CSC - COMPUTER SCIENCE

CSC 0900 Office Applications Cr. 0
Self-paced course provides instruction in the Microsoft Office Application software at both introductory and advanced levels; software covered includes Word, Excel, and Power Point. Offered Every Term.

CSC 0995 Coop Work Experience Cr. 0
Review of computer science practical experiences resulting from participation in coop/internship program. Offered Every Term.

CSC 1000 Introduction to Computer Science Cr. 3
Provides an overview of current computing technology, organization, and use. Topics surveyed include data representation and storage, hardware and software organization, communications technologies, ethical and security issues. Provides hands-on training in common application software, such as word processing, spreadsheets, presentation, as well as in electronic telecommunications, such as e-mail, Internet and database searches. The University database and Internet pages are emphasized. Offered Every Term.

CSC 1002 Personal Digital Security Cr. 3
Students learn how to reduce exposure to risks and how to identify, assess and repair infected devices. Offered Every Term.

CSC 1050 Introduction to C and Unix Cr. 2
Introduces to Unix, Unix editor, and C Programming Language. Unix development tools and fundamentals of C language discussed. No credit for computer science students after CSC 1100. Offered Every Term.
Prerequisite: MAT 1800, with a minimum grade of C

CSC 1100 Problem Solving and Programming Cr. 3
Problem solving with algorithms, and their realization as computer programs using a structured, general purpose programming language; data types, operators, expressions, assignment, input and output, selection and repetition control structures; modularity and procedural abstraction using functions with parameters; structured data types, arrays, pointers and strings. Offered Every Term.
Prerequisites: CSC 1000 with a minimum grade of C
Corequisite: CSC 1101

CSC 1101 Problem Solving and Programming Laboratory Cr. 1
Mandatory two-hour closed laboratory; discussion of lecture materials and completion of hands-on exercises. Implementing programs using a general purpose programming language; software resulting from this can be used in more advanced computer science courses. Offered Every Term.
Prerequisites: CSC 1000 with a minimum grade of C
Corequisite: CSC 1100

CSC 1500 Fundamental Structures in Computer Science Cr. 3
Introduction to fundamental control and data structures in computer science such as algorithms and complexity; recursive algorithms; program correctness using the predicate calculus; reasoning about algorithms using mathematical induction; divide and conquer algorithms; recurrence relations; set properties and their computation; and computing with relations. Graph properties and their computation, and tree properties and their computation, will be covered if time permits. Offered Every Term.
Prerequisites: CSC 1100 with a minimum grade of C, CSC 1101 with a minimum grade of C, and MAT 2010 with a minimum grade of C-
Corequisite: CSC 1501

CSC 1501 Fundamental Structures in Computer Science Lab Cr. 1
Discussion and supervised hands-on exercises to complement CSC 1500. Offered Every Term.
Prerequisites: CSC 1100 with a minimum grade of D-, CSC 1101 with a minimum grade of D-, and MAT 1800-6XXX with a minimum grade of D-
Corequisite: CSC 1500

CSC 2000 Introduction to C++ Programming Language Cr. 3
Elements of C++: arrays, pointers and references; operators; classes and objects. No credit for Computer Science majors. Offered Every Term.
Prerequisites: (MAT 1800 with a minimum grade of C-) OR (MAT 2010 with a minimum grade of C-)
Corequisite: CSC 2111

CSC 2110 Computer Science I Cr. 3
Rigorous introduction to fundamental object-oriented concepts and techniques of computer programming using an object-oriented language. Introduction to data abstraction; design of abstract data types. Introduction to recursion; programming with generic data types; inheritance; polymorphism; and exception handlers. Concepts applied to console programs and event-driven programming using a simple graphics API. Offered Every Term.
Prerequisites: CSC 1100 with a minimum grade of C and MAT 2010 with a minimum grade of C-
Corequisite: CSC 2111

CSC 2111 Computer Science I Lab Cr. 1
Mandatory two-hour supervised lab; hands-on exercises to complement CSC 2110. Object-oriented techniques in a general-purpose object-oriented programming language. Resulting software may be used in more advanced computer science courses. Offered Every Term.
Corequisite: CSC 2110

