

Course Descriptions

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| COMD 7800 | Clinical Externship in Audiology | 1-9 [®] |
| Twelve-month full-time clinical practicum experience in one or more off-campus clinical sites. Prerequisite: Admission to the Audiology Program. (F,Sp,Su) | | |
| COMD 7810 | Research Seminar in Educational Audiology | 1-3 [Ⓜ] |
| Identification of research problem, consideration of research strategies and methods, application of research and statistical concepts in departmental focus, interaction with faculty. (F,Sp,Su) | | |
| COMD 7820 | Clinical Research in Audiology | 1 [®] |
| Facilitates completion of doctoral students' clinical research projects in audiology. Further enables students to incorporate evidence-based practice into the profession of audiology. Prerequisite: Admission to the Audiology Program. (F,Sp) | | |
| COMD 7830 | Special Topics in Speech-Language Pathology | 3 [Ⓜ] |
| Discussion of advanced topics and issues in speech and language disorders, including theories of information processing and learning mechanisms underlying speech and language disorders, the nature of various types of speech and language disorders, current research in speech and language disorders, assessment practices, and/or intervention practices. (F,Sp,Su) | | |
| COMD 7840 | Journal Reading Group in Speech-Language Pathology | 1 [Ⓜ] |
| Under faculty direction, students read and discuss published research. Students learn to critique empirical and theoretical papers, as well as current research findings in important areas of speech-language pathology. (F,Sp,Su) | | |
| COMD 7850 | Externship Seminar | 3 [®] |
| Internet-based seminar in current clinical-related topics for fourth-year students in the Doctorate of Audiology Program. Prerequisite: Admission to Doctorate of Audiology Program. (F,Sp,Su) | | |
| COMD 7860 | Practice Management in Audiology | 2 |
| Audiology business and practice management. Discussion of business set-up, the business plan, managerial accounting and financial analysis, marketing, pricing, reimbursement, record keeping, and forensics. Prerequisite: Admission to the Audiology Program. (Sp) | | |
| COMD 7870 | Clinical Research Project | 1-6 [®] |
| Under the direction of his or her advisory committee, student develops a clinically-related project. This project is a creative work at a doctoral level and worthy of publication or presentation. Prerequisite: Admission to the Audiology Program. (F,Sp) | | |
| COMD 7900 | Independent Study | 1-2 [®] |
| Advanced students, under direction of a faculty member, will study independently; however, departmental permission is necessary. (F,Sp,Su) | | |
| COMD 7910 | Independent Research | 1-2 [®] |
| Advanced students, under direction of a faculty member, will do research in an area of interest to themselves. (F,Sp,Su) | | |
| COMD 7970 | Dissertation | 1-9 [®] |
| Variable credit for dissertation project in connection with the doctoral program emphasis in educational audiology. Graded Pass/Fail <i>only</i> . (F,Sp,Su) | | |
| COMD 7990 | Continuing Graduate Advisement | 1-9 [®] |
| Graded Pass/Fail <i>only</i> . (F,Sp,Su) | | |

[®] Repeatable for credit. Check with major department for limitations on number of credits that can be counted for graduation.

^{DE} This course may be available through Regional Campuses and Distance Education (RCDE), and may be offered through multiple delivery methods. Current RCDE offerings may be viewed at: <http://distance.usu.edu/>

Computer Science (CS)

See Department of Computer Science, pages 231-238

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| CS 1020 | Campus Computing and Beyond | 1 |
| Hands-on laboratory for CS 1030. Introduces the campus network and the Internet. Emphasizes general problem-solving strategies and skills associated with computer and application software use. (F,Sp,Su) | | |

