

COMPUTER SCIENCE (CSCI)

CSCI 1010 - Introduction to Computer Science: Principles

Credit(s): 3 Credits

A broad survey of the computer science discipline, focusing on the computer's role in representing, storing, manipulating, organizing and communicating information. Topics include hardware, software, algorithms, operating systems, networks.

CSCI 1020 - Introduction to Computer Science: Bioinformatics

Credit(s): 3 Credits

An introduction to computer programming motivated by the analysis of biological data sets and the modeling of biological systems. Computing concepts to include data representation, control structures, text processing, input and output. Applications to include the representation and analysis of protein and genetic sequences, and the use of available biological data sets.

Attributes: Chemical Biology Elective

CSCI 1030 - Introduction to Computer Science: Game Design

Credit(s): 3 Credits

Introduces the design of computer and video games. Students learn the practical aspects of game implementation using computer game engines and 3D graphics tools, while simultaneously studying game concepts like history, genres, storylines, gameplay elements and challenges, and the design process.

CSCI 1040 - Introduction to Computer Science: Mobile Computing

Credit(s): 3 Credits

An introduction to programming based on the development of apps for mobile devices such as phones and tablets. Students will learn to design an effective user interface, to interact with device hardware and sensors, to store data locally and access Internet resources.

CSCI 1050 - Introduction to Computer Science: Multimedia

Credit(s): 3 Credits

An introduction to computer programming, motivated by the creation and manipulation of images, animations, and audio. Traditional software development concepts, such as data representation and control flow, are introduced for the purpose of image processing, data visualization, and the synthesis and editing of audio.

CSCI 1060 - Introduction to Computer Science: Scientific Programming

Credit(s): 3 Credits

Elementary computer programming concepts with an emphasis on problem solving and applications to scientific and engineering applications. Topics include data acquisition and analysis, simulation and scientific visualization.

Prerequisite(s): (MATH 1510*, MATH 1320, MATH 1520, or MATH 2530)

* Concurrent enrollment allowed.

Attributes: Foreign Language BA Req (A&S)

CSCI 1070 - Introduction to Computer Science: Taming Big Data

Credit(s): 3 Credits

An introduction to data science and machine learning. Fundamentals of data representation and analysis will be covered, with a focus on real-world applications to business intelligence, natural language processing, and social network analysis.

CSCI 1080 - Introduction to Computer Science: World Wide Web

Credit(s): 3 Credits

An introduction to the technology of the web, from the structure of the Internet (web science) to the design of dynamic web pages (web development). The web science component of the class introduces notions of the web as an example of a network and use the tools of graph theory to better understand the web. The web development component introduces some of the fundamental languages and tools for web programming.

CSCI 1090 - Introduction to Computer Science: Special Topics

Credit(s): 3 Credits (Repeatable for credit)

CSCI 1300 - Introduction to Object-Oriented Programming

Credit(s): 4 Credits

An introduction to computer programming based upon early coverage of object-oriented principles such as classes, methods, inheritance and polymorphism, together with treatment of traditional flow of control structures. Good software development practices will also be established, including issues of design, documentation, and testing.

Prerequisite(s): ((0 Course from CSCI 1010-1090, BME 2000 with a grade of C- or higher, or CVNG 1500 with a grade of C- or higher); (MATH 1200 or 0 Course from MATH 1320-4999))

Attributes: Foreign Language BA Req (A&S)

CSCI 1930 - Special Topics

Credit(s): 1-4 Credits (Repeatable for credit)

CSCI 1980 - Independent Study

Credit(s): 1-3 Credits (Repeatable for credit)

CSCI 2040 - Unix Tools

Credit(s): 1 Credit

An introduction to programming on the Unix command line, including a thorough grounding in regular expressions, programming with pipes and filters, parsing structured and semi-structured file formats, and web scraping. (Offered every Spring)

CSCI 2050 - Computer Ethics

Credit(s): 3 Credits

This course examines the moral, legal, and social issues raised by computers and electronic information technologies for different stakeholder groups (professionals, users, business, etc.). Students are expected to integrate moral theories and social analysis for addressing such issues as intellectual property, security, privacy, discrimination, globalization, and community.