CSC 2200 Computer Science II Cr. 3
Design and implementation of fundamental abstract data types of computer science (such as stacks, queues, trees, hashing, and graphs), using an object-oriented language. Programming requirements include the implementation of abstract data types using arrays and dynamic links; recursion; sorting and searching; hashing; and string processing. Introduction to algorithm analysis. Offered Every Term.
Prerequisites: CSC 1500 with a minimum grade of C, CSC 1501 with a minimum grade of C, CSC 2110 with a minimum grade of C, CSC 2111 with a minimum grade of C, and MAT 2010 with a minimum grade of C-
Corequisite: CSC 2201

CSC 2201 Computer Science II: Lab Cr. 1
Hands-on lab which complements lecture material in CSC 2200. Lab attendance is mandatory. Implementing data structures and algorithms using object-oriented techniques; techniques of analysis of algorithms; resulting implementations are working pieces of software that can be used in more advanced computer science courses. Offered Every Term.
Corequisite: CSC 2200

CSC 3010 Ethics in Computer Science Cr. 3
Students will study the ethical and legal issues that arise with the usage and development of computing technology. Students will learn the responsibilities of the computer professionals and how to make appropriate decisions when faced with legal and ethical issues in computing. Offered Every Term.
Prerequisites: (CSC 2011 with a minimum grade of C) OR (CSC 2111 with a minimum grade of C)
CSC 3020 Java Programming Cr. 3
Introduction to the fundamentals of programming using Java. Topics include: object-oriented programming, classes, constructors, flow control statements, data types, methods, inheritance, data hiding, abstraction, exceptions, file I/O, Java GUI, and Java packages. Offered Fall, Winter.
Prerequisites: (CSC 1100 with a minimum grade of C- and CSC 1101 with a minimum grade of C-) OR (MAT 1800 with a minimum grade of C-) OR (MAT 2010 with a minimum grade of C-) OR (MAT 3430 with a minimum grade of D-)
Corequisite: CSC 3020

CSC 3100 Computer Architecture and Organization Cr. 3
Organization and architecture of computer systems. Topics include: digital logic and digital systems; machine-level representation of data and programs; assembly level machine organization and programming; register-level description of computer execution and the functional organization of a computer; role and function of programming languages, libraries and operating systems; performance evaluation; systems programming. Offered Every Term.
Prerequisites: CSC 2200 with a minimum grade of D-, CSC 2201 with a minimum grade of D-, and MAT 2010 with a minimum grade of D-
Corequisite: CSC 3101

CSC 3101 Computer Architecture and Organization: Lab Cr. 1
Two-hour closed lab; students explore and experiment with assembly language programming, data representation, and simple circuit design. Lab attendance is mandatory. Offered Every Term.
Corequisite: CSC 3100

CSC 3110 Algorithm Design and Analysis Cr. 3
Formal techniques to support design and analysis of algorithms: underlying mathematical theory and practical considerations of efficiency. Topics include asymptotic complexity bounds, techniques of analysis, algorithmic strategies, advanced data and file structures, and introduction to automata theory and its application to language translation. Offered Fall, Winter.
Prerequisites: (CSC 2200 with a minimum grade of C-, CSC 2201 with a minimum grade of C-, BE 2100 with a minimum grade of C-, and MAT 2250 with a minimum grade of C) OR (MAT 2020 with a minimum grade of C-) OR (MAT 2210 with a minimum grade of C-)

CSC 3200 Programming Languages Cr. 3
History and overview of programming languages, virtual machines, representation of data types; sequence control; data control, sharing and type checking; run-time storage management; language translation systems; programming language semantics; programming paradigms. Offered Yearly.
Prerequisites: CSC 2200 with a minimum grade of C-, CSC 2201 with a minimum grade of C-, and MAT 2010 with a minimum grade of C-

CSC 3400 Human-Computer Interaction Cr. 3
User interface design, usability, evaluation, user-centered design. Offered Irregularly.
Prerequisites: (CSC 2200 with a minimum grade of D-) OR (CSC 2201 with a minimum grade of D-)
Course Material Fees: $10

CSC 3750 Introduction to Web Technology Cr. 3
Understanding the Internet using several access methods; required software and tools. Topics include: e-mail, FTP, Telnet, Gopher, Archie, Newsgrroups, WWW, HTML, CGI and PHP scripting and how to create an active web site. Laboratory exercises required. No credit after CSC 5750. Offered Fall, Winter.
Prerequisites: CSC 1100 with a minimum grade of D- and CSC 1101 with a minimum grade of D-

