CSC 105 Survey of Computer Science 4 cr.

Catalog description:
This course builds on CSC 101 and provides an overview of selected Computer Science topics that are more technical and advanced than those discussed in the earlier course. Topics include a detailed discussion of the binary, octal, and hexadecimal numeration systems, the machine representation of data and instructions, the design of a typical computer chip, programming in a simplified machine language, and such application areas as robots and embedded systems (programming and construction), artificial intelligence, computability theory and Turing machines, and an introduction to networks, including the Internet model. Four lecture hours per week plus laboratory work outside of class. Not open to students who have received credit for CSC 215.
Prerequisite: fulfillment of the Basic Mathematics Competency Based Skills requirement and ability to use standard computer software (e.g., operating system features, word processing, email, and web browsers).

CSC 110 Software Design and Programming I 4 cr. DII

Catalog description:
This course introduces a set of fundamental design principles and problem-solving techniques for the development of computer algorithms and their implementation as programs. Problem solutions are developed with the help of an appropriate modeling language and then coded in an object-oriented programming language. (Consult the Computer Science Department for the languages and tools currently in use.) Topics such as problem specification, object-oriented analysis and design, standard data types, control structures, methods and parameter passing, and design for reuse are presented through a study of specific example problems and solutions. Style, documentation, solution robustness, and conformance with specifications are emphasized throughout. Three lecture hours and three hours of scheduled laboratory per week plus extensive programming work outside of class. Not open to students who have received credit for CSC 201J.
Prerequisites: High school algebra I & II, plus experience with a window-based operating system and the use of email and a word processor.

CSC 115 Software Design and Programming II 4 cr. DII

Catalog description:
This course extends the treatment of object-oriented methodologies, languages and tools begun in CSC110. The emphasis is on the analysis of complex problems, particularly those involving multiple design alternatives, and the use of class libraries. Fundamental strategies for algorithm design are presented and discussed. Specific topics include inheritance, polymorphism, recursion, stream and file I/O, exceptions, and graphical interface programming. Style, documentation, solution robustness, and conformance with specifications are emphasized throughout. Three lecture hours and three hours of scheduled laboratory per week, plus extensive programming work outside of class. Not open to students who have received credit for CSC 202J.
Prerequisite: CSC110 or CSC 201J.

CSC 212 Human-Computer Interfaces 4 cr.

Catalog description:
This course presents the fundamentals of computer/user interfaces using windows frameworks and object-oriented programming concepts. The basic concepts of a user interface, including command-based, graphical, and multimedia interfaces, are covered in a manner independent of specific technologies. A modern window-based interface implementation is then introduced through the use of one or more current object-oriented programming languages and object interface libraries. (Consult the instructor for the language(s) and libraries to be used.) Four lecture hours per week, plus programming work outside of class. Not open to students who have received credit for CSC 312A.
Prerequisite: CSC 115 or CSC 202J.

CSC 235 Computer Security Basics 3 cr.

Catalog description:
This course presents a unified view of information security that examines the closely related areas of software security, system security, and network security using a common set of underlying security principles. The resulting synthesis of knowledge will enable students to understand the challenges faced by contemporary designers of secure information technology infrastructure. Each of these three security areas is examined in sufficient detail for students to understand the complexity of modern threats and the corresponding sophistication of the software and hardware that is designed to counter these threats.
Prerequisites: CSC 101 or CSC 105 or CSC 200A, and CSC 110 or CSC 201J.

CSC 246 Information Visualization   **4 cr. DII Q**

Catalog description:
       This course presents the basic science and techniques behind information visualization, introducing fundamental concepts concerning the use of color, image processing, computer graphics, and scientific visualization. The course describes the principles of visual perception, information data types, and visual encoding of data representations, and then focuses on the study, design, and development of visualization techniques for the analysis, comprehension, explanation, exploration, and manipulation of large collections of datasets. The latest visual representation methodologies and state-of-the-art visualization tools including programming language(s) and visualization libraries and toolkits will be applied in the course to help understand the subject and to design and generate visual interpretation of large amounts of complex data collected from diverse areas such as physics, chemistry, biomedical studies, meteorology, geospatial research, business, etc. Students will form teams to participate in group projects that emphasize interdisciplinary interaction and cooperation, in order to analyze and solve real world quantitative problems. Three lecture hours and three hours of scheduled laboratory per week, plus additional project time outside of class.
  Prerequisites: One Mathematics course chosen from MAT 108, MAT 120, MAT 150, and MAT 208 and above; plus CSC 110 or CSC 201J, or equivalent programming experience and permission of Department Chairperson.