Prerequisite(s): PHIL 2050

CSCI 2100 - Data Structures

Credit(s): 4 Credits

The design, implementation and use of data structures. Principles of abstraction, encapsulation and modularity to guide in the creation of robust, adaptable, reusable and efficient structures. Specific data types to include stacks, queues, dictionaries, trees and graphs.

Prerequisite(s): (CSCI 1300 with a grade of C- or higher and MATH 1660*)

* Concurrent enrollment allowed.

CSCI 2190 - Computational Problem Solving

Credit(s): 1 Credit

Intended primarily to train students for the International Collegiate Programming Contest (ICPC), this course covers data structures, algorithms, and programming techniques that apply to typical programming challenges.

Prerequisite(s): CSCI 2100

CSCI 2300 - Object-Oriented Software Design**Credit(s): 3 Credits**

An implementation-based study of object-oriented software development. Teams will design and create medium-scale applications. Additional focus on the design and use of large object-oriented libraries, as well as social and professional issues.

Prerequisite(s): CSCI 2100 with a grade of C- or higher

CSCI 2400 - Computer Architecture**Credit(s): 3 Credits**

Introduction to the organization and architecture of computer systems, including aspects of digital logic, data representation, assembly level organization, memory systems and processor architectures.

Prerequisite(s): (CSCI 1300 and MATH 1660)

CSCI 2930 - Special Topics**Credit(s): 1-4 Credits** (Repeatable for credit)**CSCI 2980 - Independent Study****Credit(s): 1-3 Credits** (Repeatable for credit)

Prior approval of sponsoring professor and chair required.

CSCI 3100 - Algorithms**Credit(s): 3 Credits**

Introduction to analysis and complexity of algorithms. Big-O notation. Running time analysis of algorithms for traversing graphs and trees, searching and sorting. Recursive versus iterative algorithms. Complexity, completeness, computability.

Prerequisite(s): CSCI 2100; MATH 1660; MATH 1510

CSCI 3200 - Programming Languages**Credit(s): 3 Credits**

Overview of programming languages: procedural and functional languages. Exposure to functional languages. Analysis of solution strategies to variable binding and function calls. Problem solving paradigms and linguistic issues.

Prerequisite(s): CSCI 2300

CSCI 3250 - Compilers**Credit(s): 3 Credits**

Introduction to the theory and techniques of compiler design, lexical analysis, finite state automata, context-free grammars, top-down and bottom-up parsing, syntax analysis, code generation. Other important issues such as optimization, type-checking, and garbage collection will be discussed.

Prerequisite(s): (CSCI 2400 or ECE 3217); CSCI 2100

CSCI 3300 - Software Engineering**Credit(s): 3 Credits**

Theory and practice of software engineering. Design and implementation of software systems. Levels of abstraction as a technique in program design. Organized around major group programming projects.

Prerequisite(s): CSCI 2300

CSCI 3450 - Microprocessors**Credit(s): 3 Credits**

Microprocessors/microcomputer structure, input/output. Signals and devices. Computer arithmetic, programming, interfacing and data acquisition.

Prerequisite(s): (CSCI 1060 or CSCI 1300)

Corequisite(s): CSCI 3451

CSCI 3451 - Microprocessor Lab**Credit(s): 1 Credit**

Laboratory experiments to emphasize material covered in CSCI 3450.

Corequisite(s): CSCI 3450

CSCI 3500 - Operating Systems**Credit(s): 3 Credits**

Theory and practice of operating systems as managers of shared computer hardware: processors, memory, mass storage, and peripherals. Includes also an introduction to computer networking. Hands-on experience with general systems programming, concurrent and parallel programming, and network programming.

Prerequisite(s): (CSCI 2400 or ECE 3217); CSCI 2100

CSCI 3550 - Computer Networks**Credit(s): 3 Credits**

An exploration of the underlying concepts and principles of computer networks. Topics include communication protocols such as TCP/IP, design of network architectures, and the management and security of networks. Examples of real networks will be used to reinforce and demonstrate concepts.

