

## COMPUTER SCIENCE (CMPS)

**101. Introduction to Computer Science.** Credit 3 hours. Prerequisite: Registration in or prior credit for Mathematics 155 or 161. Introduction to the major areas of computer science including operating systems, machine architecture, programming languages, data representation and storage, and algorithm development. Includes major emphasis in problem solving and simple programming concepts. (Fall, Spring, Summer)

**105. Computers in Society.** Credit 3 hours. Topics include historical, modern, and future developments, as well as an overview of a computer system's hardware, software and people. Issues concerning security, privacy, and ethics will be discussed. Includes practical application of using communication software networks, including the Internet and the World Wide Web. This course does not satisfy the general requirement for computer literacy. (Fall, Spring, Summer)

**110. Computer Literacy.** Credit 3 hours. An introduction to microcomputer hardware and software. Software includes an operating system, a user interface, networking, word processing, and electronic spreadsheets. Credit toward the degree will not be granted for both Computer Science 110 and Management 210. (Fall, Spring, Summer)

**120. Microcomputers and BASIC Programming.** Credit 3 hours. Prerequisite: Registration in or prior credit for Mathematics 161 or 165. Introduces microcomputers using the BASIC language. Includes a study of applications and characteristics of microcomputers. (Fall, Spring, Summer)

**161. Algorithm Design and Implementation I.** Credit 3 hours. Prerequisite: Registration in or prior credit for Mathematics 155 or 161, or permission of the Department Head. Basic concepts of computer programming, problem solving, algorithm development, and program coding using a high-level, block-structured language. Credit may be given for both Computer Science 110 and 161. (Fall, Spring, Summer)

**173. Software for Management of Data.** Credit 3 hours. Prerequisite: Mathematics 155 or 161 or permission of the Department Head. Concepts of acquisition, organization, exchange and storage of quantitative data through the use of visual languages and packages. (Fall, Spring, Summer)

**204. Fundamentals of Information Technologies and Systems.** Credit 3 hours. Survey course to provide a foundation for understanding Computer Information Technology. Coverage of the fundamentals of information system and information technology concepts, strategies and skills. (Fall, Spring, Summer)

**209. Introduction to Applied Networking.** Credit 3 hours. An introduction to networking from an applied perspective. Includes configuration and physical setup of both wired and wireless local area networks using popular platforms. Also covers client/server basics. File and printer sharing, and basic network security settings. (Fall, Spring, Summer)

**210. Social Software.** Credit 3 hours. An application-based introduction to development of Social Software. Blogs, microblogs, podcasting, social networking and related issues will be examined. Emphasis will be on gaining hands-on experience in the use of content authoring tools.

**225. Software Applications.** Credit 3 hours. Prerequisite: Mathematics 241 or equivalent and Computer Science 110. Use of various software packages for data analysis including SAS, SPSS and BMDP. (Fall, Spring, Summer)

**233. Desk Top Publishing.** Credit 3 hours. Prerequisite: Computer Science 110 or with permission of the Department Head. Topics include assembling, and design of document, fonts, art layout, photos, black and white images, shading, colors, graphics, using microcomputers, scanners, and other peripheral devices. (Fall, Spring, Summer)

**234. An Introduction to Applications of Database Management Systems.** Credit 3 hours. Prerequisite: Computer Science 110 or with permission of the Department Head. A course covering relational database basic structure, method of design, implementation and manipulation. Student will design and implement a major database project using a production version database management system. (Fall, Spring, Summer)

**235. Website Design and Construction.** Credit 3 hours. Prerequisite: Computer Science 110 or permission of the Department Head. Design and construction of websites using modern website design software tools. Includes tools for creation of HTML/XHTML, visual elements and inclusion of turn-key interactive and dynamic components. Also covers selection and use of typical website hosting services. (Fall, Spring, Summer)

**257. Discrete Structures.** Credit 3 hours. Prerequisite: Computer Science 161 and Mathematics 155 or 161 or 165. Introduction to discrete structures of computing. Topics include sets, relations, functions, digraphs, matrices, recursion, partially ordered sets, Boolean Algebra, artificial languages, and finite state machines. (Fall, Spring, Summer)

**273. Software for Storing and Analyzing Data.** Credit 3 hours. Prerequisites: Mathematics 165 or 241 and Computer Science 173 or permission of the Department Head. Topics include methods for designing database schema and spreadsheet programs based on quantitative data analysis requirements; implementation of spreadsheet programs and database schema using integrated methodologies with visual languages and software packages. (Fall, Spring, Summer)