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| CS 1030 | BPS Foundations of Computer Science | 3 |
| Investigation of computers and computing in today's society, including the basic scientific and mathematical concepts that underlie computer science, computing, and computer systems. No prerequisites. (F) | | |
| CS 1050 | Problem Solving with Computers | 3 |
| Investigates problem-solving using methodologies of computer science. Emphasizes techniques used by computer scientists to solve problems, as well as the scientific method. Develops problem-solving methodology for both new and traditional computer applications. (F,Sp) | | |
| CS 1060 | BPS Cyber Security: Threats, Analysis, and Defense | 3 |
| Investigation of cyber-security threats through an analysis of computer systems and communication methods. Develops skills for identifying potential attacks, analyzing problems, and implementing solutions. Students learn to minimize vulnerabilities and defend against attacks in the cyber world. (Sp) | | |
| CS 1400 | Introduction to Computer Science—CS 1 | 3 |
| Introduction to science of problem solving, programming, program development, algorithm analysis, and data structures. Students will learn to develop correct software in a current programming language environment. Computer science majors must enroll in CS 1405 concurrently with CS 1400. Prerequisite: Grade of C- or better in MATH 1050 or Math ACT score of at least 25. (F,Sp,Su) ^{DE} | | |
| CS 1405 | Introduction to Computer Science—CS 1 Lab | 1 |
| One-hour lab taught in conjunction with CS 1400. Students learn to develop correct software in a hands-on structured environment. Computer science majors are required to pass both the laboratory and the lecture, and are required to enroll in CS 1400 concurrently with CS 1405. For students not majoring in computer science, this laboratory is advised, but not required, for CS 1400. Prerequisite: Grade of C- or better in MATH 1050 or Math ACT score of at least 25. (F,Sp,Su) | | |
| CS 1410 | QI Introduction to Computer Science—CS 2 | 3 |
| Introduction to science of problem solving, programming, program development, algorithm analysis, and data structures. Students will learn to develop correct software in a current programming language environment. Prerequisite: Grade of C- or better in CS 1400. (F,Sp,Su) ^{DE} | | |
| CS 2250 | Cooperative Work Experience | 1-9 [®] |
| Provides credit for students working at a participating firm under faculty supervision. Prerequisites: 2.5 GPA; permission of instructor. (F,Sp,Su) | | |
| CS 2420 | QI Algorithms and Data Structures—CS 3 | 3 |
| Introduction to science of problem solving, programming, program development, algorithm analysis, and data structures. Students will learn to develop correct software in a current programming language environment. Prerequisites: 2.0 GPA; grade of C- or better in CS 1410. (F,Sp,Su) | | |
| CS 2450 | CI Introduction to Software Engineering I | 3 |
| First part of a two-course series in software engineering, covering fundamental principles and practices. Provides hands-on experience in development of complete software application in a group situation. Prerequisites: 2.0 GPA; grade of C- or better in CS 2420. (F,Sp) | | |
| CS 2810 | Computer Systems Organization and Architecture I | 3 |
| Examines organization and architecture of computer systems. Covers terminology, data representation, Boolean Algebra, and combinational and sequential logic circuits as they apply to computer hardware and software. Prerequisites: 2.0 GPA; grade of C- or better in CS 1410. (F,Sp) | | |
| CS 3000 | Undergraduate Seminar | 1 |
| Serves as a capstone course for the pre-computer science curriculum, as well as an introduction to the advanced standing curriculum. Also includes discussion of computer science as a career and discussion of the advanced standing test. Graded Pass/Fail <i>only</i> . Prerequisites: 2.0 GPA; grade of C- or better in CS 2420; fulfillment of Computer and Information Literacy (CIL) requirement; grade of C- or better in ENGL 2010; or permission of instructor. (F,Sp,Su) ^{DE} | | |

