Computer Science MS Course Descriptions

CSc I0400: Operating Systems
Underlying theoretical structure of operating systems; input-output and storage systems, data management and processing; assembly and executive systems, monitors; multiprogramming.
Prereq: CSc 33200 or an equivalent undergraduate course. 3 hr./wk.; 3 cr.

CSc I0500: Computer Graphics
An intensive introduction to computer graphics hardware, design of graphics packages, geometric transformations, 3D viewing and projections, raster scan conversion, visible surface determination, lighting and shading, 3D shape representation, and splines. Emphasis is on implementation of important graphics algorithms.
Prereq: CSC 32200 and MATH 34600 or equivalent. 3 hr./wk.; 3 cr.

CSc I0600: Fundamental Algorithms
An intensive study of advanced non-numerical programming techniques. Data representation; list, tree and string manipulation algorithms. Recursive programming. Introduction to searching and sorting. Storage management algorithms. Comparative efficiency of algorithms.
Prereq: CSc 22000 or equivalent. 3 hr./wk.; 3 cr.

CSc I0700: Compiler Construction
Techniques involved in analysis of source languages and generation of efficient object code. Parsing methods, storage allocation, programming language semantics, optimization techniques, interpreters, study of existing compilers and their special features.
Prereq: CSc 22000 and CSc 30400 or equivalent. 3 hr./wk.; 3 cr.

CSc I0800: Topics in Software Systems
Selected topics of current interest. Recent offerings have included computer games, concurrent and distributed processing, search technologies, internet programming and information management. Prereq: CSc 33200 or equivalent. 3 hr./wk.; 3 cr.

CSc I0807: Image Processing
An intensive introduction to imaging intended for graduate students and advanced undergraduates. Topics include digital filtering theory, image enhancement, image reconstruction, anti-aliasing, warping, and state-of-the-art special effects. These topics form the basis of high quality rendering in computer graphics, as well as low-level processing for computer vision, remote sensing, and medical imaging. Emphasizes computational techniques for implementing useful image processing functions. Programming assignments will reinforce material covered in class.
Prereq: CSc 32200 or equivalent. 3 hr./wk.; 3 cr.
CSc I0900: Graph Theory and Algorithms
Extremal graph theory.
Prereq: CSc 22000 or equivalent. 3 hr./wk.; 3 cr.

CSc I1000: Database Systems I
An introduction to database architecture. Levels of abstraction in a database system, physical data organization, abstract data models, relational database systems, and their query language.
Prereq: CSc 22000 and CSc 33200 or equivalent. 3 hr./wk.; 3 cr.

CSc I1100: Database Systems II
Logical models for database management systems, especially relational, hierarchical and network. Case studies illustrating their implications for applications system development. Physical implementation of advanced data and storage structures.
Prereq: CSc I1000 or equivalent. 3 hr./wk.; 3 cr.

CSc I1200: Topics in Algorithms
Current developments in the design, analysis and implementation of algorithms and their applications. Recent offerings have included packing and covering, randomized algorithms, geometric graphs, computational geometry, combinatorics, and algorithms in bioinformatics.
Prereq: CSc 22000 and CSc 30400 or equivalent. 3 hr./wk.; 3 cr.

CSc I1400: Parallel Algorithms
Techniques of efficient program design. Analysis of parallel algorithms chosen from information storage and retrieval, graph theory, pattern matching, matrix operations, etc. as to their time, space, and other resource requirements. Lower bounds for the intrinsic computational difficulty of some of these programs.
Prereq: CSc 22000 and CSc 30400 or equivalent. 3 hr./wk.; 3 cr.

CSc I1500: Artificial Intelligence
The study of how to make the computer behave intelligently. State-space methods of problem solving, heuristic search techniques, representation and use of knowledge, mechanical theorem proving, psychological implications. Examples of game playing, problem solving, or other systems.
Prereq: CSc 22000 and CSc 30400 or equivalent. 3 hr./wk.; 3 cr.

CSc I1600: Natural Language Processing
Methods for processing English texts and dialogues on the computer. Parsing, transformational analysis, semantic analysis, interfacing; examples of natural language systems for carrying on dialogues and performing tests.
Prereq: CSc 44800, or CSc I1500 or equivalent. 3 hr./wk.; 3 cr.
CSc I1800: Topics in Artificial Intelligence
Selected topics from expert systems, automated systems and robotics; automated reasoning; computer vision. Prereq: CSc 44800 or CSc I1500 or equivalent. 3 hr./wk.; 3 cr.

