

Department of

Computer Science & Electrical Engineering



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Department of Computer Science and Electrical Engineering

The curricula in the Department of Computer Science and Electrical Engineering are designed to provide a broad background in the theory and practice of computer software, computer hardware, and electrical systems. Students learn how to combine scientific knowledge and engineering methods with practical technical skills to help prepare them for life-long learning and rewarding employment. Three degree programs are offered:

- 1) B.S. in Computer Science (CS)
- 2) B.S. in Computer Engineering (CompE)
- 3) B.S. in Electrical Engineering (EE)

The graduates in the Department of Computer Science and Electrical Engineering will:

- Have a thorough grounding in the fundamental principles and practices of their respective degree programs
- Have learned how to learn
- Be prepared for a successful career
- Be ethical and responsible employees who make a difference

The Department of Computer Science and Electrical Engineering continually strives to evaluate, improve, and modernize its curricula to keep pace with today's technological innovations. Advisors can help students determine the best sequence of courses to meet all graduation requirements within eight semesters. To qualify for graduation, students must achieve at least a C- grade in all major required classes.

Computer Science

As a computer scientist, imagine creating the next search engine, the next social web site, or even the next "must have" video game. The Computer Science program at BYU-Idaho offers a solid background in computer science by providing experiences in algorithm development, procedural and object-oriented design and programming, software engineering practices, computer security, web engineering, technical communication, and theoretical foundations of computing. Graduates are prepared for high paying employment as software engineers or to continue their education at graduate school.

Computer Engineering

As a computer engineer, imagine creating the next super computer, the next revolutionary MP3/video player, or even the next control system for the latest Air Force fighter jet. The Computer Engineering program at BYU-Idaho balances scientific and engineering theory with technical laboratory experiences in order to develop practical knowledge and skills that working computer engineers need. The curriculum is balanced to make you adept at designing and developing both computer hardware and computer software. In addition, throughout your computer engineering education, you will gain in-depth knowledge and skills in the design and development of many different types of computer systems: from small MP3 players to large parallel computer systems. Graduates are prepared for high paying employment as computer engineers or to continue their education at graduate school.

Electrical Engineering

As an electrical engineer, imagine creating the next generation of consumer electronic devices, the next generation of robotics, or the next electronic medical device that saves lives. The Electrical Engineering program at BYU-Idaho prepares you to use electricity and electronics in novel ways to help solve some of the world's greatest scientific challenges. The program balances scientific and engineering theory with technical laboratory experiences in order to develop practical knowledge and skills that working electrical engineers need. Graduates are prepared for high paying employment as electrical engineers or to continue their education at graduate school.

Computer Science & Electrical Engineering

Brigham Young University-Idaho 2010-2011

Computer Science and Engineering Pre-approved Clusters

Computer Science	6600
<i>Take these courses:</i>	
CS 124 Introduction to Software Development	3
CS 165 Object-oriented Software Development	3
<i>Take 2 courses:</i>	
CS 213 Web Engineering I	3
CS 235 Data Structures	3
CS 237 Discrete Mathematics I	3
CS 238 Discrete Mathematics II	3
CS 246 Software Design and Development	3
CS 371 Human-Computer Interaction	3
CS 460 Computer Communication & Networks	3
ECEN 224 Fundamentals of Digital Systems	3
ECEN 324 Computer Architecture	<u>3</u>
Total Credits	12

Computer Engineering	6601
<i>Take these courses:</i>	
CS 124 Introduction to Software Development	3
CS 165 Object-oriented Software Development	3
ECEN 150 Electric Circuit Analysis I	3
ECEN 224 Fundamentals of Digital Systems	<u>3</u>
Total Credits	12