CSC 4110 Software Engineering Cr. 3
Software life cycle; software requirement analysis; software system design; software implementation and testing; software maintenance; team programming; ethics and programmers. Offered Fall, Winter.
Prerequisites: (CSC 2200 with a minimum grade of D- and CSC 2201 with a minimum grade of D-) OR (MAT 2010 with a minimum grade of D-) OR (MAT 3430 with a minimum grade of D-)
Corequisite: CSC 4111
Course Material Fees: $10

CSC 4111 Software Engineering: Lab Cr. 1
Mandatory two-hour closed lab; lecture materials and hands-on exercises which complement CSC 4110. Offered Fall, Winter.
Corequisite: CSC 4110

CSC 4290 Introduction to Computer Networking Cr. 3
Introduction of topics such as network architecture, multiple access control, packet switching, routing and flow control, congestion control and quality-of-service, Internet protocols, and elements of distributed computing. Offered Yearly.
Prerequisites: CSC 2200 with a minimum grade of C-, CSC 2201 with a minimum grade of C-, CSC 3100 with a minimum grade of C-, and CSC 3101 with a minimum grade of C-

CSC 4420 Computer Operating Systems Cr. 3
Operating system services; file systems; CPU scheduling; memory management; virtual memory; disk scheduling; deadlocks; concurrent processes. Offered for undergraduate major credit only. Offered Fall, Winter.
Prerequisites: CSC 2200 with a minimum grade of D-, CSC 2201 with a minimum grade of D-, CSC 3100 with a minimum grade of D-, and CSC 3101 with a minimum grade of D-
Corequisite: CSC 4421

CSC 4421 Computer Operating Systems: Lab Cr. 1
Mandatory two-hour closed lab; lecture materials and hands-on exercises which complement CSC 4420. System call interface; introduction to operating systems programming; use of simulation to better understand operating systems behavior. Offered Fall, Winter.
Corequisite: CSC 4420

CSC 4500 Introduction to Theoretical Computer Science Cr. 3
Finite automata and regular expressions; context-free grammars; pushdown automata; Turing machines; hierarchy of formal languages and automata; computability and decidability. Offered Fall, Winter.
Prerequisites: (CSC 2200 with a minimum grade of C- and CSC 2201 with a minimum grade of C-) OR (CSC 5050 with a minimum grade of C-) OR (MAT 2010 with a minimum grade of C-)

CSC 4710 Introduction to Database Management Systems Cr. 3
Topics include: database concepts, ER modeling, schemas and constraints, SQL and relational algebra, web-based database applications, triggers and views, physical organization and indexing, query processing, query optimization, NoSQL databases. Offered Yearly.
Prerequisites: CSC 2200 with a minimum grade of C and CSC 2201 with a minimum grade of C

CSC 4710 Introduction to Database Management Systems Cr. 3
Topics include: database concepts, ER modeling, schemas and constraints, SQL and relational algebra, web-based database applications, triggers and views, physical organization and indexing, query processing, query optimization, NoSQL databases. Offered Yearly.
Prerequisites: CSC 2200 with a minimum grade of C and CSC 2201 with a minimum grade of C

CSC 4990 Directed Study Cr. 1-4
Individual study as agreed on by student and supervising faculty. Primarily for material not covered in regular courses. Offered Every Term.
Repeatable for 8 Credits
CSC 4992 Special Topics in Computer Science Cr. 1-3
Topics to be announced in the Schedule of Classes. Maximum of six credits may be applied toward satisfying the computer science elective, in any computer science degree program. Offered Yearly.
Prerequisite: CSC 2110, with a minimum grade of D-; CSC 2111, with a minimum grade of D-
Repeatable for 12 Credits

CSC 4995 Professional Practice in Computer Science Cr. 1
Review of computer science practical experiences resulting from participation in the cooperative work-study program. Offered Every Term.
Repeatable for 4 Credits

CSC 4996 (WI) Senior Project and Computer Ethics Cr. 3
Development of skills for planning, managing, implementing, and documenting complex software projects; legal, social and ethical issues in software development and computer use. Project management techniques; professional conduct, social responsibility, liability, ownership of information, privacy, security and crime. Offered Fall, Winter.
Prerequisites: CSC 4110 with a minimum grade of C, CSC 4111 with a minimum grade of C-, and CSC 4710 with a minimum grade of C-
Corequisite: CSC 4997
Restriction(s): Enrollment limited to students with a class of Senior, enrollment is limited to students with a major in Computer Science, Computer Science Honors or Information Systems Technology.

