COMPUTER SCIENCE • CSC

General education courses are marked with stars (*).
4601 Computer and Network Security (3) Prereq.: CSC 3102. Information security’s role, threats, elements of cryptography; protocols, architectures, and technologies for secure systems and services.

4602 Fundamental Computer Science for Teachers (3) Prereq.: ELRC 4507 (or prior programming experience) and credit in an education methods course numbered 3000 or below. Also offered as ELRC 4512. Advanced programming techniques; emphasis on structured programming, software and hardware organization, data structures, graphs, and other topics to prepare students to teach computer science in secondary schools.

4700 Special Topics in Computer Science (3) Prereq.: CSC 5102 or permission of department. May be taken for a max. of 9 cr. hrs. when topics vary. Total hrs earned in CSC 4501-5501 should not exceed 9 hrs. in any of the listed areas of current interest in computer science.

4890 Introduction to Theory of Computation (3) Prereq.: CSC 2259. Introduction to finite automata, regular expressions and languages; push-down automata and context-free languages; selected advanced language theoretical topics; emphasis on technique.

4990 Advanced Independent Undergraduate Research (1-3) Prereq.: consent of department chair. May be taken for a max. of 4 hrs. of credit. Individual readings, conferences, and program development in computer science.

6100 Advanced Elements of Computer Science for Teachers (3) Prereq.: computer science programming course or knowledge of a programming language required. Advanced techniques using a high-level language; data structures and computer systems software.

7080 Computer Architecture (3) Prereq.: CSC 7002 or equivalent. Background in electronics not required. Functional architecture of modern digital computer systems; detailed description of instruction set implementation with multiprocessor and multiprocessor structures; design and analysis of instruction sets and control structures.

7100 Knowledge Representation (3) Prereq.: CSC 4101 or equivalent. Algo-
tributive languages.

7103 Advanced Operating Systems (3) Prereq.: CSC 4103. Concurrent operating systems: shared memory, communication, and operation-oriented models; concurrent, distributed, and network programming; distributed operating systems; synchronization and deadlock detection in distributed systems.


7135 Software Engineering (3) Prereq.: CSC 4330 or equivalent. Formal specification techniques, design techniques, abstraction, information hiding, modularity, software testing, automated testing tools, maintainability factors, and cost estimation.

7200 Theory of Computation I (3) Prereq.: CSC 4990. Algorithms, computability, decidability, enumerability; formal replacements and Church’s thesis; Turing machines, primitive recursive functions, u-recursive functions; undecidable predicates.

7201 Theory of Computation II (3) Prereq.: CSC 7200. Theory of computation; problems for complexity classes, NP, P, PSpace, and NLog; characterization of polynomial time algorithms, log space, log space Turing machines and log space Turing machines by auxiliary pushdown stores; time-space trade-offs and combinatorial problems.

7235 Advanced Software Engineering (3) Prereq.: CSC 7135. Formal testing, validation and verification techniques; in-depth study of formal specification languages and techniques.

7300 Algorithm Design and Analysis (3) Characteristics of an algorithm; problems of algorithm existence; the design, implementation, and complexity of algorithms; algorithm correctness.

7333 Machine Learning (3) Prereq.: CSC 4444. Fundamental principles of machine learning; inductive learning; explanation-based learning; computational approach to knowledge representation, learning formal languages and recursive languages; neural network learning and genetic algorithms; applications of machine learning.

7351 Advanced Compiler Design Theory (3) Prereq.: CSC 4351 or equivalent. Automatic generation of LL (1), LR (1), LALR (1) parsers, syntax directed translation of high-level control structures, error recovery, optimization of branching, local code optimization using directed acyclic graphs, loop optimization, global data flow analysis, and object code optimization.

7370 Graph Algorithms (3) V Prereq.: MATH 4171 or equivalent. Graph layout algorithms; networks; application of network flow techniques; polynomial time algorithms and NP-completeness; dynamic graph drawing.

7372 Graph Algorithms for Parallel and Distributed Computing (3) Prereq.: CSC 7500 or equivalent. Parallel algorithms for searching, sorting, matrix processing, network optimization, and other problems; implementation and efficiency measures of the algorithms on different machines, and VLSI systolic arrays.

7374 Computational Models for Mobile Robots (3) Prereq.: CSC 7500. Computational tools for design, analysis, and implementation of algorithms for robotic applications: control of autonomous robots, optimal path planning, environment exploration, robust navigation, and sensor-fusion problems for mobile robots.

7375 Robot Vision (3) Prereq.: CSC 7500 or equivalent. 3D computer vision aspects of visual techniques from computational geometry, computer graphics, and artificial intelligence: visual recognition and classification.

7380 Computational Geometry (3) Prereq.: CSC 7500 or equivalent. Data structures and algorithm design techniques for geometric problems; geometric searching; convex hulls; Voronoi diagrams; proximity; intersections of geometric objects; applications of computational geometry.

7381 Computational Aspects of VLSI CAD (3) Prereq.: CSC 7500 or equivalent. Overview of VLSI design and fabrication process; abstract model of VLSI; combinatorial optimization algorithms; circuit partitioning; placement and floor plan: global routing; detailed routing; and circuit compaction.

7402 Data Base Management Systems (3) Prereq.: CSC 4402. Implementation of database systems (physical model and its mapping to conceptual model), data structures and their influence on performance, concurrency control, distributed databases, advanced database systems.