CSc I1896: Computer Vision
A survey of the techniques used in computer vision, which recovers information from images. Topics include: the geometry of image formation; multiple 2D techniques for feature detection, image segmentation, object recognition, and texture; 3D shape from shading, stereo and motion. Some mathematical maturity is assumed, including familiarity with linear algebra, multidimensional calculus and simple statistics. Prereq: CSc 22000, CSc 22100 and MATH 34600 or equivalent. 3 hr./wk.; 3 cr.

CSc I1900: Pattern Recognition and Machine Learning
Generalization and classification; pattern recognition and perception; concept formation; remembering and forgetting; learning and hypothesis formation. Prereq: CSc 44800 or CSc I1500 or equivalent, and knowledge of Linear Algebra. 3 hr./wk.; 3 cr.

CSc I2000: Introduction to Theoretical Computer Science
Fundamental concepts from logic, models of computation, and complexity theory. Scope and limitations of various formalisms. The Chomsky hierarchy of languages and machines. Basic ideas for recursive functions. Impact on programming systems. Prereq: CSc 30400 or equivalent. 3 hr./wk.; 3 cr.

CSc I2100: Finite Automata and Models of Computation
A review of the basic definitions, concepts and results concerning finite automata (e.g. Myhill - Nerode Theorem) Applications of finite state automata in the modeling of circuits for fast arithmetic computation, exploring graphs and robotic computations, pseudorandom number generators for internet protocols, recent physical and biological applications (e.g. Watson-Crick finite automata). Prereq: CSc 30400 or CSc I2000 or equivalent. 3 hr./wk.; 3 cr.

CSc I2200: Theory of Computability
Formulations of effective computability: Post machines. Turing-type models, recursive functions, and semi-Thue systems. The equivalence of the various formulations. Church’s Thesis. Fundamental theorems of computability: universal machines, S-M-N, and recursion theorem. Unsolvable problems. Recursive and recursively enumerable sets. Prereq: CSc 30400 or CSc I2000 or equivalent. 3 hr./wk.; 3 cr.

CSc I2300: Symbolic Computation
A comparative study of the structure and use of various functional, logical and sequential languages used in symbolic computation and artificial intelligence. Choice of appropriate programming tools for specific applications. Comparison of user/machine interfaces. Prereq: CSc 30400 or CSc I2000, or equivalent. 3 hr./wk.; 3 cr.
CSc I2400: Formal Language Theory
Classification of languages by grammars and automata. The Chomsky hierarchy: regular, context free, context sensitive and recursively enumerable languages and their associated grammars and automata. Closure properties for families of languages. Decision problems for grammars and automata.
Prereq: CSc 30400 or CSc I2000 or equivalent. 3 hr./wk.; 3 cr.

CSc I2600: Computational Complexity
Complexity measures for algorithmic systems, determinism vs. non-determinism, time vs. space, complexity hierarchies, aspects of the P-NP question, inherent complexity of specific algorithmic problems, recent applications to cryptography.
Prereq: CSc 30400 and CSc I2000 or CSc I0600. 3 hr./wk.; 3 cr.

CSc I2800: Topics in the Theory of Computing
Topics of current interest, such as quantum computing, biological computing, automated reasoning, parallel computation, advanced topics in complexity, algebraic and symbolic computation, historical issues and open problems.
Prereq: CSc I2000 or departmental approval. 3 hr./wk.; 3 cr.

CSc I3100: Seminar in Information Systems
Topics of current interest in computer-based information systems. Possible topics include computer-human interaction, virtual organization, decision support systems, knowledge management, and systems analysis. Students are required to complete a project on an approved topic in the course.
Prereq: CSc I1000. 3 hr./wk.; 3 cr.

CSc I3110: The Information Marketplace
All aspects of the market for computer-based information products and services. Course objectives are to define and characterize the information marketplace, to present concepts and methods for analyzing behavior within the marketplace, and review public and private policy implications of the information marketplace.
Prereq: strong background in Economics and permission of the instructor. 3 hr./wk.; 3 cr.

CSc I4200: Computer Architecture
Prereq: CSc 34200/34300 or equivalent. 3 hr./wk.; 3 cr.
CSc I4300: Computer Communications
Prereq: CSc 34200/34300 and CSc 32200 or equivalent. 3 hr./wk.; 3 cr.

CSc I4330: Advanced Topics in Internet Programming
The first part of the course will deal with platform independent software and data for Internet programming. The second part will address Web Services–messaging over standard web protocols. Students will be exposed to current technologies and standards. Topics discussed may include: distributed objects and remote invocation, messaging, name services, security.
Prereq: CSc 22100 or equivalent. 3 hr./wk.; 3 cr.