CSC 4997 Senior Project Lab Cr. 1
Development of project management skills while managing, implementing and documenting a real-world project from initial idea to final implementation. Theory, software engineering techniques, group activities, and computer tools such as Microsoft Project. Mandatory lab. Offered Fall, Winter.

CSC 4999 Honors Thesis Cr. 3-6
Independent study under supervision. Offered Every Term.

CSC 5050 Algorithms and Data Structures Cr. 4
Introduction to problem solving methods and algorithm development; data abstraction for structures such as stacks, queues, linked lists, trees, and graphs; searching and sorting algorithms and their analysis. Not for CSC major credit. Offered for graduate credit only. Offered Every Term.
Equivalent: ECE 4050

CSC 5250 Network, Distributed, and Concurrent Programming Cr. 3
Fundamental concepts and skills of developing networked, distributed, and concurrent applications. Topics include: inter-process communication, TCP/IP sockets programming, remote method invocation, multithreading, concurrency and synchronization. Offered Yearly.
Prerequisites: CSC 4420 with a minimum grade of D- and CSC 4421 with a minimum grade of D-

CSC 5270 Computer Systems Security Cr. 3
Fundamental technologies for enabling an e-society which is more predictable, more accountable, and less vulnerable to attacks. Covers three components: security requirements and protocols, cryptography algorithms, and case studies. Offered Fall.
Prerequisites: (CSC 5250 with a minimum grade of D-)

CSC 5280 Introduction to Cyber-Physical Systems Cr. 3
Topics include: modeling, design, analysis, and implementation of cyber-physical systems; dynamic behavior modeling, state machine composition, and concurrent computation; sensors and actuators; embedded systems and networks; feedback control systems; temporal logic and model checking. Offered Fall, Winter.
Equivalent: ECE 5280

CSC 5430 Game Programming and Design I Cr. 3
Fundamentals of game programming and game design using C++, DirectX, Windows, and C#. Offered Fall.
Corequisite: CSC 5431

CSC 5431 Game Programming and Design I: Lab Cr. 1
Laboratory for CSC 5430. Focus on modding, or making changes to existing programs to achieve specific results. Offered Fall.
Prerequisites: (CSC 2200 with a minimum grade of D- and CSC 2201 with a minimum grade of D-) OR (CSC 5250 with a minimum grade of D-)
Corequisite: CSC 5430

CSC 5710 Design of Intelligent Information Retrieval Systems Cr. 3
Indexing retrieval models (vector space, probabilistic and language models); document classification models (Naive Bayes and SVM); topic models (PLSA and LDA) and learning-to-rank methods; course includes practical assignments and a team-based final project. Offered Yearly.
Prerequisites: CSC 5800 with a minimum grade of D-

CSC 5750 Principles of Web Technology Cr. 3
Prerequisites: MAT 2010 with a minimum grade of D- and CSC 3750 with a minimum grade of D-

CSC 5800 Intelligent Systems: Algorithms and Tools Cr. 3
Introduction to basic algorithms and software tools for intelligent data representation and analysis, including: data pre-processing, data exploration and visualization, model evaluation, predictive modeling, classification methods, association analysis, clustering, anomaly detection, representing extracted patterns as expertise, tools for data mining and intelligent systems such as WEKA, CLIPS, and MATLAB. Offered Irregularly.
Prerequisites: (CSC 2200 with a minimum grade of D-, CSC 2201 with a minimum grade of D-, and MAT 2010 with a minimum grade of D-) OR (CSC 5050 with a minimum grade of D-

CSC 5825 Introduction to Machine Learning and Applications Cr. 3
Through algorithmic investigation, brainstorming, and case analysis, students develop the skills and strategies that are necessary for effective learning from data, including Big Data emerging from science and engineering. Offered Winter.
Prerequisites: CSC 3110

CSC 5830 Computational Modeling of Complex Systems Cr. 3
Introduction to computer methods useful for modeling complex systems which are refractory to traditional methods of analysis. Emphasis on problem formulation and concrete examples drawn from computer science, engineering, chemistry, and biology. Offered Yearly.
Prerequisites: (CSC 2200 with a minimum grade of D- and CSC 2201 with a minimum grade of D-) OR (CSC 5050 with a minimum grade of D-)

