Computer Science (CS)

CS 101 Introduction to Computers and Computing (3)

Lecture, 2 hours; laboratory, 2 hours. This course provides an overview of how computers work and how to use basic software tools and utilities on a personal computer. Topics include computer types, history of computing, computer organization and operation, survey of computer languages, program development, computer applications (word processing, database, graphics, spreadsheets, etc.), and computers in society. Weekly hands-on experience with a variety of operating systems and applications. Not applicable to the CS major. Recommended for all students. Satisfies GE, category B3.

CS 110 Introduction to Unix (1)

Laboratory, 3 hours. This course is an introduction to the use of Unix as a programming environment. Communicating with a Unix host, shells and shell commands, files and directories, X Window System, jobs and processes, scripting, and programming utilities (compiler, linker, debugger, make, hex dump, etc.). Prerequisites: GE Math eligibility and previous or concurrent enrollment in CS 115, or consent of instructor.

CS 115 Programming I (4)

Lecture, 3 hours; laboratory, 3 hours. This course gives an overview of computer organization; arithmetic and logical expressions, decision and iteration, simple I/O; subprograms; principles of good programming style, readability, documentation, and structured programming concepts; top-down design and refinements; and techniques of debugging and testing. Use of the above concepts will be implemented in a standard high-level programming language. Satisfies GE, category B3. Prerequisite: GE math eligibility or consent of instructor.

CS 115W Programming I Workshop (1)

A workshop designed to be taken with CS 115. Exploration of programming concepts through problem solving in a group setting. Corequisite: CS 115.

CS 175 Intro Computer Graphics (3)

Lecture, 2 hours; laboratory, 2 hours. This is a first course in computer graphics hardware and software. Topics include graphics hardware, microcomputer graphics, presentation and business graphics, graphics for artists, computer mapping, CAD/CAM (drafting and environmental applications), animation, 3-dimensional graphics, and desktop publishing. Students will have hands-on experience using a variety of graphics programs on microcomputers. Not applicable to the CS major. Prerequisite: previous computer course or consent of instructor.

CS 185 Special Topics in Computer Sci (1-4)

This lower-division course may be repeated with different subject matter. Content will be indicated by the specific topic. Prerequisite: consent of instructor.

CS 215 Programming II (4)

Lecture, 3 hours; laboratory, 3 hours. This course is a sequel to CS 115. Topics include Pointers and dynamic allocation of storage, linked lists, an introduction to the object oriented programming (OOP) paradigm, classes and objects, encapsulation, member variables and member functions, inheritance and polymorphism, scoping, templates, iterators, and error handling techniques. Prerequisites: CS 110 and CS 115, or consent of instructor.

CS 242 Discrete Structures for Computer Science (4)

Lecture, 4 hours. This course covers fundamental mathematical concepts blended with their applications in Computer Science. Topics include sets, functions and relations, Boolean algebra, normal forms, Karnaugh map and other minimization techniques, predicate logic, formal and informal proof techniques, relational algebra, basic counting techniques, recurrence relations, and introduction to graph theory. Prerequisites: CS 115 and MATH 161, or consent of instructor.

CS 252 Intro to Computer Organization (4)

Lecture 3 hours; laboratory 3 hours. This course looks at the interface between computer hardware and software by introducing computer architecture and low-level programming. Topics to be covered include data representations, digital logic, combinational and sequential circuits, computer system organization from the machine language point of view, and assembly language implementation of high-level constructs. Prerequisites: CS 110 and CS 115, or consent of instructor.

CS 285 Selected Topics in Computer Science (1-4)

This lower division course may be repeated with different subject matter. Content will be indicated by the specific topic. Prerequisite: as indicated in the specific topic description or by consent of instructor.

CS 315 Data Structures (4)

Lecture, 3 hours; laboratory, 3 hours. This course introduces the concept of the organization of data into different structures to support the efficient implementation of computer algorithms. The emphasis of the course is on the internal representation of the elementary and intermediate data structures, their time and space requirements, and their applications. A second component of the course is the study of more advanced features of object oriented programming. Prerequisite: CS 215 or consent of instructor.

CS 340 Computer Security (3)

Current methods for increasing security, protecting privacy, and guaranteeing degrees of confidentiality of computer records; ensuring computer installation safety; protecting software products; preventing and dealing with crime; value systems, ethics, and human factors affecting use and misuse of computers; and discussion of recent technical, legal, and sociopolitical issues influencing computer security problems. Prerequisites: CS 215 and CS 252, or consent of instructor.

CS 349 Problem Solving in a Team Environment (1)

Laboratory, 2 hours. This course focuses on problem solving and program development in a team programming environment. Topics include techniques for problem analysis and algorithm design, rapid implementation and pair programming methods, use of standard container classes and library functions. Different types of problems will be selected each semester. May be repeated for credit. A maximum of 3 units can be applied to the Computer Science major. Prerequisite: CS 315 or consent of instructor. SSU students taking this course participate in regional and national programming competitions.