Course Descriptions

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| CS 3010 | DSC/QI Information Acquisition, Analysis, and Presentation | 3 | Introduces students to use of scientific method and computer technology in analysis of multi-faceted problem, and presentation of that analysis. Each semester, built around single topic such as global warming. Prerequisites: Completion of University Studies Computer and Information Literacy (CIL) and Quantitative Literacy (QL) requirements. (F,Sp,Su) ^{DE} |
| CS 3100 | Operating Systems and Concurrency | 3 | Design and implementation of operating systems. UNIX will be used as one example, but all categories of operating systems will be discussed. Presentation of the concept of concurrency as it applies to operating system design and application. Prerequisites: 2.0 GPA; grade of C- or better in CS 2420. Not available to pre-Computer Science majors. (F,Sp) ^{DE} |
| CS 3410 | DSC/QI Computational Science: JAVA/Internet | 3 | Introduces computational science for algorithm development in JAVA-based applications. Examines information representation, storage, retrieval, and transmission in quantitative Internet-based environments. Prerequisites: CS 1410 and completion of University Studies Quantitative Literacy (QL) requirement. (F,Sp,Su) ^{DE} |
| CS 3420 | DSC/QI Computational Science: C# and .NET | 3 | Introduces algorithm development for C#/.NET applications. Examines digital representation, storage, retrieval, and transmission of information, and quantitative applications such as distributed network problems, along with the algorithms for such applications. Prerequisites: CS 1410, completion of University Studies Breadth Physical Sciences (BPS) course, and fulfillment of University Studies Quantitative Literacy (QL) requirement. (F,Sp,Su) |
| CS 3430 | DSC/QI Computational Science: Python and Perl Programming | 3 | Introduces students to algorithm development and programming in computational science for Python and Perl applications on a Linux platform. Examines computer-based representation, storage, retrieval, and transmission of information, along with the algorithms used to perform such operations. Examines specific applications in bioinformatics and biology. Prerequisites: CS 1400, completion of University Studies Breadth Life Sciences (BLS) course, and fulfillment of University Studies Quantitative Literacy (QL) requirement. (F,Sp,Su) |
| CS 3450 | Introduction to Software Engineering II | 3 | Second part of a two-course series in software engineering, covering fundamental principles and practices. Provides hands-on experience in development of complete software application in group situation. Prerequisite: CS 2450. (F,Sp) |
| CS 3810 | Computer Systems Organization and Architecture II | 3 | Examines high-level architecture of computer systems. Covers processor and memory design for optimal performance, I/O subsystems, networking, and computer security. Prerequisites: 2.0 GPA; grade of C- or better in CS 2810. Not available to pre-Computer Science majors. (F,Sp) |
| CS 4250 | Cooperative Work Experience | 1-9 [®] | Provides credit for students working at a participating firm under faculty supervision. Prerequisites: 2.0 GPA; permission of instructor. Not available to pre-Computer Science majors. (F,Sp,Su) |
| CS 4700 | Programming Languages | 3 | Theories of programming design and implementation. Introduction to variety of programming languages, showing how they represent trade-offs with respect to these theories. Prerequisites: 2.0 GPA; grade of C- or better in CS 2420. Not available to pre-Computer Science majors. (F,Sp) |
| CS 4720 | Computer Networking I | 3 | Focuses on client/server model, which is the dominant architectural model for today's computer systems. Explores the network underlying this model, specifically examining the topology, protocol(s), user interface(s), and hardware. Emphasizes the general theory and functionalities underlying the client/server model and computer networks in general. Prerequisites: 2.0 GPA; grade of C- or better in CS 2420. Not available to pre-Computer Science majors. (F,Sp,Su) ^{DE} |
| CS 4730 | Computer Networking II | 3 | Focuses on client/server model, which is the dominant architectural model for today's computer systems. Emphasizes the specifics of the products of today's dominant network companies, which are currently Novell and Microsoft. Completion of this course prepares students for certification under such products. Prerequisites: 2.0 GPA; grade of C- or better in CS 4720. Not available to pre-Computer Science majors. (Sp) |
| CS 4890 | Topics in Computer Science (Topic) | 3 | Current topics in computer science as determined by advances in the field. Prerequisites: 2.0 GPA; grade of C- or better in CS 2420. Not available to pre-Computer Science majors. (F,Sp,Su) |
| CS 4950 | Undergraduate Research | 1-4 [®] | Participation in research projects, under supervision of a computer science faculty member. Prerequisites: 2.0 GPA; grade of C- or better in CS 2420 and permission of instructor. Not available to pre-Computer Science majors. (F,Sp,Su) |
| CS 5000 | Theory of Computability | 3 | Theory of computation, including presentation of computability, decidability, and complexity. Includes formal grammars, finite and pushdown automata, and Turing machines. Prerequisites: 2.0 GPA; grade of C- or better in CS 2420. Not available to pre-Computer Science majors. (Sp) |
| CS 5050 | Advanced Algorithms | 3 | Study of algorithms and their analysis, including: design by induction, algorithms involving sequences and sets, graph algorithms, geometric algorithms, algebraic algorithms, reductions, NP-completeness, and parallel algorithms. Prerequisites: Grade of C- or better in CS 2420 and admission into Computer Science major. (F,Sp) |
| CS 5060 | Intensive Programming | 3 | Teaches high-level programming skills. Includes both data structures and OOD and OOA techniques. Required for all new MS/CS students whose undergraduate degree is not in computer science from an ABET accredited program. May not be used for credit by BS/CS majors or PhD/CS majors. Prerequisite: Enrollment in MS/CS program or instructor's permission. (F) |
| CS 5070 | Computer Science Capstone I | 1 | Students develop a project that includes the use of a significant portion of the computer science topics presented in the core curriculum. During CS 5070, the documentation, requirements, and testing plan for the project are completed and presented to a faculty review committee. Graded Pass/Fail only. Prerequisite: 2.0 GPA. Not available to pre-Computer Science majors. (F,Sp) |
| CS 5071 | Computer Science Capstone II | 3 | Students implement and test a project that includes the use of a significant portion of the computer science topics presented in the core curriculum. During CS 5071, the implementation and testing is performed on the project defined in CS 5070. Prerequisites: CS 5070, 2.0 GPA. Not available to pre-Computer Science majors. (F,Sp) |
| CS 5100 | Graphical User Interfaces and Windows Programming | 4 | Design principles of GUIs and philosophy, structure, and programming in Windows environments. Prerequisites: 2.0 GPA; grade of C- or better in CS 2420. Not available to pre-Computer Science majors. (Sp) |
| CS 5200 | Distributed and Network Programming | 4 | Introduction to programming concepts and techniques for distributed and networked environments. Explores concurrency, process synchronization, network protocols, connectionless and connection-oriented communications, network architectures and topology, load balancing, and transmission media. Prerequisites: 2.0 GPA; grade of C- or better in CS 3100. Not available to pre-Computer Science majors. (F) |
| CS 5300 | Compiler Construction | 4 | Review of programming language structures, translation, loading, execution, and storage allocation. Compilation of declarations, expressions, statements, and procedures/functions. Organization and design of a compiler. Prerequisites: 2.0 GPA; grade of C- or better in CS 2810 and 4700. Not available to pre-Computer Science majors. (F) |