CSC 5835 Introduction to Cybersecurity Cr. 3
Introduction to computer methods useful for modeling complex systems which are refractory to traditional methods of analysis. Emphasis on problem formulation and concrete examples drawn from computer science, engineering, chemistry, and biology. Offered Yearly.
Prerequisites: (CSC 2200 with a minimum grade of D- and CSC 2201 with a minimum grade of D-) OR (CSC 5050 with a minimum grade of D-)

CSC 5840 Introduction to Cybersecurity II Cr. 3
Introduction to computer methods useful for modeling complex systems which are refractory to traditional methods of analysis. Emphasis on problem formulation and concrete examples drawn from computer science, engineering, chemistry, and biology. Offered Yearly.
Prerequisites: (CSC 2200 with a minimum grade of D- and CSC 2201 with a minimum grade of D-) OR (CSC 5050 with a minimum grade of D-)

CSC 5860 Introduction to Cybersecurity III Cr. 3
Introduction to computer methods useful for modeling complex systems which are refractory to traditional methods of analysis. Emphasis on problem formulation and concrete examples drawn from computer science, engineering, chemistry, and biology. Offered Yearly.
Prerequisites: (CSC 2200 with a minimum grade of D- and CSC 2201 with a minimum grade of D-) OR (CSC 5050 with a minimum grade of D-)

CSC 5870 Introduction to Cybersecurity IV Cr. 3
Introduction to computer methods useful for modeling complex systems which are refractory to traditional methods of analysis. Emphasis on problem formulation and concrete examples drawn from computer science, engineering, chemistry, and biology. Offered Yearly.
Prerequisites: (CSC 2200 with a minimum grade of D- and CSC 2201 with a minimum grade of D-) OR (CSC 5050 with a minimum grade of D-)

CSC 5880 Introduction to Cybersecurity V Cr. 3
Introduction to computer methods useful for modeling complex systems which are refractory to traditional methods of analysis. Emphasis on problem formulation and concrete examples drawn from computer science, engineering, chemistry, and biology. Offered Yearly.
Prerequisites: (CSC 2200 with a minimum grade of D- and CSC 2201 with a minimum grade of D-) OR (CSC 5050 with a minimum grade of D-)

CSC 5890 Introduction to Cybersecurity VI Cr. 3
Introduction to computer methods useful for modeling complex systems which are refractory to traditional methods of analysis. Emphasis on problem formulation and concrete examples drawn from computer science, engineering, chemistry, and biology. Offered Yearly.
Prerequisites: (CSC 2200 with a minimum grade of D- and CSC 2201 with a minimum grade of D-) OR (CSC 5050 with a minimum grade of D-)

CSC 5999 Independent Study Cr. 1-3
Independent study. Offered Yearly.

CSC 5999 Honors Independent Study Cr. 1-3
Independent study under supervision. Offered Yearly.

CSC 5999 Senior Project and Computer Ethics Cr. 3
Development of skills for planning, managing, implementing, and documenting complex software projects; legal, social and ethical issues in software development and computer use. Project management techniques; professional conduct, social responsibility, liability, ownership of information, privacy, security and crime. Offered Fall, Winter.
Prerequisites: CSC 4110 with a minimum grade of C, CSC 4111 with a minimum grade of C-, and CSC 4710 with a minimum grade of C-
Corequisite: CSC 4997
Restriction(s): Enrollment limited to students with a class of Senior, enrollment is limited to students with a major in Computer Science, Computer Science Honors or Information Systems Technology.

CSC 5999 Senior Project Lab Cr. 1
Development of project management skills while managing, implementing and documenting a real-world project from initial idea to final implementation. Theory, software engineering techniques, group activities, and computer tools such as Microsoft Project. Mandatory lab. Offered Fall, Winter.

CSC 6999 Honors Thesis Cr. 3-6
Independent study under supervision. Offered Yearly.

CSC 6999 Independent Study Cr. 1-3
Independent study. Offered Yearly.
CSC 5860 Introduction to Pattern Recognition and Document Analysis Cr. 3
Model of a pattern recognition system; representation techniques of classifiers; parametric and nonparametric classification methods; clustering; feature selection and extraction document processing, analysis, and classification. Offered Yearly.