Prerequisite(s): CSCI 3500

CSCI 3710 - Databases**Credit(s): 3 Credits**

Fundamentals of database systems. Topics include relational and NoSQL data models, structured query language, the entity-relationship model, normalization, transactions, file organization and indexes, and data security issues. The knowledge of the listed topics is applied to design and implementation of a database application.

Prerequisite(s): CSCI 2100

CSCI 3760 - Artificial Intelligence**Credit(s): 3 Credits**

Fundamental introduction to the broad area of artificial intelligence and its applications. Topics include knowledge representation, logic, search spaces, reasoning with uncertainty, and machine learning.

Prerequisite(s): CSCI 2100

CSCI 3820 - Computer Graphics**Credit(s): 3 Credits**

Applications and implementation of computer graphics. Algorithms and mathematics for creating two and three dimensional figures. Animation and two and three dimensional transformations. Interaction, windowing, and perspective techniques. Coding using the graphics library OpenGL.

Prerequisite(s): MATH 2530; (MATH 3110 or MATH 3120); CSCI 2100

CSCI 3910 - Internship with Industry**Credit(s): 1-3 Credits** (Repeatable for credit)

A work experience with an agency, firm, or organization that employs persons in this degree field. Learning plan and follow-up evaluation required.

CSCI 3930 - Special Topics**Credit(s): 1-4 Credits** (Repeatable for credit)**CSCI 3980 - Independent Study****Credit(s): 1-3 Credits** (Repeatable for credit)

Prior approval of sponsoring professor and chairperson required.

CSCI 4130 - Automata**Credit(s): 3 Credits**

The theory of automata and finite state machines. Regular languages and automata. Algebraic coding theory and shift registers. Algebraic matching theory.

Prerequisite(s): CSCI 2100

CSCI 4500 - Advanced Operating Systems**Credit(s): 3 Credits**

Parallel processes; processor problems; linear address space and tree structured spaces of objects; resource allocation, queuing and network control policies; system balancing and thrashing; job allocation and process scheduling; multiprogramming systems; protection mechanisms for accessing jobs; pipelining and parallelism; distributed systems.

Prerequisite(s): CSCI 3500**CSCI 4650 - Computer Security****Credit(s): 3 Credits**

Fundamental introduction to the broad area of computer security. Topics include access control, security policy design, network security, cryptography, ethics, securing systems, and common vulnerabilities in computer systems.

Prerequisite(s): CSCI 2100**CSCI 4750 - Machine Learning****Credit(s): 3 Credits**

This course introduces students to the field of machine learning with emphasis on the probabilistic models that dominate contemporary applications. Students will discover how computers can learn from examples and extract salient patterns hidden in large data sets. The course will introduce classification algorithms that predict discrete states for variables as well as regression algorithms that predict continuous values for variables. Attention will be given to both supervised and unsupervised settings in which (respectively) labeled training data is or is not available.

Prerequisite(s): STAT 3850; CSCI 2100; MATH 2530**CSCI 4850 - High-Performance Computing****Credit(s): 3 Credits**

Use processor features, multiple cores, memory, graphics cards and clusters to maximize efficiency of computer software. Topics include vectorizing code, cache and memory efficiency, multithreaded programming, GPU programming and distributed programming.

Prerequisite(s): CSCI 2100**CSCI 4910 - Internship with Industry****Credit(s): 1-3 Credits** (Repeatable for credit)

A work experience with an agency, firm, or organization that employs persons in this degree field. Learning plan and follow-up evaluation required.

CSCI 4915 - Co-op with Industry**Credit(s): 0-3 Credits** (Repeatable for credit)

Full-time supervised work experience with an agency, firm, or organization that employs persons in this degree field. Learning plan and follow-up evaluation required.

