

Psychology – Quantitative Methods and Computer Science

Specific topics covered each semester may vary slightly. Examples of topics include: subliminal perception; automatic processing; implicit memory; eyewitness testimony; memory reconstruction; expertise and problem solving; the use of heuristics in decision making; person memory.

Prerequisites: PSYC 212 and 275

PSYC 422 History and Systems (4 credits)

This course explores how contemporary psychology developed from its remote and more recent roots. It emphasizes the contributions, contributors and perennial issues that led to psychology today and that could help to fashion its future.

Prerequisites: Senior standing and must be major in Psychology.

PSYC 424 Clinical Psychology (4 credits)

Study of the clinical application of psychological processes in the evaluation, diagnosis and treatment of behavioral disorders.

Prerequisites: PSYC 301 and three psychology courses or permission of instructor

PSYC 428 Theories of Counseling and Psychotherapy (4 credits)

Theories and procedures of counseling and psychotherapy are discussed, including psychoanalysis, client-centered therapy, cognitive therapy, behavior therapy, and others.

Prerequisites: PSYC 301 and three psychology courses or permission of the instructor

PSYC 475, 476 Experiential Learning (2 credits)

PSYC 477, 478 Experiential Learning (4 credits)

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

PSYC 483, 484 Seminar (2 credits)

PSYC 485, 486 Seminar (4 credits)

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

PSYC 487, 488 Topics (2 credits)

PSYC 489, 490 Topics (4 credits)

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PSYC 491, 492 Research (2 credits)

PSYC 493, 494 Research (4 credits)

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

PSYC 495, 496 Individual Study (2 credits)

PSYC 497, 498 Individual Study (4 credits)

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Quantitative Methods and Computer Science (QMCS)

College of Arts and Sciences

Department of Quantitative Methods and Computer Science

Heltne (chair), Bagley, Hansen, Jarvis, Komar, Pliego, Raymond, Schwebel (emeritus), Smith, Sturm, Werness

Quantitative Methods and Computer Science is part of the liberal arts curriculum at the University of St. Thomas. The QMCS program is 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, telecommunication, security, artificial intelligence, statistics and operations research. Program goals can be found on the department website: www.stthomas.edu/qmcs.

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 defines three paths for its majors: Computer Science (CS), Computer Information Systems (CIS), and Quantitative Methods (QM). These paths are described below. 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. There is also a dual degree program with Engineering.

Major in Quantitative Methods and Computer Science

QMCS 220 Statistics I (4 credits)

QMCS 230 Software Design Using the JAVA Language (4 credits)*

QMCS 281 Object-Oriented Design and Programming (4 credits)*

QMCS 350 Data and File Structures (4 credits)

*A grade of C- or higher must be earned by majors in each of these courses chosen to fulfill the core requirement.

Plus (for all majors):

Eight credits numbered 300 through 450. Students should consult with their department adviser in choosing the most appropriate courses.

Plus (for all majors):

Four credits numbered 100 through 499

Plus:

A set of courses in one of three paths (CS, CIS, or QM):

Computer Science (CS)

A traditional computer-science path that emphasizes low-level computing fundamentals as well as high-level design issues.

QMCS 420 Systems Analysis and Design I (4 credits)

QMCS 450 Database Design (4 credits)

Plus four credits from the following:

QMCS 300 Computer Organization (4 credits)

QMCS 340 Digital Electronics and Microcontrollers (4 credits)

Computer Information Systems (CIS)

A management information systems path emphasizing high-level design issues and designer/user interaction.

QMCS 420 Systems Analysis and Design I (4 credits)

QMCS 450 Database Design (4 credits)

Plus four credits from the following:

QMCS 421 Systems Analysis and Design II (4 credits)

QMCS 425 Information Resource Management (4 credits)

Quantitative Methods (QM)

A path emphasizing the role of statistics, mathematics and operations research as well as the use of computers in solving problems in organizations.

QMCS 410 Operations Research I (4 credits)

Plus eight credits from the following:

QMCS 320 Statistics II (4 credits)

QMCS 411 Operations Research II (4 credits)

QMCS 420 Systems Analysis and Design I (4 credits)

QMCS 450 Database Design (4 credits)

Allied requirements

MATH 128 Introduction to Discrete Mathematics (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)

Plus four credits from the following:

COMM 100 Public Speaking (4 credits)

COMM 105 Communication in the Workplace (4 credits)

Teacher Licensure

Elementary Education with a Co-major in Science and Mathematics for Elementary Education

See Education

Minor in Quantitative Methods and Computer Science – for sciences

This minor is intended to support majors in biology, chemistry, environmental studies, geology, mathematics and physics.

