

CS 1000. Computer Basics (3). Fall, Spring, Summer. Computer technology and related social issues. Hardware, software, applications in diverse areas. Problems concerning computerized services, data banks, governmental controls. Problem solving using software packages (such as hypertext, spreadsheets, word processing, database, presentation graphics, etc.). Credit not applicable toward a major in computer science. Prerequisite: one year of high school algebra or MATH 0950. Extra fee. Approved for Distance Ed.

CS 1010. Introduction to Programming (3). Fall, Spring, Summer. Algorithms. Programming language features: expressions, assignments, functions with parameters, conditions, loops, arrays. Several programming assignments required. Does not apply to the computer science major. Prerequisite: two years of high school algebra or MATH 0950. Extra fee. Approved for Distance Ed.

CS 1800. Introductory Topics (1-3). Introduction to the use of a programming language or other computer software. Can be repeated to three hours if topics differ. Credit not applicable to major in computer science. Extra fee.

CS 1810. Introductory Topics (1-3). Introduction to the use of a programming language or other computer software. Can be repeated to three hours if topics differ. Credit not applicable to major in computer science. Graded S/U.

CS 2010. Programming Fundamentals (3). Fall, Spring, Summer. Problem solving and algorithm development. Basic programming concepts including elementary data types, arrays, strings, files, control structures, and functions. Searching and sorting algorithms. Testing and debugging strategies. Prerequisite: Two years of high school algebra or MATH 1120 or equivalent.

CS 2020. Object-oriented Programming (3). Fall, Spring, Summer. Introduction to object-oriented programming techniques. Constructors, destructors, operator overloading. Inheritance and polymorphism. Elementary data structures including linked lists. Dynamic storage allocation concepts. Prerequisite: Grade of C or better in CS 2010.

CS 2170. Computer Organization (3). Fall, Spring, Summer. Organization of digital computer hardware. Combinational and sequential circuits. Assembly language concepts. ALU, CPU, and control unit design. Projects will be implemented on a circuit simulator. Prerequisite: CS 2010.

CS 2800. Intermediate Topics (1-3). Introduction to use of a programming language or other computer software. For students who already know how to program. Can be repeated to three hours if topics differ. Credit not applicable to major in computer science. Prerequisite: CS 1010 or CS 2010 or equivalent. Approved for Distance Ed.

CS 2900. Internship (Co-op) Preparation (1). Fall. Introduction to the internship experience. Resumes. How to work a job fair and how to interview. Job search strategies. Professional ethics and etiquette. Credit not applicable to a major in computer science. Prerequisite or corequisite: CS 2020. Graded S/U.

CS 3000. Professional and Societal Issues in Computing (3). Summer. Impact of computers, the Internet and related computer technology on society and the social forces underlying the rapid and widespread adoption of computer technology. Personal privacy, intellectual property, legislative and constitutional issues, changing labor force composition, professional ethics. Not a programming course. Prerequisite: CS 2010 or equivalent. Approved for Distance Ed.

CS 3010. Information Management Technologies (3). Spring. An introduction to technologies of current importance in information management application development, such as database management, computer graphics, artificial intelligence, and web development. Prerequisite: CS 2020.

CS 3140. Web Application Development (3). Fall. A survey of web technologies and emerging web standards, protocols, markup languages, and scripting languages. Both client-side and server-side technologies and scripting languages are covered. Prerequisite: CS 2010.

CS 3160. Windows Application Development (3). Spring. Implementing a graphical user interface on the Windows operating system with object-oriented programming. Event-driven programming; dialogs and controls; data validation; graphics; database access; n-tier application design. Prerequisite: CS 2020.

CS 3210. Introduction to Software Security (3). Introduction to software security and secure programming guidelines. Basic security issues of programming languages, C and C++, and secure coding. Prerequisite: CS 2020. Approved for Distance Ed.

CS 3240. Usability Engineering (3). Spring. User interface design and human-computer interaction. Understanding the user. Design and prototyping of highly usable interfaces. Design notations, dialog styles, screen layouts, and usability testing. Event-driven programming language for rapid prototyping. Prerequisite: CS 2020.

CS 3270. Operating Systems and Networks (3). Fall. Design of multiprocessing operating systems, process scheduling and synchronization. Device drivers and communication hardware. Networks and their

topologies. Communication protocols and client/server environments with implication for operating system services and user programs. Prerequisites: CS 2020 and CS 2170.

CS 3350. Standard Data Structures and Algorithms (3). Fall. Advanced programming concepts. Adaptation and use of standard class libraries and generic algorithms. Prerequisite: CS 2020.