CSCI 4930 - Special Topics**Credit(s): 1-4 Credits** (Repeatable for credit)**CSCI 4961 - Capstone Project I****Credit(s): 2 Credits**

The first part of a two-course sequence serving as a concluding achievement for graduating students. In this course, students develop a proposal, collect and formalize specifications, become acquainted with necessary technologies, and create and present a detailed design for completing the project.

Restrictions:

Enrollment limited to students with a semester level of Junior or Senior.

Enrollment is limited to students with a major in Computer Science.

CSCI 4962 - Capstone Project II**Credit(s): 2 Credits**

The continuation of CSCI 4961. In the second part of the sequence, students complete their project based upon the design that was developed during the first part of the sequence. Students must demonstrate continued progress throughout the semester and make a preliminary and final presentation of their results.

Restrictions:

Enrollment limited to students with a semester level of Senior.

CSCI 4980 - Advanced Independent Study**Credit(s): 1-6 Credits** (Repeatable for credit)

Prior permission of sponsoring professor and chairperson required.

CSCI 5001 - Object-Oriented Programming**Credit(s): 3 Credits**

An accelerated introduction to object-oriented computer programming including coverage of classes, methods, inheritance and polymorphism. Good software development practices will also be established, including issues of design, documentation, and testing. Students not able to register due to the restrictions may contact the department for permission.

Restrictions:

Enrollment limited to students in the BICB11, CS11 or SOEN11 programs.

CSCI 5002 - Data Structures**Credit(s): 3 Credits**

An accelerated study of the design, implementation, and use of data structures. Principles of abstraction, encapsulation, and modularity to guide in the creation of robust, adaptable, reusable and efficient structures. Specific data types to include stacks, queues, dictionaries, trees, and graphs. Students not able to register due to the restrictions may contact the department for permission.

Prerequisite(s): CSCI 5001 with a grade of C- or higher**Restrictions:**

Enrollment limited to students in the BICB11, CS11 or SOEN11 programs.

CSCI 5030 - Principles of Software Development**Credit(s): 3 Credits**

An overview of software development at a graduate level, including software engineering processes, software design and architecture, testing and quality assurance, and selected other topics of interest to software practitioners. Students not able to register due to the restrictions may contact the department for permission.

Restrictions:

Enrollment limited to students in the BICB11, CS11 or SOEN11 programs.

CSCI 5050 - Computing and Society**Credit(s): 3 Credits**

A study of legal and ethical issues that arise with the use of computing technologies, and how new technologies alter the society that we live in. Students not able to register due to the restrictions may contact the department for permission.

Restrictions:

Enrollment limited to students in the BICB11, CS11 or SOEN11 programs.

CSCI 5090 - Computer Science Colloquium**Credit(s): 1 Credit** (Repeatable for credit)

A series of presentations, given by faculty members and invited speakers, to provide students with exposure to current research and developments in the field of computer science. Students will be required to produce written summaries of the presentations. Students not able to register due to the restrictions may contact the department for permission.

Restrictions:

Enrollment limited to students in the BICB11, CS11 or SOEN11 programs.

CSCI 5100 - Algorithms**Credit(s): 3 Credits**

An overview of algorithm design and analysis. Topics include analysis of algorithms for traversing graphs and trees, searching and sorting, recursion, dynamic programming, and approximation, as well as the concepts of complexity, completeness, and computability. Students not able to register due to the restrictions may contact the department for permission.

Restrictions:

Enrollment limited to students in the BICB11, CS11 or SOEN11 programs.

CSCI 5150 - Computational Geometry**Credit(s): 3 Credits**

The goal of computational geometry is to find efficient algorithms for solving geometric problems. Topics include convex hulls, Voronoi diagrams, Delaunay triangulations, geometric search and geometric data structures. Students not able to register due to the restrictions may contact the department for permission.

Restrictions:

Enrollment limited to students in the BICB11, CS11 or SOEN11 programs.

CSCI 5200 - Programming Languages**Credit(s): 3 Credits**

Overview of programming languages: procedural and functional languages. Exposure to functional languages. Analysis of solution strategies to variable binding and function calls. Problem solving paradigms and linguistic issues. Students not able to register due to the restrictions may contact the department for permission.