CS 351 Computer Architecture (4)

Lecture, 4 hours. This course is a sequel to CS 252 and includes the following topics: Instruction set design; stages of instruction execution, data and control path design; CISC, RISC, stack architectures; pipelining; program optimization techniques, memory hierarchy: cache models and design issues, virtual memory and secondary storage; I/O interfacing. Advanced topics to include some of the following: parallel architectures, DSP or other special purpose architecture, FPGA, reconfigurable architecture, and asynchronous circuit design. Prerequisites: CS 215 and CS 252, or consent of instructor.

CS 355 Database Management Systems Design (4)

Lecture, 4 hours. This course focuses on the theoretical as well as the practical aspects of modern database systems. Topics include the study of the entity-relationship (E/R) model, relational algebra, data normalization, XML as a semi-structured data model, data integrity, and database administration. Current tools and technology are used to create and manipulate sample databases. Prerequisite: CS 215 or consent of instructor.

CS 360 Object Oriented Programming (3)

Principles of object-oriented programming, including encapsulation, inheritance, and polymorphism, and design patterns for object-oriented programming. Specific applications are developed in one or more object-oriented programming languages and will cover the use of application frameworks and graphical user interfaces based on object-oriented principles. Prerequisites: CS 215, or consent of instructor.

CS 365 Computer Networking and the Internet (3)

Lecture, 2 hours; laboratory, 3 hours. A study of the principles, algorithms, and protocols used in computer networks with an emphasis on those used in the Internet. Prerequisites: CS 215 and CS 252, or consent of instructor.

CS 370 Software Design and Development (4)

Lecture, 4 hours. Techniques of software design and development. Software life-cycle, requirements, formal specification, metrics, design, functional and structural testing, rapid prototyping, complexity, version control, team management, software metrics, and tools for component based software development. Prerequisite: CS 215 or consent of instructor.

CS 375 Computer Graphics (3)

An introduction to the principles of computer graphics hardware, coordinate transformations, 2- and 3-dimensional primitives, raster display algorithms, polygon manipulation, interactive techniques, device-independent software, and curve fitting. Prerequisites: CS 215 and MATH 161, or consent of instructor.

CS 380 ETS Major Field Test (1)

The focus of this course is preparation for the Major Field Test in Computer Science. Students will review material in the basic knowledge areas of computer science including discrete structures, programming, algorithms and complexity, systems, software engineering, and information management. The course will culminate with students taking the Major Field Test in Computer Science administered through Educational Testing Services. This course is intended for students whom have completed the majority of required coursework in the CS major and are within one semester of graduation.

CS 385 Selected Topics Computer Sci (1-4)

This course may be repeated with different subject matter for credit in the CS major. Prerequisites: upper-division standing with consent of a CS advisor and consent of instructor.

CS 390 Computer Science Colloquim (1)

Series of lectures on current developments in computer science. May be repeated for credit; a maximum of 3 units can be applied to the CS major; students will be required to attend all presentations, keep a journal, and do a research project based on one or more of these presentations. Contact the department for specific information. Cr/NC only.

CS 395 Community Involvement Program (1-4)

CIP involves students in basic community problems. The most common task for a CS student will be tutoring at a local school. Not applicable to the CS major. Prerequisites: CS 115 and consent of instructor.

CS 415 Algorithm Analysis (4)

Lecture 4 hours. This course provides a systematic approach to the design and analysis of algorithms with an emphasis on efficiency. Topics include algorithms for searching and sorting, hashing, exploring graphs, and integer and polynomial arithmetic. Foundations in recurrence relations, combinatorics, probability, and graph theory as used in algorithm analysis are covered. Standard design techniques such as divide-and-conquer, greedy method, dynamic programming, heuristics, and probabilistic algorithms along with NP-completeness and approximation algorithms are included. Prerequisite: CS 315, or consent of instructor.

CS 450 Operating Systems (4)

Lecture, 4 hours. This course covers the fundamental concepts of operating system design and implementation, the study of problems, goals, and methods of concurrent programming, and the fundamentals of systems programming. Topics include resource-management, process and thread scheduling algorithms, inter-process communication, I/O subsystems and device-drivers, memory management including virtual memory, segmentation, and page-replacement policies. These topics will be covered in theory and in practice through the study of the source-code of a working operating system. Prerequisites: CS 252 and CS 315, or consent of instructor.

CS 452 Compiler Design and Construction (3)

Lecture, 2 hours; laboratory, 2 hours. Application of language and automata theory to the design and construction of compilers; lexical scanning, top-down and bottom-up parsing; semantic analysis and code generation; optimization; and design and construction of parts of a simple compiler using compiler generation tools. Prerequisite: CS 215 and 252, or consent of instructor.

CS 454 Theory of Computation (4)

Lecture, 4 hours. This course provides a mathematical study of the types of problems that can and cannot be solved by computers using abstract mathematical models of computing devices and language specification systems with focus on regular and context-free languages. Classification of computer-solvable problems. Prerequisite: CS 315, or consent of instructor.