**280. Algorithm Design and Implementation II.** Credit 3 hours. Prerequisite: Computer Science 161 and a C or better in Math 155 or 161. An intensive capstone of the material covered in Computer Science 161 and an

introduction to elementary data structures, searches, simple and complex sorts, and objects. (Fall, Spring, Summer)

**285. Software Engineering.** Credit 3 hours. Prerequisite: Computer Science 280 or permission of the Department Head. Introduction of the methods used for specifying, designing, implementing, and testing medium and large scale software systems; methods for organizing and managing software development projects; professionalism and ethical responsibilities in software development. (Fall, Spring, Summer)

**290. Computer Organization.** Credit 3 hours. Prerequisite: Computer Science 120 or Computer Science 161 or Engineering Technology 212. An introduction to the structure and function of computing machines. The primary components of the computer are examined from an organizational and logical standpoint. Topics include introduction to digital systems; machine level representation of data; assembly level machine organization; memory system organization and architectures; and introduction to language translation. Credit toward the degree will not be granted for both Computer Science 290 and Computer Science 293. (Fall, Spring, Summer)

**293. Introduction to Assembly Language.** Credit 3 hours. Prerequisite: Computer Science 120 or Computer Science 161 or Engineering Technology 212. Fundamentals of assembly language programming. Topics include machine representation of data, fixed point, floating point, and decimal arithmetic, macros, address modification, bit manipulation, and subroutine linkage. Credit toward the degree will not be granted for both Computer Science 290 and Computer Science 293. (Fall, Spring, Summer)

**294. Internet Programming.** Credit 3 hours. Prerequisite: Computer Science 280. This course concerns the art and science of programming for WWW Internet applications from a client-side perspective. Basic and advanced HTML will be covered, with emphasis on current scripting technologies. (Spring)

**295. Special Problems.** Credit 1-3 hours. Prerequisite: Computer Science 110 or equivalent. Independent investigation and application of computing software that is not covered in existing courses. May be repeated for up to 3 hours credit. (As needed)

**297. Digital Logic.** Credit 3 hours. Principles of digital logic, to include gates, combinational circuits, flip-flops, registers, counters, timers, memory, buses, input/output interfaces and microprocessors. (Fall)

**315. System Administration.** Credit 3 hours. Prerequisite: Computer Science 285. This course teaches skills and concepts that are essential to the administration of operation systems, networks, software, various computing support systems, and system documentation, policies, and procedures. This also includes education and support of the users of these systems. (Fall)

**329. Computer Networking and Security.** Credit 3 hours. Prerequisite: Topics include protocols used in local area and wide area networks, network administration, and the conceptual and technical aspects of computer security and information assurance, especially as it impacts computer networks and the Internet. (Spring)

**333. Advanced Desktop Publishing and Multimedia.** Credit 3 hours. Prerequisite: Computer Science 233. Students will develop various informative and promotional materials. Emphasis will be on independent work, and developing concepts with outside clients when possible. Projects will include work with traditional print media as well as digital media. Credit toward the degree will not be granted for Computer Science majors. (Spring)

**335. Advanced Web Publishing.** Credit 3 hours. Prerequisite: Computer Science 235 and one introductory programming course or permission of the Department Head. Topics include using a variety of markup languages and scripting techniques for both server and client WWW applications. (Fall, Spring)

**355. Object-Oriented Programming.** Credit 3 hours. Prerequisite: Computer Science 280. Introduction to the Object-Oriented Paradigm, including data abstraction, encapsulation, polymorphism, inheritance, and garbage collection. Implementation of these concepts using an Object-Oriented language. (As needed)

**375. Computer Architecture.** Credit 3 hours. Prerequisite: Computer Science 293 or Computer Science 290. Hardware organization and implementation of computer architecture. Instruction set considerations and addressing modes. System control concepts. CPU control, microprogramming, I/O interface and memory organization. Parallel and data flow architecture. (Spring)

**383. Information Systems.** Credit 3 hours. Prerequisite: Computer Science 285. A study of file organization and management, analysis of the concept of information systems, approaches and techniques for evaluating information systems. Fourth generation languages will be explored. (Spring)