Prerequisite(s): CSCI 5030 with a grade of C- or higher

Restrictions:

Enrollment limited to students in the BICB11, CS11 or SOEN11 programs.

CSCI 5250 - Compilers**Credit(s): 3 Credits**

Theory and practice of compiler design, including lexical analysis, finite state automata, context-free grammars, parsing algorithms, and code generation. Other important issues such as optimization, type-checking, and garbage collection will be discussed. Students not able to register due to the restrictions may contact the department for permission.

Prerequisite(s): CSCI 5030 with a grade of C- or higher

Restrictions:

Enrollment limited to students in the BICB11, CS11 or SOEN11 programs.

CSCI 5300 - Software Engineering**Credit(s): 3 Credits**

Key aspects of the software engineering discipline, including software process models, software project initiation, software analysis and design, software project planning and management, and software process and product metrics. Students not able to register due to the restrictions may contact the department for permission.

Prerequisite(s): CSCI 5030 with a grade of C- or higher

Restrictions:

Enrollment limited to students in the BICB11, CS11 or SOEN11 programs.

CSCI 5310 - Software Architecture**Credit(s): 3 Credits**

The theory and practice of software architecture and global design of software systems, with focus on recurring architectural patterns via in-depth case studies of various large-scale systems. Students not able to register due to the restrictions may contact the department for permission.

Prerequisite(s): CSCI 5300 with a grade of C- or higher

Restrictions:

Enrollment limited to students in the BICB11, CS11 or SOEN11 programs.

CSCI 5320 - Software Project Management**Credit(s): 3 Credits**

A study of key components of project management including project integration, project scope management, project time and cost management, quality management, human resource considerations, communications, risk management, and procurement management. Students not able to register due to the restrictions may contact the department for permission.

Prerequisite(s): CSCI 5300

Restrictions:

Enrollment limited to students in the BICB11, CS11 or SOEN11 programs.

CSCI 5330 - Software Quality Assurance**Credit(s): 3 Credits**

Best practices for the process of quality assurance for complex software systems. Topics include prevention of errors, testing, verification, and validation of software systems, inspection and review processes, and the distinction between process assurance and product assurance. Students not able to register due to the restrictions may contact the department for permission.

Prerequisite(s): CSCI 5300 with a grade of C- or higher

Restrictions:

Enrollment limited to students in the BICB11, CS11 or SOEN11 programs.

CSCI 5350 - Human-Computer Interaction**Credit(s): 3 Credits**

An introduction to the field of Human-Computer Interaction, with a particular focus on the design, implementation, and evaluation of software interfaces. Students not able to register due to the restrictions may contact the department for permission.

Prerequisite(s): CSCI 5030 with a grade of C- or higher

Restrictions:

Enrollment limited to students in the BICB11, CS11 or SOEN11 programs.

CSCI 5360 - Web Technologies**Credit(s): 3 Credits**

An overview of the client-side and server-side technologies that power the modern web. Hands-on experience with interactive web site and web application development for desktop and mobile. Students not able to register due to the restrictions may contact the department for permission.

Prerequisite(s): CSCI 5030 with a grade of C- or higher

Restrictions:

Enrollment limited to students in the BICB11, CS11 or SOEN11 programs.

CSCI 5500 - Operating Systems**Credit(s): 3 Credits**

Theory and practice of operating systems, with hands-on emphasis on one of the UNIX family of operating systems. Processes, processor scheduling, virtual memory, parallelism and concurrency, race conditions, file systems, networking models, sockets programming, as well as a general focus on operating systems mechanisms and abstractions. Students not able to register due to the restrictions may contact the department for permission.

Restrictions:

Enrollment limited to students in the BICB11, CS11 or SOEN11 programs.

CSCI 5550 - Computer Networks**Credit(s): 3 Credits**

A graduate-level introduction to the concepts and principles of computer networks, including the basic technologies of a network and how these systems interact. Focus includes the design and implementation of network software that transforms raw hardware into a richly functional communication system. Students not able to register due to the restrictions may contact the department for permission.