CSC 260 Data Structures and Algorithms   **4 cr.**

Catalog description:
    Basic data structures such as stacks, queues, linked lists, and trees are studied and applied to problems in data storage and manipulation. Applications include basic searching and sorting algorithms. Fundamental strategies for algorithm design are reviewed and extended. Design, analysis and implementation techniques are discussed. Three lecture hours and three hours of scheduled laboratory per week, plus extensive programming work outside of class.
  Prerequisites: CSC 101 or CSC 105 or CSC 200A, and CSC 115 or CSC 202J.

CSC 263 Database Systems   **4 cr.**

Catalog description:
    This course is an in-depth study of the underlying principles of database systems. Topics include data modeling and reduction, physical representations of data and access paths, and the semantics and theory of several major approaches to database organization, including relational and object-relational. Extensive discussion of query generation and optimization is included for at least one database system. Four lecture hours per week, plus programming work outside of class.
  Prerequisite: **CSC 115 or CSC 202J.**

CSC 276 Topics in Computer Science   **3 cr.**

Catalog description:
    This course is used for the exploration of emerging aspects of applied computer science. The course is intended for coverage of a single area or a strongly unified collection of topics not otherwise available in the Computer Science curriculum. The topic(s) will be announced prior to registration. This course may be repeated once for additional credit if topics covered are different. Three lecture hours per week. Course content and prerequisites are variable.
  Prerequisites: Variable depending on topics.

CSC 278 Scripting Techniques   **4 cr.**

Catalog description:
    This course presents rapid application development (RAD) techniques and their implementation using modern scripting languages. Methods for defining problems and their solutions will be examined, including task analysis and the development of design criteria. The course investigates the design of modern scripting languages, emphasizing the use of their particular attributes for developing solutions to complex problems. Fundamental programming language paradigms, type systems, and memory allocation and management strategies are presented and discussed, followed by comparative analysis of the languages utilized in this course and its prerequisites. Four hours of lecture per week, plus programming work outside of class.
  Prerequisites: CSC 115 or CSC 202J.

CSC 279 C + C++   **4 cr.**

Catalog description:

This course presents the particular goals, features, and strengths and limitations of the C and C++ programming languages. C's capabilities and limitations as a procedural programming language are examined, followed by an exploration of C++ as an object-oriented language that provides access to C's feature set. Topics include language grammar rules and their effect on programming style, operators, pointer and reference types, bit manipulation, memory management, and the utilization of the STL (Standard Template Library). Programming assignments will highlight the use of each language in appropriate contexts (e.g. C: systems programming, text processing; C++: program-solving strategies emphasizing OO and the use of the STL). Fundamental programming language paradigms, type systems, and memory allocation and management strategies are presented and discussed, followed by comparative analysis of the languages utilized in this course and its prerequisites. Four lecture hours per week, plus extensive programming work outside of class.

Prerequisite: CSC115 or CSC 202J.

CSC 295 Computer Architecture and Organization   **3 cr.**

Catalog description:

This course examines the basic principles of computer systems and how these concepts relate to the design of such systems. Both hardware and software concepts are considered and the interdependence between them are covered. Determining basic tradeoffs and related decisions are covered. Logic level designs, data representations, computer circuits, fundamental computer operations, program creation, I/O programming, processing elements, links and interfaces, memory hierarchy, and memory management are covered. Three lecture hours per week.