CSC 5870 Computer Graphics I Cr. 3
Graphics devices, graphics primitives, 2-D transformations, windowing and clipping, modeling 3-D objects, 3-D viewing transformations, hidden surface removal, shading and color. Offered Yearly.
Prerequisites: (CSC 2200 with a minimum grade of D-, CSC 2201 with a minimum grade of D-, and MAT 2250 with a minimum grade of D-) OR (CSC 5050 with a minimum grade of D-)

CSC 5991 Special Topics in Computer Science Cr. 1-4
Topics to be announced in the Schedule of Classes. Offered Irregularly.
Prerequisites: (CSC 2200 with a minimum grade of C and CSC 2201 with a minimum grade of C) Repeatable for 9 Credits

CSC 6110 Software Engineering Cr. 3
Software process models; advanced software system design; software project management; software analysis; testing and performance analysis; software maintenance; reverse engineering; software reuse; software metrics; object-oriented development. Offered Yearly.
Prerequisites: (CSC 2200 with a minimum grade of D-, CSC 2201 with a minimum grade of D, and MAT 2010 with a minimum grade of D-) OR (CSC 5050 with a minimum grade of D-)

CSC 6220 Parallel Computing I: Programming Cr. 4
Parallel computing concepts, examples of parallel computers, parallelism in algorithms / data / programs, experiences with state of the art parallel computers. Offered Yearly.
Prerequisites: (2 of [CSC 2200 with a minimum grade of C, CSC 2201 with a minimum grade of C] and 3 of [CSC 2200 with a minimum grade of C, CSC 2201 with a minimum grade of C]) OR (2 of [CSC 3300 with a minimum grade of C, CSC 3301 with a minimum grade of C], CSC 5050 with a minimum grade of C] and 3 of [CSC 3300 with a minimum grade of C, CSC 3301 with a minimum grade of C, CSC 5050 with a minimum grade of C])

CSC 6280 Real-Time and Embedded Operating Systems Cr. 3
Operating system design for real-time and embedded systems. Focus on scheduling, synchronization, communication, and process and memory management for time-critical and resource-constrained applications. Offered Biannually.
Prerequisites: CSC 4420 with a minimum grade of D- and CSC 4421 with a minimum grade of D-

CSC 6290 Data Communication and Computer Networks Cr. 3
Data communication fundamentals and principles governing computer communication networks. Components of networks, how they are connected; basics of design and implementation of network protocols. Offered Yearly.
Prerequisites: CSC 5250 with a minimum grade of D-

CSC 6430 Game Programming and Design II Cr. 3
Game design methods, team development, languages for game design, debugging and testing, game platforms, memory management and I/O, game physics, character animation, AI agents, AI path programming, networking, online and multiplayer gaming. Offered Yearly.
Prerequisites: CSC 5430 with a minimum grade of D- and CSC 5431 with a minimum grade of D-
Corequisite: CSC 6431

CSC 6431 Game Programming and Design II: Lab Cr. 1
Architecture and tools for modern game platforms. Game development environment; basic aspects of game engine design, graphics engine design, use of shaders. Offered Yearly.
Prerequisites: CSC 5430 with a minimum grade of D- and CSC 5431 with a minimum grade of D-

CSC 6500 Theory of Languages and Automata Cr. 3
Recursive and recursively enumerable languages; decidability and computability; Rice’s theorem; time complexity; space complexity. Offered Fall, Winter.
Prerequisites: CSC 4500 with a minimum grade of D-

CSC 6580 Design and Analysis of Algorithms Cr. 3
Best case, worst case, and expected case complexity analysis; asymptotic approximations; solutions of recurrence equations; probabilistic techniques; divide-and-conquer; the greedy approach; dynamic programming; branch and bound; NP-completeness; parallel algorithms. Offered Fall, Winter.
Prerequisites: CSC 3110 with a minimum grade of D-

CSC 6620 Matrix Computation I Cr. 4
Background matrix algebra; linear system sensitivity; basic transformations; Gaussian elimination; symmetric systems; positive definite systems; Householder method for least squares problems; unsymmetric eigenvalue problems; the QR algorithm. Offered Yearly.
Prerequisites: (3 of [CSC 2200 with a minimum grade of C, CSC 2201 with a minimum grade of C] and 1 of [CSC 2200 with a minimum grade of C, CSC 2201 with a minimum grade of C, MAT 2250 with a minimum grade of C]) OR (3 of [ECE 3040 with a minimum grade of C, BE 2550 with a minimum grade of C] and 1 of [ECE 3040 with a minimum grade of C, BE 2550 with a minimum grade of C])
Equivalent: ECE 5020