Restrictions:

Enrollment limited to students in the BICB11, CS11 or SOEN11 programs.

CSCI 5650 - Computer Security**Credit(s): 3 Credits**

Fundamental introduction to the broad area of computer security. Topics will include access control, security policy design, network security, cryptography, ethics, securing systems, and common vulnerabilities in computer systems. Students not able to register due to the restrictions may contact the department for permission.

Restrictions:

Enrollment limited to students in the BICB11, CS11 or SOEN11 programs.

CSCI 5710 - Databases**Credit(s): 3 Credits**

This course introduces the foundations of database systems: the relational model, file organization and indexes, relational algebra, structured query language, the entity model, normalization, object databases. Students not able to register due to the restrictions may contact the department for permission.

Restrictions:

Enrollment limited to students in the BICB11, CS11 or SOEN11 programs.

CSCI 5750 - Machine Learning**Credit(s): 3 Credits**

This course introduces students to the field of machine learning with emphasis on the probabilistic models that dominate contemporary applications. Students will discover how computers can learn from examples and extract salient patterns hidden in large data sets. The course will introduce classification algorithms that predict discrete states for variables as well as regression algorithms that predict continuous values for variables. Attention will be given to both supervised and unsupervised settings in which (respectively) labeled training data is or is not available. Emphasis is placed on both the conceptual relationships between these different learning problems as well as the statistical models and computational methods used to employ those models. Students not able to register due to the restrictions may contact the department for permission.

Restrictions:

Enrollment limited to students in the BICB11, CS11 or SOEN11 programs.

CSCI 5830 - Image Processing**Credit(s): 3 Credits**

This course will introduce the fundamentals of image processing and computer vision, including image models and representation, image analysis methods such as feature extraction (color, texture, edges, shape, skeletons, etc.), image transformations, image segmentation, image understanding, motion and video analysis, and application-specific methods such as medical imaging, facial recognition, and content-based image retrieval. Students not able to register due to the restrictions may contact the department for permission.

Restrictions:

Enrollment limited to students in the BICB11, CS11 or SOEN11 programs.

CSCI 5850 - High-Performance Computing**Credit(s): 3 Credits**

Use processor features, multiple cores, memory, graphics cards and clusters to maximize efficiency of computer software. Topics include vectorizing code, cache and memory efficiency, multithreaded programming, gpu programming and distributed programming. Students not able to register due to the restrictions may contact the department for permission.

Restrictions:

Enrollment limited to students in the BICB11, CS11 or SOEN11 programs.

CSCI 5910 - Internship with Industry**Credit(s): 1-3 Credits (Repeatable for credit)**

A work experience with an agency, firm, or organization that employs persons in this degree field. Learning plan and follow-up reflection and evaluation are required. Permission of department required.

Restrictions:

Enrollment limited to students in the BICB11, CS11 or SOEN11 programs.

CSCI 5930 - Special Topics**Credit(s): 1-3 Credits (Repeatability up to 12 credits)****Restrictions:**

Enrollment limited to students in the BICB11, CS11 or SOEN11 programs.

CSCI 5960 - Capstone Project

Credit(s): 3 Credits

A culminating experience in which teams of students complete a full software development life-cycle resulting in the creating of a software system.

Prerequisite(s): CSCI 5300 with a grade of C- or higher

Restrictions:

Enrollment limited to students in the BICB11, CS11 or SOEN11 programs.

CSCI 5970 - Research Topics

Credit(s): 1-3 Credits (Repeatable for credit)

A research experience in computer science guided by faculty. Permission of instructor required.

Restrictions:

Enrollment limited to students in the BICB11, CS11 or SOEN11 programs.

CSCI 5980 - Graduate Reading Course

Credit(s): 1-3 Credits (Repeatability up to 9 credits)

CSCI 5990 - Thesis Research

Credit(s): 1-6 Credits (Repeatable for credit)

Work towards a Master's thesis.

Restrictions:

Enrollment limited to students in the BICB11, CS11 or SOEN11 programs.