**389. Computer Graphics.** Credit 3 hours. Prerequisites: Mathematics 200 and Computer Science 280. Introduction and techniques of computer graphics. Topics include interactive versus passive graphics, input-output devices, and programming techniques suitable for the visual representation of data and images. (Odd Year Spring Semesters)

**390. Data Structures.** Credit 3 hours. Prerequisite: Computer Science 257, 280, and registration in or prior credit for Computer Science 285. Further study of trees, including: balanced trees, B-trees, 2-3 trees, and tries; external sorting, symbol tables, and file structures. (Fall, Spring, Summer)

**391. Numerical Methods.** Credit 3 hours. Prerequisites: Computer Science 280 and Mathematics 201 or equivalent. Computer-oriented numerical methods for scientific problems. Topics include error analysis, Taylor series, solutions of equations, linear simultaneous equations, and interpolation. (Even Year Fall Semesters)

**394. Web Systems and Technologies.** Credit 3 hours. Prerequisite: Computer Science 294. This course covers the setup and management of important web-based services, server-supported programming technolo-

gies, and some other host-management issues such as user support, security, staffing, and purchasing. (Even Year Fall Semesters)

**400. Internship.** Credit 1-6 hours. Prerequisite: CMPS 390 and permission of the Department Head. Student must be an integral part of a software project team in industry during the semester. Graded as Pass/Fail only. Can be counted as a general elective only, not as a Computer Science Elective (300-400). (As Needed)

**401. Survey of Programming Languages.** Credit 3 hours. Prerequisite: Computer Science 390. Involves the formal study of programming languages, specification, and analysis in terms of data types and structures. (Fall)

**409. Advanced Computer Networking.** Credit 3 hours. Prerequisite: Computer Science 309. Advanced computer networking. Topics include security, optimization, custom modules, protocols, information flow management, disaster recovery, wireless applications, and legal and ethical issues. (Odd Year Spring Semesters)

**411. Capstone I.** Credit 3 hours. Prerequisite: Computer Science 390. This course must be taken in the academic year in which the student intends to graduate. Through participation in a major capstone project, this course presents a formal approach to the top-down design, development, and maintenance of software systems. Topics include organization and management of software projects, security, programmer teams, validation and verification. (Fall)

**412. Capstone II.** Credit 3 hrs. Prerequisite: Computer Science 411. This course provides for direction to students wishing to extend a completed capstone experience from CMPS 411. Students are expected to make a substantial change or improvement that extends their basic capstone experience. (As Needed)

**415. Integrated Technologies for Enterprise Systems.** Credit 3 hours. Prerequisite: Computer Science 390. This course provides an introduction to several current technologies, and how they can be used to integrate software solutions into a functional large interconnected system. The course will focus on contemporary technologies used for enterprise software development. (Spring)

**420. Human Computer Interaction.** Credit 3 hours. Prerequisite: Computer Science 390. Designing, implementing, and evaluating computer systems. Task analysis, prototyping, usability evaluation, dialogue specification, interaction styles and techniques, human factors, virtual reality, multimedia, and hypermedia systems. (Fall)

**431. Operating Systems.** Credit 3 hours. Prerequisite: Computer Science 375 and 390. Design and implementation of operating systems. Topics include process management, processor management, memory management, device management, file management, process synchronization and interprocess communication, and user interface. Other issues such as distributed computing and system performance may be discussed. (Fall)

**434[393]/534. Fundamental Algorithms.** Credit 3 hours. Prerequisites: Computer Science 257, 390 and Mathematics 201. The design, implementation, and complexity of algorithms analysis. (Odd Year Fall Semesters)

**439/539. Database Systems.** Credit 3 hours. Prerequisite: Computer Science 390. Design and implementation of database systems. Topics include hierarchical, relational, and network models, normalization of relations, data integrity and security, and database administration. A programming project using a relational DBMS is required. (Spring)

**441. Artificial Intelligence.** Credit 3 hours. Prerequisites: Computer Science 390 and Mathematics 241 or Mathematics 380. Introduction to intelligent processes and their performance by a computer. Topics include computer representation of knowledge, problem solving, game playing, theorem proving, natural language understanding, computer vision, and robotics. (Odd Year Fall Semesters)

**443/543. Simulation and Modeling.** Credit 3 hours. Prerequisite: Computer Science 390 and Mathematics 380. Construction and use of computer and mathematical models, parameter estimation, simulation techniques, applications of simulation, examples, and cases and studies taken from physical, social and life sciences, engineering, business and information sciences. (Even Year Fall Semesters)