CSc I4600: Topics in Computer Architecture
Selected topics from the current literature in computer architecture.
Prereq: CSc 34200/34300 or CSc I4200 or equivalent. 3 hr./wk.; 3 cr.

CSc I4633: Multimedia
Algorithms and software that handle and manipulate interactively digital sound, image, animation and video. Topics covered include digital sound formats and conversion factors affecting sound quality, digital image formats and conversion, image compression and factors affecting image quality, digital video formats and standards, video compression methods, videoconferencing and interactive media.
Prereq: CSc 32200 and good programming knowledge. 3 hr./wk.; 3 cr.

CSc I4700: Topics in Computer Communications
Selected topics from the current literature in computer communications.
Prereq: CSc I4300 or equivalent. 3 hr./wk.; 3 cr.

CSc I4800: Codes, Cryptography, and Secure Communication
Concepts from probability and information theory entropy, codes for compression, error–correcting codes, secrecy codes, block ciphers and public key cryptosystems, cryptographic protocols for secure communication, introduction to quantum cryptography.
Prereq: CSc 30400 and CSc 34200 or equivalent. 3 hr./wk.; 3 cr.
CSc I4900: Computer Security
Prereq: CSc 30400 and CSc 22000 or equivalent. 3 hr./wk.; 3 cr.

CSc I6000: Mathematics for the Analysis of Algorithms
Those areas of mathematics necessary for the advanced analysis of algorithms: manipulation of sums, solving recurrences, number theory, binomial coefficients, special sequences, generating functions, and asymptotics.
Prereq: CSc 22000 or CSc I0600. 3 hr./wk.; 3 cr.

CSc I6100: Mathematical Programming I
Prereq: CSc 22000 or CSc I0600, and MATH 34600 or equivalent. 3 hr./wk.; 3 cr.

CSc I6200: Mathematical Programming II
Prereq: CSc I6100. 3 hr./wk.; 3 cr.

CSc I6300: Decision Analysis
Prereq: CSc 22000 or CSc I0600, and an undergraduate course in probability. 3 hr./wk.; 3 cr.

CSc I6400: Topics in System Simulation
Simulation methodology, design, and analysis of simulation experiments. Generation and testing of random variates. Variance reduction techniques. Simulation languages. Analysis of queuing models on computer systems simulation.
Prereq: CSc 22000 and CSc 21700 or equivalent. 3 hr./wk.; 3 cr.
CSc I6600: Probabilistic Models in Computer Science
Prereq: CSc 22000 or CSc I0600. 3 hr./wk.; 3 cr.

CSc I6700: Topics in Scientific and Statistical Computing
Selected topics from computer algebra, advanced numerical methods, advanced numerical computation, advanced operations research, combinatorial computing, graph algorithms, cryptography. Recent offerings have included computer vision, cluster computing, digital libraries, pattern recognition and satellite image processing.
Prereq: CSc 22000 or CSc I0600. 3 hr./wk.; 3 cr.

CSc I6730: Data Reduction in the Physical Sciences
A course in the reduction of data sets gathered by government agencies (NOAA and NASA). Data comes from satellite remote sensing and other atmospheric and oceanographic measuring systems.
Prereq: Permission of the instructor. 3 hr./wk.; 3 cr.

CSc I6744: Neural Computing
An introduction to neural networks and their applications. Material to be covered includes: models of a neuron, network architectures, visualization processes and artificial intelligence in neural networks, learning processes, the perceptron, multilayer perceptrons.
Prereq: MATH 20300, MATH 34600 and a working knowledge of C or Fortran. 3 hr./wk.; 3 cr.

CSc I9600: Special Topics in Contemporary Computer Science
A research seminar course, focusing on a specialized and contemporary topical areas of computer science. The course will present research articles and technology papers to students in the chosen topic, actively engaging them in the presented materials through their interactive discussions, writing of short summary reports, team projects, literature search and/or exams.
Prereq: advanced graduate standing and permission of the instructor. 3 hr./wk.; 3 cr.

CSc I9700: Report
Co-requisite: CSc I96XX, 0 cr.; satisfies non-course requirement.

CSc I9800: Project
Experimental or theoretical project under the direction of a faculty advisor. Student submits proposal, performs the required studies, submits a written final report, and gives a comprehensive oral presentation to the department or an approved forum.
Prereq: departmental approval. 3 cr.; satisfies non-course requirement.

CSc I9900: Research for Master's Thesis
Departmental approval required. 6 cr.; satisfies non-course requirement.