Prerequisites: **CSC 115 or CSC 202J, and CSC 105 or CSC 215, and PHS 205.**

CSC 300 Software Engineering I   **4 cr. W-II**

Catalog description:

This course will explore in detail the software development process for large software systems using modern software engineering principles. Topics include software life cycle models, tools and techniques for software engineering, the software development life cycle, the Unified Process, testing/evaluation techniques, and evaluation metrics. Group design projects will be used to gain understanding of course topics and experience with development tools. Three lecture hours and three hours of scheduled laboratory per week, plus programming work outside of class.

Prerequisites: CSC 260.

CSC 315A Computer Networks and Data Communications   **4 cr.**

Catalog description:

This course provides an introduction to the basic principles of data communications and computer networks. Modulation techniques, multiplexing, transmission media, error control techniques, message formatting, switching and packet-switching techniques, various communication protocols, and networking and internetworking techniques are discussed. Three lecture hours and three hours of scheduled laboratory per week, plus programming work outside of class.

Prerequisite: CSC 260.

CSC 325 Advanced Programming Techniques   **4 cr.**

Catalog description:

This course presents state-of-practice software development techniques such as Web based computing, application data exchange, frameworks for managing and securing robust systems, developing multi-tier software systems. Topics will be illustrated by applications to such areas as remote objects, communication with remote components, reflection, security and Web Services. Specific topics will be chosen based on current software industry trends. Fundamental programming language paradigms, type systems, and memory allocation and management strategies are presented and discussed, followed by comparative analysis of the languages utilized in this course and its direct and indirect prerequisites. Three lecture hours and three hours of scheduled laboratory per week, plus extensive programming work outside of class.

Prerequisite: CSC 260.

CSC 340 Artificial Intelligence 3 cr.

Catalog description:
This course studies the theory and application techniques which allow a computer to "behave intelligently". Various operational definitions of intelligence are discussed, along with the concept of "mechanized intelligence". The course includes case studies of expert systems which solve engineering design problems, diagnose disease, and learn from their environment via natural language and/or visual interaction with a user. The role of planning, goal formation, search analysis and evaluation, and various forms of representation will be discussed extensively. Four lecture hours per week, plus programming work outside of class.
Prerequisites: **CSC 105 or CSC 215, and CSC 260.**

CSC 345 Embedded Systems 4 cr.

Catalog description:
This course covers fundamentals of embedded systems: basic architecture, programming, and design. A hands-on approach to microprocessor and peripheral system programming, I/O interfacing, and interrupt management will be utilized to understand and apply the concepts. A sequence of projects requiring programming and integration of FPGA-based systems will be conducted. Three lecture hours and three hours of scheduled laboratory per week.
Prerequisite: **CSC 295**

CSC 351 Software Engineering II 4 cr.

Catalog description:
This course is an extension of CSC 300 and focuses on the implementation of the software engineering principles covered therein. It will explore state-of-practice and cutting-edge techniques and tools related to the design, implementation and maintenance of software systems. Topics include: design patterns; Model Driven Architecture (MDA); test-driven development; agile development; extreme programming (XP); aspect-oriented design. An ongoing group project will be used to gain practical experience with current software engineering practices and a variety of IDEs and CASE tools. Three lecture hours per week and three hours of scheduled laboratory per week, plus programming work outside of class. Not open to students who have received credit for CSC 301.
Prerequisite: CSC 300; CSC 263 strongly recommended.

CSC 367 Internship in Computer Science 1 - 6 cr.

Catalog Description:
This course provides an opportunity for broadening and augmenting a student's computer knowledge through placement in an organization or agency engaged in work directly related to a Computer Science student's academic interests. The number of credits will vary with the nature of the work and the time commitment involved. A student must meet Departmental requirements before registering for the course. Limited to Computer Science Majors. Free elective credit only. This course may be repeated for credit, but the total number of Internship credits may not exceed 6.
Prerequisites: CSC 260 and permission of Department Chairperson.

CSC 376 Topics in Computer Science 3 cr.

Catalog description:
This course is used for the exploration of advanced aspects of computer science The course is intended for coverage of a single area or a strongly unified collection of topics not otherwise available in the Computer Science curriculum The topic and instructor will be announced prior to registration This course may be repeated once for additional credit if topics covered are different. Three lecture hours per week. Course topics and therefore prerequisites variable.

Prerequisite(s): Variable depending on topic(s).