QMCS 230 Software Design Using the JAVA Language (4 credits)

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

Plus twelve credits from the following:

QMCS 220 Statistics I (4 credits)

QMCS 300 Computer Organization (4 credits)

QMCS 320 Statistics II (4 credits)

QMCS 330 Graphics and Numerical Methods (4 credits)

QMCS 340 Digital Electronics and Microcontrollers (4 credits)

QMCS 342 Computer Applications in Experimental Sciences (4 credits)

QMCS 350 Data and File Structures (4 credits)

QMCS 380 Artificial Intelligence and Robotics (4 credits)

Quantitative Methods and Computer Science

QMCS 381 Expert Systems (4 credits)
QMCS 410 Operations Research I (4 credits)
QMCS 411 Operations Research II (4 credits)
QMCS 450 Database Design (4 credits)

Minor in Quantitative Methods and Computer Science – for business

This minor is intended to support majors in any concentration of business administration, economics and other related disciplines.

QMCS 200 Introduction to Computer Technology and Business Applications (4 credits)

Plus four credits from the following:

QMCS 230 Software Design Using the JAVA Language (4 credits)
QMCS 238 Software Design using Business Languages (4 credits)

Plus twelve credits from the following:

QMCS 215 Rapid Application Development (4 credits)
QMCS 281 Object-Oriented Design and Programming (4 credits)
QMCS 420 Systems Analysis and Design I (4 credits)
QMCS 425 Information Resource Management (4 credits)
QMCS 450 Database Design (4 credits)

Minor in Quantitative Methods and Computer Science – for mathematics

This minor is intended to support majors in mathematics and those interested in statistics and operations research.

QMCS 230 Software Design Using the JAVA Language (4 credits)

Plus twelve credits from the following:

QMCS 220 Statistics I (4 credits)
QMCS 281 Object-Oriented Design and Programming (4 credits)
QMCS 320 Statistics II (4 credits)
QMCS 330 Graphics and Numerical Methods (4 credits)
QMCS 410 Operations Research I (4 credits)
QMCS 411 Operations Research II (4 credits)

QMCS 110 Introduction to Information Processing (4 credits) (QMCS 216)

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 QMCS 110 may NOT receive credit for QMCS 216.

QMCS 120 Computers in Elementary Education (4 credits)

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, 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

QMCS 200 Introduction to Computer Technology and Business Applications (4 credits)

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.

QMCS 201 Introductory Statistics II (2 credits) (QMCS 220)

This course is for students desiring to satisfy the coverage of QMCS 220 (a full semester of statistics), but who have taken less than one full semester of statistics. Review of basic statistical techniques (confidence intervals, hypothesis testing, regression), multiple regression, contingency tables, analysis of variance, sampling, plus emphasis on use of statistical packages and design of a statistical study.

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

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

QMCS 215 Rapid Application Development (4 credits)

Introduction to user-friendly development tools. These tools allow non-programmers to create usable software without programmer assistance. Students will be exposed to developing systems using software packages emphasizing

structured analysis techniques. These packages integrate spreadsheet software database management software and presentation software. Queries to the World Wide Web (WWW) and a variety of techniques to display data on the Web are included. Approximately half of the course deals with philosophical and foundational topics such as modeling or requirements. This course fulfills the second-level Computer Competency requirement of the core curriculum.
Prerequisite: QMCS 110 or 200

QMCS 216 Quantitative Techniques in Business (2 credits) (QMCS 110)

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 110 and who are required to take 110.

Prerequisite: ACCT 205 or ACCT 216

NOTE: Students who receive credit for QMCS 216 may not receive credit for QMCS 110.

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

Introductory applied statistics: sampling, descriptive (exploratory) statistics, probability, sampling distributions, estimation and hypothesis testing, non-parametrics, simple and multiple linear regression, introduction to analysis of variance; use of statistical packages. 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: Math placement at level of MATH 111 or above; or MATH 100, or 101, or 105, or 109, or 111, or 113

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

QMCS 230 Software Design Using the JAVA Language (4 credits)

Introduction to software development including procedural and object-oriented concepts. Topics include: algorithmic development, classes and methods, arrays, sorting and searching, recursion. This course fulfills the second-level Computer Competency requirement in the core curriculum.

Prerequisite: None in general. However, certain sections will be designated for science students. The prerequisite for those sections is MATH 109 or 111 or 113.

QMCS 238 Software Design Using Business Languages (4 credits)

Introduction to software development using COBOL 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.

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

Continuation of object-oriented design and programming in JAVA, with emphasis on more advanced concepts. Topics include classes, inheritance, encapsulation, polymorphism, GUI interface design, exception handling and files. This course fulfills the second-level Computer Competency requirement in the core curriculum.

Prerequisite: QMCS 230; MATH 128 recommended

QMCS 295, 296 Topics (2 credits)

QMCS 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 at www.stthomas.edu/register/onlineschedule/.