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| <p>CS 5400 Computer Graphics I 4 Introduction to concepts of graphical techniques. Digital and pictorial representation of information. Prerequisites: 2.0 GPA; grade of C- or better in <i>all</i> of the following: CS 2420; MATH 1220; MATH 2250 or 2270. Not available to pre-Computer Science majors. (F)</p> <p>CS 5410 Game Development 4 Explores technical game development. Emphasizes integration of multiple computer science topics within a single application, including: graphics, AI multi-threading, multi-core, networking, synchronization, optimization, and scripting languages. Includes a team project to develop a computer-based game. Prerequisites: CS 2420 and 3100. (Sp)</p> <p>CS 5450 Multimedia Systems* 4 Introduction to concepts and techniques underlying multimedia-based systems. Deals with both the hardware aspects of multimedia systems (e.g., transfer rates, capacities, resolution, etc.) and the software requirements of such systems. Each student required to develop a multimedia-based system. Prerequisites: 2.0 GPA; grade of C- or better in CS 2420. Not available to pre-Computer Science majors. (Sp)</p> <p>CS 5460 Computer Security I 3 Introduction of computer security principles, data protection models, and application techniques. Develops basic skills necessary for protecting systems and communication from a variety of computer security threats. Topics include encryption, policies, access control, network security, OS security, and software security. Prerequisites: 2.0 GPA; grade of C- or better in CS 2420. Not available to pre-Computer Science majors. (F)</p> <p>CS 5500 Parallel Programming 3 Examines basic techniques for designing parallel algorithms, such as balanced trees, pointer jumping, partitioning, pipelining, accelerated cascading, list ranking, and tree contraction. Consideration of classic parallel algorithms in graphs, merging, sorting, planar geometry, string matching, and randomized techniques. Prerequisites: 2.0 GPA; grade of C- or better in CS 2420. Not available to pre-Computer Science majors. (Sp)</p> <p>CS 5600 Intelligent Systems 4 (dual listing 6600) Introduction to artificial intelligence topics, including software agent design, informed search, heuristics, inference (logical and probabilistic), knowledge representation, game playing, planning, machine learning, philosophy, and ethics. Prerequisites: 2.5 GPA; grade of C- or better in CS 2420 or instructor permission. Not available to pre-Computer Science majors. (F)</p> <p>CS 5650 CVPRIP I: Computer Vision, Pattern Recognition, and Image Processing 3 Introduction to theories and techniques of machine intelligence, with emphasis on pattern recognition, computer vision, fuzzy logic, and neural networks. Prerequisites: 2.0 GPA; grade of C- or better in <i>all</i> of the following: CS 2420, MATH 2270, STAT 2000 or 3000. Not available to pre-Computer Science majors. (F)</p> <p>CS 5660 Bioinformatics I 3 Introduction to tools and techniques used in the study of bioinformatics, genomics, and computational biology. Explores usage of these tools and techniques for storage, retrieval (mining), processing, visualization, and analysis of biological information. Prerequisite: Permission of instructor. (F) ^{DE}</p> <p>CS 5670 Bioinformatics II 3 Builds on material presented in CS 5660, presenting more advanced topics in bioinformatics, such as data mining, machine learning, and evolutionary algorithms. Students <i>cannot</i> receive credit for <i>both</i> CS 5670 and 6670. Prerequisites: 2.0 GPA; grade of C- or better in CS 5660. Not available to pre-Computer Science majors. (Sp)</p> <p>CS 5700 Object-Oriented Software Development 3 Study of fundamental object-oriented principles, e.g., abstraction, encapsulation, classification, and inheritance. Application of these principles in all phases of software development, with emphasis on analysis, design, and testing. Introduction to software design patterns. Prerequisites: 2.0 GPA; grade of C- or better in CS 3450. Not available to pre-Computer Science majors. (F)</p> | <p>CS 5800 Introduction to Database Systems 3 Comparison of various database systems. Normal forms, protection, concurrency, security and integrity, and distributed and object-oriented systems. Prerequisites: 2.0 GPA; grade of C- or better in CS 2420. Not available to pre-Computer Science majors. (F) ^{DE}</p> <p>CS 5850 Systems Analysis 3 Theory and practice of analysis, design, and implementation of information systems. Students will construct an information system. Prerequisites: 2.0 GPA; grade of C- or better in CS 5800. Not available to pre-Computer Science majors. (Sp)</p> <p>CS 5890 Topics in Computer Science (Topic) 1-4[®] Current topics in computer science as determined by advances in the field. Prerequisites: 2.0 GPA; grade