

Computer Science Course Descriptions

(Department of Computer Science)

CSC 100. Orientation to Computer Science (1) Introduction to the field of computer science. Overview of computer science disciplines, application areas, and career options. Presentations in the department's research areas. This course is a required course for all majors and minors in computer science.

CSC 105. Introduction to Computing and Computer Applications (3) Basic computer concepts for non-CSC majors. Elements of computing systems and organization; computer communications including the Internet; applications such as word processing; spreadsheets, data base management, and the rudiments of programming in a current programming language. Social and technical issues including legal, ethical, and security considerations. Students who have passed MIS 105 may not enroll in CSC 105.

CSC 110. Fluency in Information Technology (3) Information representation, the Internet and HTML, algorithmic thinking and programming, language translation, modeling and abstraction, algorithmic complexity and non-computability, machine architecture and parallel computation, networks and communication database principles, multimedia, social impacts of computing.

CSC 112. Introduction to Computer Programming (3) Prerequisite: MAT 111 or 115. An introduction to programming in a high-level language for students who are not computer science majors. Algorithms, computer systems, data representation, survey of computer applications, elementary programming techniques, debugging and verification of programs. The language to be used will be specified in the schedule of classes. Two lecture and two laboratory hours each week. May be repeated once for credit under a different subtitle.

CSC 121. Introduction to Computer Science I (3) Prerequisite: MAT 111 or 115. Problem-solving methods and algorithms in a modern high-level programming language. Introduces classes and objects; control structures; arrays; characters and strings. Emphasis on programming style and the design, coding, and testing of complete programs. A grade of "C" (2.00) or better is required for taking any course for which CSC 121 is prerequisite. Two lecture and two laboratory hours each week.

CSC 133. Discrete Mathematical Structures (4) Prerequisite: MAT 111 or 115, or equivalent. Corequisite: CSC 121. Introduction to discrete mathematics applicable to computer science. Propositional and predicate logic, basic proof techniques, set algebra and Boolean algebra, recursion and induction, trees and graphs, and introductory combinatorics. Four lecture hours each week.

CSC 204. Multimedia Systems (3) Prerequisite: CSC 105 or 110 or equivalent. Introduction to technologies of the Internet. Issues in Web page design; graphics and animation; client/server concepts; collaborative computing and group work; network publishing; security and encryption; audio, video, and image compression; ethical issues and privacy; e-commerce; client-side Web programming; and dynamic Web page generation.

CSC 220. (ART 220) (FST 220) 3-D Computer Graphics Tools and Literacy (3) Prerequisites: CSC 105, 121 or permission of instructor. Project-based approach to learning fundamental principles of 3-D computer graphics using high-level software tools. Modeling of objects, geometrical transformations, surface algorithms, lighting and shading, alternative rendering techniques, and providing background skills necessary to create animated movies.

CSC 221. Introduction to Computer Science II (4) Prerequisites: CSC 121. Continuation of CSC 121 with emphasis on sorting and searching; recursion; exception and event handling; text and binary file I/O; GUIs; inheritance, interfaces, and polymorphism; and the use of software tools. Completion of a software project is required. A grade of "C" (2.00) or better is required for taking courses for which CSC 221 is a prerequisite.

CSC 242. Digital Logic, Computer Organization and Assembly Language (4) Prerequisites: CSC 121 and 133. Fixed-precision binary numbers, binary representation of integers and real numbers, combinational and sequential logic circuits, memory and logic devices, instruction set architecture, CPU design, I/O and communication, cache memory, introduction to a modern instruction set, machine, assembly and mix language programming, procedure call and return, parameter passing, interrupt handling.

CSC 255. Database Management With Internet Applications (3) Introduction to data management for non-computer science majors. Topics include data storage and retrieval; database modeling and design; security and privacy issues; and database accessibility via the Web. Hands-on experience with database technologies and internet applications.

CSC 275. Topics in Computer Science and Technology (3) Prerequisite: Permission of instructor. Topics of current interest relating to computer science or computer technology and its uses not covered in existing courses. May be repeated under a different subtitle.

CSC 320. (ART 320) (FST 320) Computer Animation (3) Prerequisite: CSC 220 (ART 220) (FST 220) or permission of instructor. Basic principles of animation using 3-D computer-generated animation and basic processes for animating synthetic objects through structured exercises. Principles of designing and producing 3-D computer-generated animation through the creation of advanced motion studies. Projects focus on developing higher-level skills in model building, animation and color, and lighting.