7420 Parallel and VLSI Computation (3) F Prereq.: CSC 3102. Theoretical aspects of the design and analysis of algorithms for parallel computation; physical implementation of VLSI chips.

7424 Data Mining and Knowledge Discovery (3) Prereq.: CSC 7333. Introduction to data mining and knowledge discovery in databases; data cleaning, statistical techniques, and rule learning; time series and spatial data mining algorithms, clustering algorithms, data visualization.

7443 Scientific Information Visualization (3) Prereq.: CSC 7500 or equivalent. Study of computer visualization principles, techniques, and tools used for exploratory and interactive information visualization, includes visualization algorithms, techniques, and applications.

7444 Advanced Artificial Intelligence (3) Prereq.: CSC 4444 Temporal and nonmonotonic logic; truth maintenance systems; probabilistic reasoning; deductive databases; automated learning, planning, and tutoring; story understanding; structure of domain dependent expert systems.

7446 Soft Computing (3) Prereq.: CSC 4464 or permission of instructor. Interplay of three paradigms in soft computing: fuzzy sets and fuzzy logic, neural computing, and evolutionary algorithms; applications in image processing, diagnosis and classification, decision making, and other areas; software and simulation tools for problem solving in the soft-computing arena.

7500 Programming and Performance Evaluation of Parallel Computers (3) Prereq.: CSC 3102 or equivalent and CSC 7300. Parallel programming techniques; message passing and synchronization; performance evaluation; prediction of parallel architectures and algorithms, scalability analysis.

7481 Information Retrieval Systems (3) Prereq.: CSC 3102 or equivalent. Also offered as LIS 7610. Topics include commercially available retrieval systems, text content analysis, query processing models and current research problems.

7550 System Modeling and Computer Simulation (3) Prereq.: CSC 2263 or equivalent. Construction and use of mathematical and computer models; parameter estimation; compartmental models; simulation techniques; applications of simulations; examples and case studies from physical, social, and life sciences, engineering, business, and information sciences.

7551 Advanced Computer Networks (3) Prereq.: CSC 4501. Design and analysis of computer networks; routing algorithms and protocols; switch and router architectures; traffic flow management and error control; scheduling and quality of service; modeling and performance evaluation; queuing theory applied to computer networks; selected issues in high-speed network design.

7552 Advanced Computer and Network Security (3) Prereq.: CSC 4601. Secret sharing; secret sharing homomorphism; verifiable secret sharing; electronic voting; advanced cryptography; anonymity on the net; wireless security.

7550 Distributed Systems (3) Prereq.: CSC 4103. Networking and inter-networking; client-server model; remote procedure calls; processes and processors in distributed systems; transaction-processing techniques; transaction-processing systems.

7560 Computational Methods (3) Prereq.: CSC 4362 or equivalent. Simulation, implementation, and analysis of numerical algorithms; algorithm concept introduced in context of abstract schemes.

7600 High Performance Computing I (3) V Prereq.: CSC 4362 or consent of instructor. Fundamental computational techniques required for scientific computing; important algorithms for parallel computation; high performance computing.

7601 Design Issues in High-Speed Networks: Multicasting, Pricing and Control (3) Prereq.: CSC 4501. Multicasting architectures, protocols, and applications; ATM and Internet solutions; scalable reliable multicast, distributed sensor networks; Internet pricing and economics of communication; game theoretic approaches to congestion control.

7602 Wireless Networks (3) Prereq.: CSC 4501. Radio systems and ad-hoc wireless networks; relevant concepts in terms of mobility, migration, and service levels and their impact on system design; wireless network communication; packet radio techniques; ad-hoc networks; nomadic computing; issues in cellular networks; TCP/IP over wireless.

7610 High Performance Computing II (3) V Prereq.: CSC 7600 or equivalent. Finite difference schemes for molecular dynamics; classical deterministic simulations; computational models for parallel computer systems; computational models for molecular dynamics; computational biology.

7620 High Performance Computing III (3) V Prereq.: CSC 7600 or equivalent. Basic stochastic simulation techniques for massively parallel computer systems; simulated annealing and routing algorithms.

7700 Special Topics in Computer Science (3) May be taken for a max. of 12 hrs. of credit when topics vary. Specialized areas of current interest in computer science.
7701 Sensor Networking Concepts (3) Prereq.: CSC 4501 or 7501. Self-organizing sensor networks; querying, and data aggregation; routing; energy-efficient communication protocols; sensor network security.

7702 Telecommunications Networks (3) Prereq.: CSC 4501. The convergence of traditional voice-centric telecommunication networks, applications-focused distributed middleware architectures, and the Internet; traditional telecommunications; telephone and ISDN architectures; Signal System 7; distribution of application processing in the Advance Intelligent Network; new frameworks for Internet-based core architectures; proposals to generalize the existing telephony architecture.

7800 Computer Science Research Seminar (1) V May be taken for a max. of 2 hrs. of credit when topics vary. Pass-fail grading. Student presentations and discussions on research topics in computer science.

7999 Selected Readings in Computer Science (1-3) Prereq.: consent of department chair. May be taken for a max. of 6 sem. hrs. of credit.

9000 Dissertation Research (1-12 per sem.) "S"/"U" grading.