CSC 6710 Database Management Systems I Cr. 3
Data models, normal forms, relational systems and SQL, query optimization, object-oriented systems, object-relational systems, student Oracle project. Offered Yearly.
Prerequisites: CSC 4710 with a minimum grade of D-

CSC 6800 Artificial Intelligence I Cr. 3
Basic concepts; topics include: recursive problem solving, knowledge representation using semantic networks and frames, state space search methods, planning and problem solving, game playing and adversarial search methods, rules and production systems (RETE networks), constraint satisfaction techniques and applications, optimization algorithms including genetic algorithms, logic programming. Implementation in Lisp and Prolog. Offered Yearly.
Prerequisites: (CSC 3110 with a minimum grade of D-

CSC 6860 Digital Image Processing and Analysis Cr. 3
Review of image formation and acquisition; image transformation; image enhancement and restoration; image compression; morphological image processing; edge detection and segmentation; architecture for image processing. Offered for graduate credit only. Offered Irregularly.

CSC 6870 Computer Graphics II Cr. 3
Representing curves and surfaces; solid modeling; fractal geometry; camera models; illumination models; ray tracing; radiosity methods; transparency; texture; graphics packages. Offered Yearly.
Prerequisites: CSC 5870 with a minimum grade of D-
Course Material Fees: $20
CSC 6991 Topics in Computer Science Cr. 1-4  
Current topics to be announced in the Schedule of Classes. Offered Irregularly.  
**Prerequisites:** (CSC 2200 with a minimum grade of C and CSC 2201 with a minimum grade of C)  
**Repeatable for 9 Credits**

CSC 6995 Internship in Computer Science Cr. 1-3  
Experience in industry using tools from the computer science curriculum. Students provide a written report based on the internship experience. Offered Every Term.  
**Repeatable for 4 Credits**

CSC 7110 Software Engineering Environments Cr. 3  
Architecture of software engineering environments; syntax directed editors; CASE tools; tools for software maintenance; expert systems for software maintenance. Offered Yearly.  
**Prerequisite:** CSC 6110, with a minimum grade of D-

CSC 7220 Parallel Computing II: Algorithms and Applications Cr. 4  
Problems in parallel algorithms: design, analysis, complexity. Cluster and grid computing: tools, programming, and applications. Offered Yearly.  
**Prerequisite:** CSC 6220, with a minimum grade of C

CSC 7260 Distributed Systems Cr. 3  
Models of distributed systems, distributed synchronization, algorithms, consistency and replication models and algorithms, fault-tolerance in distributed systems. Offered Biannually.  
**Prerequisite:** CSC 5250, with a minimum grade of C

CSC 7290 Advanced Computer Networking Cr. 3  
Foundations of computer networking (e.g., performance evaluation and analysis, protocol specification and verification), latest development in network architecture and technology (e.g., wireless networks, sensor networks, peer-to-peer networks, vehicular networks). Offered Yearly.  
**Prerequisite:** CSC 6290, with a minimum grade of C

CSC 7300 Bioinformatics I: Biological Databases and Data Analysis Cr. 3  
Concepts of bioinformatics; tools for storing and analysis of bioinformatics data. Offered Winter.  

CSC 7301 Bioinformatics I: Programming Lab Cr. 1  
Hands-on experience and exercises for CSC 7300/MBG 7300 lectures. Offered Fall.

CSC 7410 Bioinformatics II Cr. 4  
Biological of bioinformatics, DNA and protein sequencing, introduction of systems biology, mRNA expressions analysis, pathway and molecular machines analysis. Offered Winter.  
**Prerequisite:** CSC 7300, with a minimum grade of C ; CSC 7301, with a minimum grade of C ; MG 7010, with a minimum grade of C

CSC 7430 Electronic Commerce Cr. 3  
Introduction to design and analysis of internet commerce systems. Protocols for electronic transactions; online payments and exchanges e-cash; game theory and mechanism design; online auction design; sponsored search auctions, combinatorial auctions. Offered Fall.