CSC 381 Operating System Principles 3 cr.

Catalog description:
This course presents the evolution of computer operating systems, operating system functionalities, and current design and implementation techniques. Relationships between the operating system, computer architecture, and the user community are discussed. Three lecture hours per week. Not open to students who have received credit for CSC 280.
Prerequisite: CSC 260.

CSC 400 Theory of Computation 3 cr.

Catalog description:
This course introduces the basic concepts underlying the theoretical study of computing and computers: formal languages, automata, Turing machines, computability, and computational complexity. Three lecture hours per week. Not open to students who have received credit for CSC 290.
Prerequisites: CSC 260 and MAT 214A.

CSC 415 Analysis of Algorithms 3 cr.

Catalog description:
Advanced concepts from data structures and general algorithms are discussed from both theoretical and applied viewpoints. Topics covered include: multi-lists, graph theory, searching and sorting algorithms, and general n-way tree structures. Techniques for analysis of algorithms for average and best/worst cases are presented. Laboratory work may involve programming in a high-level language. Three lecture hours per week.
Prerequisites: CSC 260 and MAT 214A.

CSC 425 Computer Graphics and Games 4 cr.

Catalog description:
This course covers fundamental principles and applications underlying computer graphics and computer games. The course presents key aspects of computer graphics including graphics pipeline, scene graphs, 2D/3D geometric objects and transformations, viewing, shading, and modeling. Topics related to computer game development include game engines, animation, and behavior and interaction. The course will also introduce basic concepts of collision detection, illumination, game design and implementation, and will emphasize the application of the topics in game-related computer graphics programming projects with the use of graphics libraries and game engines and toolkits. Four lecture hours per week, plus programming work outside of class.
Prerequisites: MAT 108 or MAT 150 or any MAT course numbered 208 or above, plus CSC 260.

CSC 435 Computer and Network Security Engineering 3 cr.

Catalog description:
This course offers a detailed analysis of security problems and the corresponding methods used to create practical, working solutions to problems in computer and network security. Topics include secure software design, architecture of security products, and organization and administration of information security in IT infrastructures. The course uses an in-depth approach to analysis of security solutions – secure operating systems, secure communication protocols, and secure software. Through laboratory exercises, students will develop expertise in the use of contemporary security tools for protecting computers and computer networks.
Prerequisites: CSC 315A; CSC 279 strongly recommended.

CSC 445 Parallel Processing 4 cr.

Catalog description:
This course deals with the hardware and software aspects of multiprocessor systems (two or more processors in use simultaneously). The reasons for using such systems, including processor speed limitations and non-uniform capabilities of processors or computers, are examined. Basic hardware concepts such as machine models, parallel programs, networks, and performance and scalability are discussed. Relevant compiler and operating system concepts, programming models, and program development methodologies are introduced. Three lecture hours and one scheduled laboratory hour per week, plus additional laboratory work outside of class.
Prerequisites: CSC 115 or CSC 202J, and CSC 295.

CSC 475 Distributed and Cloud Computing

4 cr.

Catalog description:
This course introduces the design principles, system architectures and innovative applications of parallel, distributed, and cloud computing systems. It aims to acquaint students with supercomputers, distributed and cloud computing systems for high-performance computing, research, e-commerce, social networking, and web-scale Internet applications. Topics include clustering, virtualization, cloud platform architecture, service-oriented architecture, cloud programming, security in distributed and cloud computing, and the Internet of Things. Software development platforms and tools from several leading distributed and cloud computing vendors are used to gain hands-on experiences. Three lecture hours per week, plus programming work outside of class.
Prerequisite: CSC 381 or CSC 280.

CSC 485 Robotics and Computer Vision   **4 cr.**

Catalog description:
This course presents the basic science behind mobile robotics, robotic manipulation, and computer vision. The course examines key aspects of autonomous systems including sensors, map making, and path planning. The fundamentals of robotic manipulation will be presented, including coordinate transformations, manipulator kinematics, and motion. Topics in computer vision include image formation and sensing, region and edge extraction, feature identification, camera calibration, and optical measurement. The course concludes with techniques for integrating vision, mobile robots, and manipulators into a complete system. Three hours of lecture and three hours of scheduled laboratory time per week.
Prerequisites: Pre- or Co-Requisite: MAT 221; Prerequisite: CSC 260; CSC 279 strongly recommended.