CS 3600. COBOL Programming (3). Spring. COBOL programming language and techniques for use; report generation; table handling; sorting; sequential and random-access data files; debugging techniques; COBOL standards. Prerequisite: Grade of "C" or better in CS 1010 or CS 2010. Extra fee.

CS 3710. Introduction to Unix (1). Fall. The Unix operating system; utilities, file structure; pipes; filters; shell programming. Prerequisite: CS 1010 or CS 2010. Graded S/U.

CS 3720. Unix System Administration (2). Fall. User accounts; devices and drivers; file systems and disk management; backups; startup and shutdown; network services and applications; print service; security issues. Graded S/U. Corequisite: CS 3710.

CS 3800. Special Topics in Computer Science (1-3). Detailed study of the professional and ethical issues pertaining to computer science or of a particular computer system or programming language which is not covered elsewhere in the curriculum. May be repeated if topics differ. Prerequisite: CS 2010. Approved for Distance Ed.

CS 3900. Practicum in Computer Science (1-6). For students working in internship or co-op programs. Written report required. Does not apply to major or minor in computer science. May be repeated to three hours. Students working through the internship office may earn up to six hours of credit. Prerequisite: consent of department. Graded S/U.

CS 4080. Advanced Operating Systems (3). Spring. Structure of operating systems. Physical input-output, buffering, interrupt processing. Memory, processor, device, information management; resource management interdependencies. Job and processor scheduling. Prerequisite: CS 3270.

CS 4090. Language Design and Implementation (3). Fall. Fundamental concepts of languages. Processors, data, operations, sequence control, data control, storage management, syntax, translation. Prerequisite: CS 2170 and CS 3350.

CS 4100. Formal Language Theory (3). Fall (odd years.) Various types of languages (context-sensitive, context-free, regular). Discussion of recognition devices such as pushdown automata, linear bounded automata and Turing Machines. Some topics of current interest. Prerequisite: MATH 2220 or MATH 3220.

CS 4170. Introduction to Parallel Computing (3). Fall (even years). Principles and practice of parallel computing. Parallel program design, implementation and evaluation of parallel programs for shared memory, local memory and vector architectures. Prerequisite: CS 3270.

CS 4200. Artificial Intelligence Methods (3). Summer (odd years). Intermediate AI programming with application to representative problems requiring searching, reasoning, planning, matching, deciding, parsing, seeing and learning. Prerequisite: Junior or senior standing.

CS 4250. Computer Graphics (3). Spring (every year); Summer (even years). Graphic I-O devices; two-dimensional and three-dimensional display techniques; display processors; clipping and windowing; hidden-line removal; data structures for graphics. Prerequisites: CS 3350 and one of MATH 2220, MATH 3220, MATH 3320.

CS 4290. Data Communication and Networks (3). Spring. Data communication concepts; network topologies; transmission media; network access control; communication protocols; network architecture; LANs, MANs, and WANs; internetworking. Prerequisite: CS 3270.

CS 4400. Optimization Techniques (3). Fall (even years). Linear programming, game theory, PERT, network analysis; duality theory and sensitivity analysis; applications. Computer programs written to implement several techniques. Prerequisites: CS 1010 or CS 2010 and either MATH 2220 or MATH 3220.

CS 4420. Techniques of Simulation (3). Fall (odd years). Principles of simulation and application of simulation languages to both continuous and discrete systems. Prerequisites: MATH 2470 and CS 2020.

CS 4510. Numerical Analysis (3). Fall. Study of numerical methods for interpolation and approximation, integration and differentiation, solution of non-linear equations and systems of linear and non-linear equations. Prerequisites: CS 1010, or CS 2010 and MATH 3320. Not open to students with credit for MATH 4510.

CS 4520. Numerical Analysis (3). Spring. Numerical methods for the algebraic eigenvalue problem, solutions of ordinary differential equations; topics from approximation theory, numerical solution of partial differential equations, optimization techniques and sparse matrix computations. Prerequisites: CS 4510 and MATH 3370. Not open to students with credit for MATH 4520.

CS 4620. Database Management Systems (3). Spring. Semantic models for conceptual and logical design of databases. Detailed study of relational systems: design, dependency and normal forms. Use of interactive and embedded query language. Overview of topics such as database connectivity, security and object-oriented systems. Prerequisite: CS 2020.

CS 4640. Software Development (3). Fall. In-depth study of all aspects of software development process: user requirements, specifications, design, coding, testing, maintenance, documentation, management. Use of CASE tools for analysis and design. Prerequisite: CS 3240.

CS 4800. Seminar in Computer Applications (1-3). Prerequisite: consent of instructor. May be repeated up to six hours.

CS 4900. Independent Project (1-3). Readings and/or computer implementations in area of interest to individual student. Does not apply to a major in computer science. May be repeated up to six hours. Graded S/U.