of C- or better in CS 2420 and permission of instructor. Not available to pre-Computer Science majors. (F,Sp,Su)</p> <p>CS 5950 Independent Study 3[®] Provides for independent study of selected topics. Prerequisites: 2.0 GPA; grade of C- or better in CS 2420 and permission of instructor. Not available to pre-Computer Science majors. (F,Sp,Su) ^{DE}</p> <p>CS 6050 Computational Geometry: Algorithms and Applications 3 Computational geometry is the study of computation involving geometric objects, such as lines, polygons, and circles. It has application in bioinformatics, graphics, robotics, CAD/CAM, etc. This course presents the algorithms, data structures, and techniques of computational geometry. Prerequisite: Permission of instructor. (Sp)</p> <p>CS 6100 MultiAgent Systems 3 MultiAgent systems are composed of multiple interacting computing elements, known as agents. Agents are software systems with two important capabilities: first, autonomous actions; and second, interacting with other agents by engaging in cooperation, coordination, and negotiation. Prerequisites: 3.0 GPA and enrollment in Computer Science master's or PhD program. (Sp)</p> <p>CS 6200 Distributed System Design* 3 Examines advanced design concepts related to development of distributed software systems. Students learn how to model and evaluate communication protocols and study techniques for time coordination, distributed process synchronization, object replication and migration, and distributed transaction processing. Students also learn about Common Object Request Broker Architecture (CORBA). Prerequisites: 3.0 GPA; grade of B- or better in CS 5200 and enrollment in Computer Science master's or PhD program. (Sp)</p> <p>CS 6220 Concurrent Systems* 3 Explores concurrency in its various forms, emphasizing debugging techniques, development techniques that guarantee correctness, and performance evaluation and tuning. Prerequisite: CS 5200. (F)</p> <p>CS 6250 Cooperative Work Experience, Graduate 1-9^W Provides credit for students working at a participating firm under faculty supervision. Graded Pass/Fail <i>only</i>. Prerequisites: 3.0 GPA; permission of instructor and enrollment in Computer Science master's or PhD program. (F,Sp,Su)</p> <p>CS 6300 Supercompilers for Sequential and Parallel Computers* 3 Analysis and optimization for sequential and parallel computers, including loop restructuring, concurrency analysis, vector analysis, and optimizations for shared and distributed memory computers. Prerequisites: 3.0 GPA; grade of B- or better in CS 5300 and enrollment in Computer Science master's or PhD program. (Sp)</p> <p>CS 6400 Computer Graphics II* 3 Study of computer rendering of three-dimensional objects. Object representation, hidden surface removal, and shading. Ray tracing of synthetic scenes using mathematically defined surfaces. Prerequisites: 3.0 GPA; grade of B- or better in CS 5400 and enrollment in Computer Science master's or PhD program. (Sp)</p> <p>CS 6460 Computer Security II 3 Maintaining the integrity and security of computer systems is critical. Course explores aspects of system vulnerabilities and protection, attack categories and methodologies, the development of secure computer systems, etc. Prerequisite: CS 5460 or permission of instructor. (Sp)</p> |
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| <p>CS 6500 Advances in Parallel Systems 3</p> <p>Survey of current advances in parallel processing and concurrent systems. Review of current scientific literature to understand current issues, problems, and progress in advanced topics of parallel processing. Students read, summarize, report, and discuss up-to-date scientific papers in the field. Prerequisites: 3.0 GPA; grade of <i>B-</i> or better in CS 5500 and enrollment in Computer Science master's or PhD program. (F)</p> <p>CS 6550 Parallel Computing Systems 3</p> <p>Design of large-scale parallel systems. Explores machine organizations SIMD and/or MIMD modes of parallelism, emphasizing interconnection patterns among processors. Discussion of low-level parallel processing algorithms. Presents case studies of existing and proposed systems. Prerequisites: 3.0 GPA; grade of <i>B-</i> or better in CS 5500 and enrollment in Computer Science master's or PhD program. (F)</p> <p>CS 6600 Intelligent Systems 4 (dual listing 5600)</p> <p>Introduction to artificial intelligence topics, including software agent design, informed search, heuristics, inference (logical and probabilistic), knowledge representation, game playing, planning, machine learning, philosophy, and ethics. Graduate students must complete an independent project. Prerequisites: 2.5 GPA; grade of <i>C-</i> or better in CS 2420 or instructor permission; and enrollment in Computer Science master's or PhD program. (F)</p> <p>CS 6610 AI: Advanced Topics in Artificial