CSC 325. (MAT 325) Numerical Algorithms (3) Prerequisites: CSC 112 or 121, MAT 162. An introduction to the numerical algorithms fundamental to scientific computer work. Includes elementary discussion of error, polynomial interpolation, quadrature, linear systems of equations, solution of nonlinear equations, and numerical solution of ordinary differential equations. The algorithmic approach and the efficient use of the computer are emphasized.

CSC 332. Data Structures (3) Prerequisites: CSC 221. Prerequisite or corequisite: MAT 161. Study of basic data structures and their applications: lists and trees; heaps; graph algorithms; sort and search techniques; hashing; and analysis and design of efficient algorithms.

CSC 340. Scientific Computing (3) Prerequisites: MAT 162 and CSC 221. Introduction to the design, application, and performance of numerical algorithms fundamental to scientific computation. Topics include error and error propagation, finding solutions to linear systems, matrix algebra, finding eigenvalues and eigenvectors, root finding, numerical integration, interpolation and curve fitting. Emphasizes relative merits and implementations of algorithms.

CSC 342. Operating Systems (3) Prerequisites: CSC 242 and 332. Introduction to the C language and study of supervisory programs. System services and file systems; CPU scheduling; memory management; virtual memory; disk scheduling. Deadlock characterization, prevention, and avoidance; concurrent processes; semaphores; critical sections; synchronization. Distributed systems and communication protocols.

CSC 344. Computer Networks (3) Prerequisite: CSC 242. The theory and application of inter-computer communications. Local-area and wide-area networks; data transmission and error correction; OSI and TCP/IP layering protocols; Ethernet, token ring, token bus, and other network technologies; network topologies; the client-server model; bridges and multi-protocol routers; the Internet. Applications include electronic funds transfer and distributed databases.

CSC 360. Formal Languages and Computability I (3) Prerequisites: CSC 242 and 332. An introduction to theoretical computer science. Topics include regular expression and finite state concepts; basic automata theory; formal grammars and languages; computability; Turing machines; elementary recursive function theory.

CSC 370. Computer Graphics (3) Prerequisites: CSC 332 and MAT 162. Detailed study of two-dimensional graphics and introduction to issues from three-dimensional graphics. Graphics hardware and applications. Study of graphics primitives in two dimensions: lines, attributes, windowing, clipping, and transformations. Overview of other topics: three-dimensional transformations, modeling, color science, rendering.

CSC 385. Professional and Ethical Issues in Computer Science (1) Prerequisite: Junior or senior standing in computer science. Student presentations and discussions of case studies relating to computer ethics.

CSC 415. (515) Artificial Intelligence (3) Prerequisite: CSC 332. Introduction to key concepts and applications of artificial intelligence. Knowledge representation; state space searching; heuristic search; expert systems. Biologically inspired computing techniques such as neural networks, fuzzy logic, and genetic algorithms. Implementation of concepts and techniques.

CSC 421. Computer Gaming (3) Prerequisites: CSC 320 (ART 320) (FST 320), 340, and 370. Topics related to the design and implementation of computer games are covered, including design, modeling, and animation of meshes for game characters and environments, scene and object representation, graphics pipeline, collision detection, picking, graphics optimization, and other issues such as basic physics and AI for games. Meshes and animations will be created using 3D software, and code modifications and additions to a game engine will be made.

CSC 422. Performance Evaluation of Computer Systems (3) Prerequisites: STT 215, MAT 162, and CSC 221. Modeling and evaluation of computer systems. Probability spaces and probability calculus, random variables and their distribution functions, the calculus of expectations. Markov chains; birth-death processes; Poisson processes;

single queue; network of queues and their simulation. System simulation for performance prediction. Modeling concurrent processes and the resources they share.

CSC 425. (525; MAT 425/525) Numerical Analysis (3) Prerequisites: MAT 325, 335 and 361. Introduction to the theoretical foundations of numerical algorithms. Solution of linear systems by direct methods, least squares, minimax, and spline approximations; polynomial interpolation; numerical integration and differentiation; solution of non-linear equations; initial value problems in ordinary differential equations. Error analysis. Certain algorithms are selected for programming.