**447. Introduction to Robotics.** Credit 3 hours. Prerequisite: Computer Science 280. An introduction to robotics including the history of robots, the sense-plan-act paradigm, any-time learning systems, and the three-layer architecture. The class will emphasize concepts and practical application of robotics. (Even Year Fall Semesters)

**450/550. Spatial Database and Applications.** Credit 3 hours. Prerequisite: Computer Science 390. Topics include introduction to GIS, map projections and coordinate systems, spatial data structures, data entry, spatial database management, spatial analysis, remote sensing, GPS and GIS, internet GIS, and GIS scientific applications. (Odd Year Fall Semesters)

**455/555. Computational Aspects of Game Programming.** Credit 3 hours. Prerequisite: Math 200 and Computer Science 280. This course will investigate computational aspects of game programming, and students completing the course will have sufficient technical background, well founded in science, to be able to successfully develop computer video games. Topics covered include coordinate systems, geometric elements, transformations, hyperspace, numerical analysis, rendering, graphics, lighting, code optimization, and other system design and programming issues related to game programming. (As Needed)

**458/558. Expert Systems.** Credit 3 hours. Prerequisite: Computer Science 441. Introduction to Expert Systems. Topics include artificial intelligence techniques for Expert Systems, knowledge bases, knowledge repre-

sentation, inference engines, system shells, natural language processing, heuristic techniques, rule-based systems, and meta level languages. (As Needed)

**460. Design and Implementation of Neural Networks.** Credit 3 hours. Prerequisite: Computer Science 441 and Mathematics 360. Introduction to Neural Networks. Topics include connections, processing elements, n-dimensional geometry, self-adaptive equations, data transformation structures, mapping networks, and neuro-computing applications. (As Needed)

**470/570. Machine Learning.** Credit 3 hours. Prerequisites: Computer Science 390 and Mathematics 241. Introduction to machine learning. Topics include genetic algorithms, inductive learning, statistical learning methods, reinforcement learning, neural networks, decision trees, analytical learning, and Bayesian learning. (Even Year Spring Semesters)

**479. Automata and Formal Languages.** Credit 3 hours. Prerequisites: Computer Science 257 or Mathematics 223 and senior standing. Introduction to computing device capabilities through study of abstract machines and corresponding formal languages. Topics include Turing machines, recursion, Chomsky grammars, context-free languages, regular languages, and finite automata. (Spring)

**481. Seminar.** Credit 1 hour. Prerequisite: Senior Classification. Discussion of social, ethical, and professional issues. Students present reports on topics of current interest in Computer Science. (As Needed)

**482. Current Trends in Computer Science.** Credit: 3 hours. Prerequisite: Senior Classification and registration in or prior credit for CMPS 411. Topics include computer and information ethics, social implications of technology, current trends in computer science and information technology applications and development, professional issues, and emerging trends and current topics in computer science research. (Fall, Spring, Summer)

**491/591. Special Topics.** Credit 1-3 hours. Prerequisite: Permission of Department Head. Special topics in computer science that are appropriate for major electives in the Science and Information Systems concentrations. Any combination of 491/591, 493/593, and 494/594 may be taken for up to 9 hours of credit, provided that the specific topics are different. (As Needed)

**493/593. Special Topics in Computer Science Theory.** Credit 1-3 hours. Prerequisite: Permission of the Department Head. Special topics in computer science that are appropriate for a Theory elective in the Information Technology concentration. Any combination of 491/591, 493/593, and 494/594 may be taken for up to 9 hours of credit, provided that the specific topics are different. (As Needed)

**494/594. Special Topics in Information Technology.** Credit 1-3 hours. Prerequisite: Permission of the Department Head. Special topics in computer science that are appropriate for an Information Technology elective in the Information Technology concentration. Any combination of 491/591, 493/593, and 494/594 may be taken for up to 9 hours of credit, provided that the specific topics are different. (As Needed)

**495/595. Special Problems.** Credit 1-3 hours. Prerequisite: Permission of Department Head. Permits work by students on special projects in Computer Science. May be taken more than once for credit.

**691. Advanced Special Topics.** Credit 1-3 hours. Prerequisite: Permission of Department Head. Special topics in advanced computer science that are appropriate for graduate students with a computer science background. May be taken multiple times, provided that the specific topics are different. (As Needed)