CSC 7710 Database Management Systems II Cr. 3  
Concurrency control, transaction processing, crash recovery, security, distributed and heterogeneous databases, data warehousing, data mining, multimedia systems, student Oracle project. Offered Yearly.  
**Prerequisite:** CSC 6710, with a minimum grade of C

CSC 7800 Artificial Intelligence II Cr. 3  
Advanced topics from these areas: machine learning techniques (inductive and deductive), neural networks and perceptrons, genetic algorithms, advanced concepts in knowledge-based system design, inexact inference, constraint satisfaction techniques and applications, object-oriented programming. Implementation in Lisp and Prolog. Offered Yearly.  
**Prerequisite:** CSC 6800, with a minimum grade of C

CSC 7810 Data Mining: Algorithms and Applications Cr. 3  
Application of various basic/advanced data mining techniques to real-world problems. Offered Winter.  
**Prerequisite:** CSC 5800, with a minimum grade of C

CSC 7825 Machine Learning Cr. 3  
Supervised learning including regression, kernel-based, tree-based, probability model based and ensemble learning; unsupervised learning including distance based and model based; Markov Chain Monte Carlo (MCMC) methods; graphical models; current topics from literature. Offered Fall.  
**Prerequisite:** CSC 5825, with a minimum grade of C

CSC 7860 Computer Vision Cr. 3  
Low-level vision processing, use of constraints in visual processing, three-dimensional object recognition, dynamic scene analysis, model-based vision systems, use of neural and fuzzy logic methods in vision. Offered Yearly.  
**Prerequisite:** CSC 6860, with a minimum grade of C

CSC 7990 Directed Study Cr. 1-5  
Offered Every Term.  
**Repeatable for 9 Credits**

CSC 7991 Advanced Topics in Computer Science Cr. 1-4  
Topics to be announced in the Schedule of Classes. Offered Biannually.  
**Repeatable for 9 Credits**

CSC 8110 Seminar in Software Engineering and Environments Cr. 3  
Discussion of current papers in the field. Offered Biannually.  
**Prerequisite:** CSC 7110, with a minimum grade of C

CSC 8260 Seminar in Networking, Distributed Systems and Parallel Systems Cr. 3  
Discussion of current research papers in the fields. Offered Biannually.

CSC 8710 Seminar in Database Management Systems Cr. 3  
Discussion of current papers in the field. Offered Biannually.  
**Prerequisite:** CSC 6710,

CSC 8800 Seminar in Artificial Intelligence Cr. 3  
Discussion of current papers in the field. Offered Biannually.  
**Prerequisite:** CSC 7800, with a minimum grade of C

CSC 8860 Seminar in Computer Vision and Pattern Recognition Cr. 3  
Discussion of current papers in the field. Offered Biannually.  
**Prerequisite:** CSC 7860, with a minimum grade of C

CSC 8850 Seminar Topics in Computer Vision and Pattern Recognition Cr. 3  
Discussion of current papers in the field. Offered Biannually.  
**Prerequisite:** CSC 7860, with a minimum grade of C

CSC 8990 Graduate Seminar Cr. 1  
Discussion of current research by faculty and visitors. Offered Fall, Winter.  
**Repeatable for 8 Credits**

CSC 8999 Master's Thesis Research and Direction Cr. 1-8  
Research in preparation for doctoral dissertation. Offered Every Term.  
**Repeatable for 12 Credits**
CSC 9991 Doctoral Candidate Status I: Dissertation Research and Direction Cr. 7.5
Offered Every Term.

CSC 9992 Doctoral Candidate Status II: Dissertation Research and Direction Cr. 7.5
Offered Every Term.
Prerequisite: CSC 9991, with a minimum grade of S

CSC 9993 Doctoral Candidate Status III: Dissertation Research and Direction Cr. 7.5
Offered Every Term.
Prerequisite: CSC 9992, with a minimum grade of S

CSC 9994 Doctoral Candidate Status IV: Dissertation Research and Direction Cr. 7.5
Offered Every Term.
Prerequisite: CSC 9993, with a minimum grade of S

CSC 9995 Candidate Maintenance Status: Doctoral Dissertation Research and Direction Cr. 0
Offered Every Term.
Repeatable for 0 Credits

CSC 9999 Doct Diss Res&Dir Cr. 1-16
Offered Every Term.