CSC 430. (FST 430) Digital Special Effects (3) Prerequisites: CSC 332 and 220, or FST 302 and 220. Covers aspects of digital image and video representation and manipulation for motion-picture visual effects. Topics include image storage and compression, film and video formats, compositing, filtering, scripting for graphics and visual effects, photorealistic lighting and rendering, virtual cinematography, camera tracking, and particle effects.

CSC 434. Programming Languages (3) Prerequisites: CSC 332 and 360. Comparative study of programming languages from both theoretical and applied viewpoints. Typical issues include syntax and semantics, scope and binding times, storage allocation, parameter-passing techniques, control structures, run-time representation of programs and data. Detailed examples from the imperative, functional, parallel, object-oriented, and logical programming paradigms.

CSC 437. (CSC 537) Parallel Computing (3) Prerequisite: CSC 340. Implementation of scientific algorithms in parallel. Use of shared-memory, distributed-memory, and multicore technologies. Study of techniques for improved performance and issues related to speedup and slowdown.

CSC 442. Computer System Architecture (3) Prerequisite: CSC 242. Advanced study of the architecture of computer systems. Common processor organizations, hardwired and micro-programmed control, input/output subsystem; bus control; programmed I/O; DMA and interrupts; memory subsystem; interleaved, cache and associative memory; cache design; instruction pipelines, arithmetic pipelines, and their scheduling, RISC and CISC architectures, common multiprocessor architectures.

CSC 444. Network Programming (3) Prerequisites: CSC 342 and 344. Implementation of network and distributed programming concepts using C, C++, or JAVA on UNIX or PC platforms. Networking programming interfaces, security, management, design and applications. Hands on experience with network components. Students plan, configure, install, diagnose, performance tune, operate, and manage state-of-the-art computer networks, internetworking devices, and protocols.

CSC 446. (CSC 546) Grid Computing (3) Prerequisite: CSC 344 or 332. Grid computing software components, standards, Web services, security mechanisms, schedulers and resource broker, workflow editors, grid portals, grid computing applications.

CSC 450. Software Engineering (3) Prerequisites: CSC 332 and senior standing. Study of the design and production of large and small software systems. Topics include systems engineering, software life-cycle and characterization, use of software tools. Substantial software project required.

CSC 453. Object-Oriented Analysis and Design (3) Prerequisites: CSC 332 and senior standing. An exploration of object-oriented design and software construction. Topics in object-oriented analysis and programming: classes, methods, messages, inheritance, static and dynamic binding, polymorphism, templates, design methodologies, class libraries, and software reuse. Substantial object-oriented software project required.

CSC 455. Database Management (3) Corequisite: CSC 332. Introduction to relational database management systems. E-R models, relational algebra, SQL, database design, normalization, transaction processing concepts. Substantial software project required.

CSC 457. Compiler Construction (3) Prerequisites: CSC 434 and senior standing. Study of programming language translation. Organization of a compiler including symbol tables, lexical scan, syntax scan, object code generation, error diagnostics, object code optimization, and overall design; compilation of simple expressions and statements; use of compiler writing tools. Substantial software project required.

CSC 460. Formal Languages and Computability II (3) Prerequisite: CSC 360. Advanced topics in theoretical computer science. Theory of computation; languages and syntactic analysis; computational complexity and NP - completeness.

CSC 475. Topics in Computer Science (3) Prerequisites: Senior standing and permission of instructor. Topics of current interest in computer science not covered in existing courses. May be repeated under a different subtitle.

CSC 491. Directed Individual Study (1-3) Prerequisites: Overall GPA of at least 2.00, junior or senior standing, and consent of instructor, department chair and dean. Involves investigation under faculty supervision beyond what is offered in existing courses. For further information, consult the Directed Individual Studies section in this catalogue.

CSC 495. Seminar in Computer Science (1) Prerequisites: Junior or senior standing and consent of instructor.

CSC 498. Internship in Computer Science (1-3) Prerequisites: Overall GPA of at least 2.50 and a GPA in CSC courses of at least 2.80. Academic training and practical experience through work in a private company or public agency. Faculty supervision and evaluation of all study and on-site activity. Open to students of junior or senior standing who have been approved by the faculty supervisor, department chair, and dean.

CSC 499. Honors Work in Computer Science (2-3) Prerequisite: Eligibility for honors program. Individual study for honors students.

For 292 and 492; 294 and 494, see explanations on p. 184, 107.