QMCS 300 Computer Organization (4 credits)

Concepts of computer system organization and programming. Instruction and data representations. Instruction set decoding, addressing modes, and fundamentals of assembly language. The organization and the operation of the central processing unit, instruction fetching and execution, hardwired and microprogrammed control, I/O structures, direct memory access, interrupts, bus protocols and I/O interfaces, multiple-module memory, caches, memory, memory organization, registers, microprocessor families, pipelining, and RISC features. This course fulfills the second-level Computer Competency requirement in the core curriculum.

Prerequisites: QMCS 230 or 238 and MATH 128

QMCS 310 World Wide Web Management (4 credits)

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: QMCS 281

QMCS 320 Statistics II (4 credits)

Analysis of variance; regression with indicator variables; topics from: general linear model; design of experiments; further use of statistical packages, discriminant, cluster analysis, time series.

Prerequisite: QMCS 201 or 220 or MATH 333

Quantitative Methods and Computer Science

QMCS 330 Graphics and Numerical Methods (4 credits)

An integrated approach to using the computer to solve numerical problems and to present information in graphical form. Includes: non-linear equations, systems of linear equations, interpolation, approximation, differential equations, two and three-dimensional picture transformations plus viewing and rendering of graphical images.

Prerequisites: QMCS 230 and MATH 109 or 111 or 113

QMCS 340 Digital Electronics and Microcontrollers (4 credits)

Digital electronics techniques: semiconductor devices, digital logic, counters, clocks, shift registers, combinatorial and sequential logic circuits and minimization. Microcontroller organization, programming, device addressing, buffering and enabling. Microcontroller interfacing with switches, A to D, D to A, and communications.

Prerequisites: QMCS 230 and MATH 128

QMCS 342 Computer Applications in Experimental Sciences (4 credits)

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, and math modeling and simulation. This course fulfills the second-level Computer Competency requirement in the core curriculum.

Prerequisites: QMCS 230 or 238; MATH 109 or 111 or 113; one course in a laboratory science

QMCS 350 Data and File Structures (4 credits)

An introduction to data structures and abstract data types using an object-oriented language. Includes arrays and linked lists, stacks and queues, recursion, searching and sorting, trees, heaps, files, hashing and graphs. Measures of algorithmic efficiency are developed for algorithms processing these data structures.

Prerequisites: QMCS 281 and MATH 128

QMCS 360 Operating Systems Design (4 credits)

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: QMCS 281; Recommended: QMCS 300

QMCS 370 Telecommunications and Teleprocessing (4 credits)

The fundamental concepts of telecommunications and networking for voice, data and video, including hardware, media, signaling and digital switching, open-system interconnection model, standards and protocols, local and wide-area networks and inter-networking.

Prerequisites: QMCS 230 or 238 and MATH 128

QMCS 371 Advanced Voice and Data Communications (4 credits)

Analysis of voice, data and video telecommunication requirements, network configuration, network operations, network monitoring and optimization, documentation and legal issues.

Prerequisite: QMCS 370

QMCS 380 Artificial Intelligence and Robotics (4 credits)

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.

Prerequisites: QMCS 220 and 281

QMCS 381 Expert Systems (4 credits)

Emphasis on a practical understanding of artificial intelligence, LISP, and the expert system-building process. Course goals include understanding what expert systems are, how they operate, techniques used to build expert systems, and evaluating commercially available expert systems packages.

Prerequisites: QMCS 281 and junior standing

QMCS 410 Operations Research I (4 credits)

Utilization of computer and analytic techniques to support the decision-making process in both the public and private sectors. Topics include linear programming, simulation, PERT, inventory control, goal programming and queuing theory. This course fulfills the second-level Computer Competency requirement in the core curriculum.

Prerequisites: QMCS 220 and MATH 109 or 111 or 113

QMCS 411 Operations Research II (4 credits)

Advanced modeling techniques. Techniques include: decision theory, Markov chains, integer programming, dynamic programming, forecasting, game theory, transportation problems and decision theory.

Prerequisites: QMCS 410 and MATH 114

QMCS 419 Accounting Information Systems (4 credits)

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

QMCS 420 Systems Analysis and Design I (4 credits)

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: QMCS 230 or 238 and junior standing

QMCS 421 Systems Analysis and Design II (4 credits)

Continuation of 420. Concentration on implementation problems, software and hardware limitations. Emphasis on managerial problems in an information-processing system. Continued use of computer-based analysis and design and project-management tools. A “real world” project is an integral part of this course.

Prerequisite: QMCS 420

QMCS 425 Information Resource Management (4 credits)

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: QMCS 230 or 238; junior standing

QMCS 450 Database Design (4 credits)

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: QMCS 281 or 420 or 425

QMCS 460 Senior Project (4 credits)

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

Prerequisite: Senior standing and permission of the instructor

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