Intelligence (Topic) 3</p> <p>Advanced course in selected theories and techniques of artificial intelligence. Prerequisites: 3.0 GPA; permission of instructor and enrollment in Computer Science master's or PhD program. (Sp)</p> <p>CS 6630 Fuzzy Logic and its Application 3</p> <p>Introduces students to machine learning and problem solving techniques based on fuzzy logic. Prerequisites: 3.0 GPA; grade of <i>B-</i> or better in CS 2420 and advanced standing, or instructor's permission; and enrollment in Computer Science master's or PhD program. (F)</p> <p>CS 6650 Neural Networks* 3</p> <p>Advanced course in theories and techniques of machine intelligence, using neural networks. Emphasizes various neural network paradigms and the types of problems they are best suited to solve. Prerequisite: CS 2420 or permission of instructor. (Sp) ^{DE}</p> <p>CS 6655 Evolutionary Computation 3</p> <p>In-depth analysis of the foundations of optimization techniques founded on evolutionary computation. Includes evolutionary algorithms, genetic algorithms, genetic programming, etc. Prerequisite: CS 2420 or permission of instructor. (Sp)</p> <p>CS 6665 Data Mining* 3</p> <p>Covers recent advances in machine learning and intelligent information retrieval. Focuses on how these topics relate to and are applied in data mining. Prerequisite: Enrollment in Computer Science master's or PhD program or permission of instructor. (Sp)</p> <p>CS 6670 Advanced Bioinformatics 3</p> <p>Focuses on the various advanced algorithms and models used in bioinformatics applications. Opportunities and needs for improvement of such algorithms discussed in the context of current and future problems in bioinformatics. Prerequisite: CS 5670. (F)</p> <p>CS 6700 Object-Oriented Models, Methods, and Tools 3</p> <p>Study of object-oriented concepts, principles, techniques, development processes, and tools across all areas of software engineering, with special emphasis on current research topics. Prerequisites: 3.0 GPA; grade of <i>B-</i> or better in CS 5700 and enrollment in Computer Science master's or PhD program. (F)</p> <p>CS 6800 Advanced Database Systems 3</p> <p>Covers advanced topics in database systems, including XML, OODBMS, query optimization, query processing, deductive databases, concurrency, theory of relational databases, normalization, and recovery. Prerequisites: 3.0 GPA; grade of <i>B-</i> or better in CS 5800 and enrollment in Computer Science master's or PhD program. (Sp) ^{DE}</p> | <p>CS 6890 Topics in Computer Science (Topic) 1-4 [®]</p> <p>Current topics in computer science as determined by advances in the field. Prerequisites: 3.0 GPA; permission of instructor and enrollment in Computer Science master's or PhD program. (F,Sp,Su)</p> <p>CS 6900 Seminar 1</p> <p>Series of one-hour seminars on current research topics presented by computer science faculty. Graded Pass/Fail <i>only</i>. Prerequisites: 3.0 GPA; permission of instructor and enrollment in Computer Science master's or PhD program. (F) ^{DE}</p> <p>CS 6950 Directed Readings in Computer Science 3 [®]</p> <p>Directed reading on advanced topics in computer science. Prerequisites: 3.0 GPA; permission of instructor and enrollment in Computer Science master's or PhD program. (F,Sp,Su) ^{DE}</p> <p>CS 6970 Thesis and Research 1-9 [®]</p> <p>Graduate research in computer science. Graded Pass/Fail <i>only</i>. Prerequisites: 3.0 GPA; permission of instructor and enrollment in Computer Science master's or PhD program. (F,Sp,Su) ^{DE}</p> <p>CS 6990 Continuing Graduate Advisement 1-6 [®]</p> <p>Graded Pass/Fail <i>only</i>. Prerequisites: 3.0 GPA; permission of instructor and enrollment in Computer Science master's or PhD program. (F,Sp,Su) ^{DE}</p> <p>CS 7100 Advanced MultiAgent Systems* 3</p> <p>Advanced topics in multiAgent systems, including algorithms for finding solutions, social welfare with preferences and utilities, multiAgent learning, and distributed search problems. Prerequisites: 3.0 GPA; grade of <i>B-</i> or better in CS 6100 (or permission of instructor) and enrollment in Computer Science master's or PhD program. (Sp)</p> <p>CS 7350 Patterns in Computer Software Systems 3</p> <p>Investigates patterns in computer software systems and how they can be better cataloged, understood, and reused to improve development productivity and quality. Includes readings of current literature, writing research papers, and participation in group discussions. Prerequisites: 3.0 GPA; grade of <i>B-</i> or better in CS 5700 and enrollment in Computer Science master's or PhD program. (Sp)</p> <p>CS 7380 Software Testing* 3</p> <p>Explores current issues, including testing object-oriented software, test data generation and sufficiency, domain-based testing, functional testing, and code-based testing. Prerequisites: 3.0 GPA; permission of instructor