introduction, inferences, diagnostics, remedial measures, simultaneous inferences. Matrix approach in linear regression. Multiple regression; inferences, remedial measures, extra sums of squares, partial determinations, standardized models, use of indicator and mixed variables, polynomial regression, model selection and validation, diagnostics, remedial measures, multicollinearity and effects, autocorrelation. Single and multi-factor analysis of variance: analysis of factor level means, interactions, inferences, diagnostics, and remedial measures. A statistical package must be used as tool. Optional topics may include logistic regression, design of experiments, and forecasting.

Prerequisite: IDTH 201 or 220 or MATH 333

IDTH 400 Data Mining and Machine Learning (4 credits)

Introduction to statistical learning methods, from a statistical and computational perspective, to deal with massive and complex data. Topics include: Introduction; creating a project and diagram. Data preparation; defining and exploring data sources. Pattern discovery; cluster analysis, market basket analysis. Decision trees; cultivating and pruning decision trees, autonomous tree growth. Regression; transforming inputs, categorical inputs, polynomial regression. Neural Networks; input selection, stopped training. Model assessment; fit statistics, graphs, separate sampling. Model implementation; scored data sets, score code models. Applications. This course will give the basic ideas and intuition behind these methods, and special emphasis will be placed on their application through statistical software.

Prerequisites: MATH 113, and one of MATH 128 or MATH 240, and one of IDTH 320 or MATH 333

Computer and Information Sciences – Economics

IDTH 410 Operations Research I (4 credits) (formerly QMCS 410)

Introduction to computer and analytic techniques to support the decision-making process. Topics include: Introduction to linear programming algorithms, sensitivity, duality, transportation, assignment, transshipment, integer linear programming, network models, project scheduling, inventory models, and waiting line models. This course fulfills the second-level Computer Competency requirement in the core curriculum.

Prerequisites: MATH 113 or MATH 114 or MATH 128; and either IDTH 220 or MATH 314

IDTH 411 Operations Research II (4 credits) (formerly QMCS 411)

Advanced modeling and analytic techniques to support the decision-making process. Topics include: forecasting, decision analysis, multicriteria decision problems, simulation, Markov processes, dynamic programming, and non-linear programming.

Prerequisites: IDTH 410 and MATH 114

IDTH 460 Senior Project (4 credits)

Work on a software analysis, design, and implementation project or on a computer support project under the direction of a faculty member.

Prerequisite: Senior standing and permission of the instructor

IDTH 475, 476 Experiential Learning (2 credits)

IDTH 477, 478 Experiential Learning (4 credits)

See the description of these courses at the beginning of the “Curricula” section of this catalog.

IDTH 483, 484 Seminar (2 credits)

IDTH 485, 486 Seminar (4 credits)

See the description of these courses at the beginning of the “Curricula” section of this catalog.

IDTH 487, 488 Topics (2 credits)

IDTH 489, 490 Topics (4 credits)

The subject matter of these courses will vary from year to year, but will not duplicate existing courses. Descriptions of these courses are available in the Searchable Class Schedule on Murphy Online,

<https://banner.stthomas.edu/pls/banner/prod/bwckschd>.

IDTH 491, 492 Research (2 credits)

IDTH 493, 494 Research (4 credits)

See the description of these courses at the beginning of the “Curricula” section of this catalog.

IDTH 495, 496 Individual Study (2 credits)

IDTH 497, 498 Individual Study (4 credits)

See the description of these courses at the beginning of the “Curricula” section of this catalog.

Criminal Justice

See Sociology and Criminal Justice

Economics (ECON)

College of Arts and Sciences, Department of Economics

O’Shaughnessy Education Center (OEC) 427, (651) 962-5675

Papagapitos (chair), Fairchild, Hartmann, Hendrickson, Kim, Marcott, Riley, Saavedra, Vincent, Walsh, Wilson, Wu

The economics program develops a logical, consistent and rigorous method of thinking about the world and its problems. The economic way of thinking can be applied to a wide variety of topics including inflation, unemployment, financial markets, international trade, poverty, income inequality, currency depreciation, monopoly power, bank failures, sports, budget deficits and health-care costs.

The Department of Economics offers two majors and a minor in economics. All three programs are designed to provide excellent career-entry skills and those skills providing preparation for possible career shifts.

Whether a major or minor in economics is pursued, students are strongly encouraged to complement their studies with work in other fields. In recent years, for example, graduates have done complementary coursework in such fields as mathematics, foreign languages, business, environmental studies, computer science, international studies and English.

The choice of major and of a complementary field depends upon the path the student wishes to pursue. For example, students pursuing a liberal arts major, wishing to double major, or who are interested in continuing studies in professions other than economics would likely find the Bachelor of Arts (B.A.) best suited to their needs. Students wishing to engage the discipline at a deeper level would find the Bachelor of Science (B.S.) a better alternative.

Students graduating with a major in economics will be able to integrate the tools and concepts of the discipline in the analysis of an economic issue. The background provided by this major should equip the student with sound preparation for career advancement.