CS 460 Programming Languages (4)

Lecture 4 hours. This course provides a survey of the syntactic, semantic, and implementation features of functional, procedural, object-oriented, logic and concurrent programming languages. Prerequisites: CS 252 and CS 315, or consent of instructor.

CS 465 Data Communications (3)

Lecture, 2 hours; laboratory, 3 hours. The ISO reference model, theoretical basis for data communications, data transmission theory and practice, telephone systems, protocols, networks, and internetworks, with examples. Prerequisites: CS 351, or consent of instructor.

CS 470 Advanced Software Design Project (3)

Lecture, 3 hours. This course is a project based course designed to provide a "real world, team oriented" capstone experience for computer science majors. Coursework will be organized around large programming projects. The content of the projects may vary depending on the interests of the instructor and may include industry, government, non-profit organization, or other affiliations. Prerequisites: CS 315, CS 370, and senior standing in the major or consent of instructor.

CS 480 Artificial Intelligence (3)

This course is a survey of techniques that simulate human intelligence. Topics may include pattern recognition, general problem solving, adversarial game-tree search, decision-making, expert systems, neural networks, fuzzy logic, and genetic algorithms. Prerequisite: CS 315 or consent of instructor.

CS 495 Special Studies (1-4)

This course is intended for students who are doing advanced work in an area of computer science (e.g., a senior project). Prerequisite: an upper-division CS course in the area of interest and consent of instructor.

CS 496 Senior Seminar (1-4)

Discussion of a topic of current importance in computer science. Independent student projects or oral presentations may be required. Prerequisite: senior standing in CS curriculum.

CS 497 Internship (1-3)

Student projects conceived and designed in conjunction with an off-campus organization or group. The internship is intended to provide on-the-job experience in an area of computer science in which the student has no prior on-the-job experience. Computer hardware or computer time required for the internship, as well as regular supervision of the intern, must be provided by the off-campus organization. Prerequisite: student must be within 30 units of completion of the CS major. May be taken Cr/NC only. No more than 3 units can be applied to the CS major.

Computer and Engineering Science (CES)

CES 400 Linear Systems Theory (3)

Lecture, 3 hours. Analysis of linear time-invariant systems, correlation, convolution, impulse response, complex variables, Fourier series and transform, sampling, filtering, modulation, stability and causality, feedback and control systems, Laplace and Z-transform, and fast Fourier transforms. Prerequisite: MATH 241 or consent of instructor.

CES 430 Photonics (3)

Lecture, 3 hours. Lasers, diode lasers and LED's, fiber optics, and optical radiation detectors. Prerequisites: A course in modern Physics (such as PHYS 314) and electromagnetism (such as PHYS 430).

CES 432 Physics of Semiconduct Devices (3)

Lecture, 3 hours. Semiconductor materials, crystal structure and growth, energy bands and charge carriers, and conductivity and mobility; metal semiconductor and p-n junctions, p-n junction diodes, bipolar junction transistors, field effect transistors, CCD's, photonic devices and integrated circuits. Projects in photolithography, conductivity and contact resistance measurements, I-V and C-V characteristics of diodes, and characterization of transistors may be assigned. Prerequisites: ES 230 or PHYS 314 or consent of instructor.

CES 440 Data Communications (3)

Lecture, 2 hours; laboratory, 3 hours. The ISO reference model, theoretical basis for data communications, data transmission theory and practice, telephone systems, protocols, networks, and internetworks, with examples. Prerequisites: ES 440 or consent of instructor.

CES 490 Selected Topics in CES (1-3)

Special topics to introduce new emerging fields, provide foundation for advanced graduate level courses or augment other courses in computer and engineering science. Prerequisite: consent of instructor.

CES 494 Directed Readings (1-3)

Independent study under a faculty member. The proposal must be approved by the graduate advisor if the course is to apply toward degree requirements. Prerequsite: consent of instructor.

CES 500 Queuing and Transform Theory (3)

Lecture, 3 hours. Review of probability theory, fundamentals of transform theory, Fourier and Z-transforms, Markovian and discrete time queuing systems, single and multi server queuing networks, and their applications. The course may require significant lab and/or project activity. Prerequisites: ES 314 or consent of instructor.

CES 510 Intelligent Systems Design (3)

Lecture, 3 hours. Introduction to adaptive systems: neural networks, genetic algorithms (GAs), fuzzy logic, simulated annealing, and tabu search. Specific topics include perceptions, backpropagation, Hopfield nets, neural network theory, simple GAs, parallel GAs, cellular GAs, schema theory, mathematical models of simple GAs, and using GAs to evolve neural networks. Prerequisites: ES 314 and CES 400, or consent of instructor.

CES 512 Theory of Software Systems (3)

Lecture, 3 hours. Review of data structures and basic algorithms for sorting, searching, and string processing. Basics of logic, formal systems, grammars, and automata. Applications to some of the following areas: design of language processing tools (editor, translator etc.), software specification, testing and verification, and non-numerical problem solving. The course may require significant lab and/or project activity. Prerequisite: ES 314 or consent of instructor.