CSC 490 Compiler Construction   **4 cr.**

Catalog description:
The fundamental problems in the design and implementation of programming language processors are studied. Language syntax and semantics, parsing, implementation techniques such as recursive descent and backtracking, code generation, optimization, and error diagnostics are covered. Concepts are illustrated through extensive programming assignments. Three lecture hours per week and three hours of scheduled laboratory per week, plus extensive laboratory work outside of class. Not open to students who have received credit for CSC 390.
Prerequisite: CSC 260.

CSC 498 Project Specification and Design Practicum   **1 cr.**

Catalog description:
The practicum sets up a typical environment for the development of a detailed proposal for a software- or hardware-system project. The instructor will assist each student in choosing an appropriate project topic and in refining the proposal through all stages from initial outline to final formal specification. The completed proposal will serve as the contract for the CSC 500 Directed Study project. The course involves periodic meetings, group discussions, and individual conferences. The practicum is graded on a Pass/Fail basis and is taught on a Directed Study basis. Open only to Computer Science majors.
Prerequisites: CSC 300 and permission of Department Chairperson.

CSC 500 Directed Study in Computer Science I   **3 cr.**

Catalog description:
A substantial project involving system design and implementation is carried out on an individual or group basis under the supervision of a faculty member. The specification for the project must have been completed in the prerequisite course CSC 498. Open only to Computer Science majors.
Prerequisites: CSC 498. Additional prerequisites, which vary with the project, are at the discretion of the faculty supervisor for the project.

CSC 520 Computer Science Capstone Project Specification **1 cr.**

Catalog description:

   This course sets up a typical environment for the development of a detailed proposal for a software- or hardware-system project. The instructor will assist each student in choosing an appropriate project topic and in refining the project proposal through all stages from initial outline to final formal specification. The completed proposal will serve as the contract for the CSC 521 Computer Science Capstone Project. The course involves periodic meetings, group discussions, and individual conferences. A presentation of the completed proposal will be made to the Computer Science Department faculty and students. This course is graded on a Pass/Fail basis and is taught on a Directed Study basis. Open only to Computer Science majors.

   Prerequisites: **CSC 300 and permission of Department Chairperson. Additional prerequisites, which vary with the project, are at the discretion of the faculty supervisor for the project.**

CSC 521 Computer Science Capstone Project **3 cr.**

Catalog description:

   A substantial project involving system design and implementation is carried out on an individual or group basis under the supervision of a faculty member. The specification for the project must have been completed in the prerequisite course CSC 520. A presentation of the completed project will be made to Computer Science faculty and students; writing experiences will be used to develop skills in analysis and rhetoric. The course involves periodic meetings, group discussions (if appropriate), and individual conferences. Open only to Computer Science majors.

   Prerequisites: CSC 520 and permission of the Department Chairperson. Additional prerequisites, which vary with the project, are at the discretion of the faculty supervisor for the project.

MAT214A Discrete Structures **4 cr. DII**

Catalog description:

   A study of discrete mathematical structures of interest in computer science and other applied fields. Topics will be chosen from logic, proof techniques, sets, Boolean algebra, functions, relations, basics of counting, recursion, graphs, trees, and discrete probability. Four lecture hours per week. Not open to students who have received credit for either MAT214 or MAT 314.

PHS 205 Digital Circuit Design **4 cr.**

Catalog description:

   This course is an introduction to logic design and digital circuit fundamentals. Topics include: binary systems, Boolean algebra, combinatorial and sequential circuit analysis and design, and fundamental building blocks of modern computers, such as multiplexers, decoders, counters and registers. Hands-on laboratory activities and team projects are required to apply learned theory in design, simulation and implementation of digital circuits using current computer aided-design software and hardware tools. Three lecture hours and three hours of scheduled laboratory per week.

   Pre- or Co-requisite: MAT 220, or MAT 150 or equivalent.