and enrollment in Computer Science master's or PhD program. (F)</p> <p>CS 7460 Advances in Computer Security Research 3</p> <p>Covers recent research directions in computer security. Reviews current state of the field, and explores possible research directions for further work. Prerequisite: CS 6460 or permission of instructor. (F)</p> <p>CS 7500 Fault-Tolerant Systems 3</p> <p>Advanced study of design and implementation of operating systems for fault-tolerant parallel and distributed systems. Topics chosen will provide students with knowledge of current research issues, practices, and techniques for the design and development of such systems. Prerequisites: 3.0 GPA; permission of instructor and enrollment in Computer Science master's or PhD program. (Sp)</p> <p>CS 7550 Interconnection Networks for Parallel Computer Systems 3</p> <p>Explores the design of large-scale parallel processing systems generally suited for multi-microprocessor implementation. Emphasizes interconnection patterns among the processing elements in parallel processors. Prerequisites: 3.0 GPA; permission of instructor and enrollment in Computer Science master's or PhD program. (F)</p> <p>CS 7650 Advanced CVPRIP: Computer Vision, Pattern Recognition, and Image Processing 3</p> <p>Investigates new developments in representation and processing of gray-level and color images, including thresholding, segmentation, curve detection, etc. Also examines visual perception, as well as statistical and syntactical pattern classification. Prerequisites: 3.0 GPA; permission of instructor and enrollment in Computer Science master's or PhD program. (Sp)</p> |
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| CS 7660 | Robotics and Autonomous Systems | 3 |
| Surveys current advances in robotic and autonomous systems. Reviews current scientific literature in the field, with emphasis on understanding the problems solved and the approaches used. Prerequisites: 3.0 GPA; permission of instructor and enrollment in Computer Science master's or PhD program. (F) | | |
| CS 7680 | Advanced Computer Vision* | 3 |
| Emphasizes current topics and research in the general area of computer vision. Focuses on detection, recognition, tracking, and analysis of human activity by using computer vision. Prerequisites: 3.0 GPA; grade of B- or better in CS 5650 and enrollment in Computer Science master's or PhD program. (Sp) | | |
| CS 7900 | Seminar | 2 |
| Series of lectures and presentations on current topics in computer science. Students participate by giving presentations. As part of the course, students are expected to prepare their dissertation proposal. Graded Pass/Fail only. Prerequisites: 3.0 GPA; permission of instructor and enrollment in Computer Science master's or PhD program. (Sp) | | |
| CS 7910 | Special Topics in Intelligent Systems (Topic) | 3^u |
| Discussion of current topics in intelligent systems, such as parallelism and software systems. Prerequisites: 3.0 GPA; permission of instructor and enrollment in Computer Science master's or PhD program. Taught on demand. (F,Sp,Su) | | |
| CS 7920 | Special Topics in Parallelism (Topic) | 3[®] |
| Topics of current interest in the area of parallelism. Prerequisites: 3.0 GPA; permission of instructor and enrollment in Computer Science master's or PhD program. (F,Sp,Su) | | |
| CS 7930 | Special Topics in Software Systems (Topic) | 3^u |
| Topics of current interest in the area of software systems. Prerequisites: 3.0 GPA; permission of instructor and enrollment in Computer Science master's or PhD program. (F,Sp,Su) | | |
| CS 7935 | Topics in Mobile Systems | 3 |
| Mobile computing devices are now ubiquitous. Computations and communications on such devices require a new computing paradigm and raise issues such as power-awareness, location-awareness, security, reliability, etc. This course explores mobile systems and issues pertaining to reliable operation. Prerequisites: CS 3100, 4700, and 5200; or permission of instructor. (F) | | |
| CS 7950 | Reading and Reports | 3[®] |
| Directed reading on cutting-edge topics in computer science. Prerequisites: 3.0 GPA; permission of instructor and enrollment in Computer Science master's or PhD program. (F,Sp,Su) | | |
| CS 7960 | Topics in Bioinformatics (Topic) | 3 |
| Topics of current interest in bioinformatics. Prerequisite: Permission of instructor. (F,Sp,Su) | | |
| CS 7970 | Dissertation Research | 1-15[®] |
| PhD dissertation research. Graded Pass/Fail only. Prerequisites: 3.0 GPA; permission of instructor and enrollment in Computer Science master's or PhD program. (F,Sp,Su) | | |
| CS 7990 | Continuing Graduate Advisement | 1-6[®] |
| Continuing PhD-level advisement. Graded Pass/Fail only. Prerequisites: 3.0 GPA; permission of instructor and enrollment in Computer Science master's or PhD program. (F,Sp,Su) | | |

[®] Repeatable for credit. Check with major department for limitations on number of credits that can be counted for graduation.

^{DE} This course may be available through Regional Campuses and Distance Education (RCDE), and may be offered through multiple delivery methods. Current RCDE offerings may be viewed at: <http://distance.usu.edu/>

*This course is taught alternating years. Check with department for information about when course will be taught.

Electrical and Computer Engineering (ECE)

See Department of Electrical and Computer Engineering, pages 248-254

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| ECE 1000 | Introduction to Electrical and Computer Engineering | 2 |
| Basic concepts and techniques for electrical and computer engineering majors. Introduction to analog and digital electronics with fundamental laboratory skills. One lecture and one lab. Prerequisites: MATH 1050 and 1060; or AP Calculus score of at least 3 on the AB test; or Math ACT score of at least 27. Enrollment limited to electrical engineering and computer engineering majors only. (F) | | |
| ECE 2250 | Electrical Circuits | 4 |
| Introduction to electrical circuits and basic circuit elements. Circuit theory, analysis techniques, and introduction to design. DC analysis. First-order inductive and capacitive circuits. Operational amplifiers. AC steady-state analysis. Introduction to computer-aided design and analysis. Three lectures, one lab. Prerequisite: MATH 2280 (may be taken concurrently). (F,Sp) | | |
| ECE 2700 | Digital Circuits | 4 |
| Design of combinational and sequential logic circuits with discrete and programmable logic devices. Simulations and timing analysis. Use of CAD tools. Design of digital systems. Three lectures, one lab. Prerequisite: Minimum grade of C- in CS 1400. (F,Sp) | | |
| ECE 3410 | Microelectronics I | 4 |
| Fundamentals of transistors, operational amplifiers, and other integrated circuits, along with their utilization in amplifiers, switches, and other applications. Laboratory work required. Prerequisite: ECE 2250. Prerequisite or corequisite: ECE 3620. (Sp) ^{DE} | | |
| ECE 3620 | Circuits and Signals | 3 |
| Continuation of basic circuit concepts. Second-order response, time-domain analysis of higher-order systems. Impulse response and convolution. Transform domain analysis of circuits and other systems. Some lab and computational work required. Prerequisites: MATH 2270, 2280, ECE 2250, CS 1410, PHYS 2220 (may be taken concurrently). (F) ^{DE} | | |
| ECE 3640 | Signals and Systems | 3 |
| Systems realizations. Time and transform domain analysis of discrete-time systems. Vector-space concepts and Fourier series. Fourier transforms in continuous and discrete time. Some lab and computational work required. Prerequisite: ECE 3620. (Sp) ^{DE} | | |
| ECE 3710 | Microcontroller Hardware and Software | 4 |
| Synthesis of microcontroller systems, including hardware, programming, and interfacing. Covers architecture basics, instruction set, assembly language programming, I/O, timing, and interrupts. Includes hands-on implementation. Three lectures, one lab. Prerequisites: ECE 2250, 2700, CS 1410. (F,Sp) ^{DE} | | |
| ECE 3810 | Engineering Professionalism | 1 |
| Introduces students to life as an engineer, including: the design process, working in teams, understanding professional and ethical responsibility, the impact of engineering on society, and the need for continued professional development. Also includes discussion of how engineering meets the contemporary needs of society. Prerequisite: ENGL 3080 (may be taken concurrently). (F,Sp) | | |
| ECE 3860 | Transmission Lines | 1 |
| Covers transmission line analysis and high frequency effects, including reflections, standing waves and interference, VSWR, crosstalk, and coupling. Intended to be taken by computer engineers. Meets simultaneously with ECE 3870 during the first five weeks of the semester. Prerequisites: ECE 2250, PHYS 2220, MATH 2250. | | |
| ECE 3870 | Electromagnetics I | 4 |
| Discussion of Maxwell's equations, electromagnetic waves, power and energy, reflection and refraction processes, transmission lines, waveguides, and antennas. Explores electrostatic and magnetostatic fields produced by charge and current distributions, as well as electromagnetic forces and materials. Prerequisites: ECE 2250, MATH 2210, 2270, 2280, PHYS 2220. (Sp) ^{DE} | | |