Course Descriptions	Credits*	
CS 124 Introduction to Software Development Prerequisite: High School Algebra CS 124, Introduction to Programming, is the first step in the computer science major tract. The goal of this class is that each student will be able to solve problems in C++ and have a solid foundation in software development methodology. (Fall, Winter, Spring)	(3.0:3:0)	CS 312 Computer Graphics (3.0:3:0) Prerequisite: CS 235, and College Algebra (MATH 110, FDMAT 110, MATH 109, FDMAT 109, MATH 112, or FDMAT 112) and MATH 111 Fundamentals of computer graphics; introduction to a graphics API; introduction to one or more graphics resources; graphics project. (Fall, Winter)
CS 165 Object-Oriented Software Development Prerequisite: CS 124 Software design and development using the object-oriented paradigm. Algorithm formulation and object-oriented programming. (Fall, Winter, Spring)	(3.0:3:0)	CS 313 Web Engineering II (3.0:3:0) Prerequisite: CS 213, CS 246 This course builds upon Web Engineering I allowing students to create more advanced web applications and services. The emphasis of this course will be on server-side technologies and n-tier applications using relational database technology. Different server-side technologies will be used for creating dynamic n-tier web applications. Client-side technologies will be enhanced and combined with server-side technologies to create rich web applications. (Winter, Spring)
CS 202 Ethics (1.0:1:0) Prerequisite: (ENG 111 or ENG 111C or FDENG 101 or FDENG 101C) and CS 165 Survey of issues regarding ethics in Computer Science. Overview of intellectual property rights relative to computing including copyright, patents, trademarks, and piracy. Discussion of current social issues related to computing. (Fall, Winter)		CS 345 Operating Systems (3.0:3:0) Prerequisite: ECEN 324 Analysis of methods used by operating systems to perform typical system services, including: process control, memory management, scheduling, I/O, file management, and concurrency. (Winter, Spring)
CS 213 Web Engineering I (3.0:3:0) Prerequisite: CS 165 Internet and Web basics. Web fundamentals - web terminology, web browsers and web servers. This course teaches the concepts behind the fundamental tools used for building client-side web applications. It emphasizes client side programming standards and programming tools used to create dynamic web applications. (Fall, Winter)		CS 364 Software Engineering I (4.0:4:1) Prerequisite: CS 246 and CS 308 Software engineering overview. Software requirements engineering including elicitation and specification. Software design. (Fall, Spring)
CS 235 Data Structures (3.0:3:0) Prerequisite: CS 165 Builds on the foundation of CS 124 and CS 165 to introduce the fundamental concepts of data structures and the algorithms that proceed from them. (Fall, Winter, Spring)		CS 371 Human-Computer Interaction (3.0:3:0) Prerequisite: Junior Status This class will follow the development lifecycle of a single user interface (UI) intensive project building a new UI for the windows media player. During this process, we will: 1. Identify a target user 2. Build a scenario in which this user will interact with the product. 3. Create a paper prototype of the UI 4. Develop a functional specification 5. Build the project into a workable media player skin 6. Conduct a usability study with people matching the target user (and a few not. . .) 7. Redesign and rebuild the project to account for findings of the study (Fall, Spring)
CS 237 Discrete Mathematics I (3.0:3:0) Prerequisite: CS 165 and Math 112 Introduces the mathematical topics needed to provide a solid theoretical foundation for computer science and computer engineering. (Fall, Winter, Spring)		CS 398 Internship (1.0-4.0:0:0) Prerequisite: CS 246 and consent of Department Internship Coordinator. Planned and supervised practical experience in vocational or educational settings. Interns acquire practical skills while applying classroom theory and principles. (Fall, Winter, Spring)
CS 238 Discrete Mathematics II (3.0:3:0) Prerequisite: CS 237 Continues the mathematical topics needed to provide a solid theoretical foundation for computer science. (Fall, Winter)		CS 416 Software Engineering II (2.0:2:0) Prerequisite: CS 246 and CS 308 Software quality engineering including testing and verification and validation. Software metrics. Software cost estimation. (Fall, Winter)
CS 246 Software Design and Development (3.0:3:0) Prerequisite: CS 235 Advanced object-oriented design and software development. (Fall, Winter)		CS 432 Software Engineering III (3.0:3:0) Prerequisite: CS 246 and CS 308 Software process and project management. (Winter, Spring)
CS 290 Special Topics (1.0-3.0:0:0) Prerequisite: Consent of Instructor. Faculty/Student consultation will determine an area of study/research that will give an advanced student greater appreciation and experience in this field. Terms of enrollment, credit, etc., will be determined by the instructor. (Fall, Winter, Spring)		CS 460 Computer Communication and Networks (3.0:3:0) Prerequisite: CS 246 or, for non-CS major: CS 235 and consent of instructor Introduction to computer networking and network programming with an Internet focus, including: applications, protocols, transport services, IP, routing, LANs, wireless and security. (Winter, Spring)
CS 306 Algorithms and Complexity (3.0:3:0) Prerequisite: CS 235 and CS 237 Introduces formal techniques to support the design and analysis of algorithms, focusing on both the underlying mathematical theory and practical considerations of efficiency. Topics include asymptotic complexity bounds, techniques of analysis, and algorithmic strategies. (Fall, Spring)		CS 470 Computer Security (3.0:3:0) Prerequisite: CS 308 CS 470, Computer Security, is essentially a research class. The purpose of this class is to help each student develop the skills necessary to become a security expert in whatever domain of computer security that is important to their job when they enter the work force. (Winter, Spring)
CS 308 Technical Communication (2.0:2:1) Prerequisite: (ENG 316 or ENG 316C or FDCOM 201 or FDENG 201 or ENG 311) and CS 235 Technical research. Technical writing and presentation to technical audiences. (Fall, Winter, Spring)		

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<p>CS 480 Computational Theory (3.0:3:0) Prerequisite: CS 306 Finite automata, regular expressions, grammars, languages, Turing machines, computability, complexity, P and NP problems. (Winter, Spring)</p>	<p>ECEN 324 Computer Architecture (3.0:2:2) Prerequisite: ECEN 224 and CS 235 Computer system and processor architecture including: instruction sets, control unit and data path design, memory hierarchy, pipelining, I/O and program performance optimization. Laboratory exercises are included. (Fall, Winter)</p>
<p>CS 490R Special Topics (3.0:3:0) Prerequisite: Consent of Instructor Current topics in Computer Science. (Taught as needed)</p>	<p>ECEN 340 Digital Systems Design (3.0:2:2) Prerequisite: ECEN 224; CS 124 Hierarchical design of digital systems. Synchronous state machine design, including the use of ROMs, one-hot count sequences, and other variations. Asynchronous state machine design. Circuit synthesis and simulation using the Verilog hardware description language. Circuit implementation field programmable gate arrays (FPGAs). A technical report and presentation is required. Laboratory exercises are included. (Fall, Spring)</p>
<p>CS 498R Internship (1.0-4.0:0:0) Prerequisite: CS 246 and consent of Department Internship Coordinator. Planned and supervised practical experience in vocational or educational settings. Interns acquire practical skills while applying classroom theory and principles. (Fall, Winter, Spring)</p>	<p>ECEN 350 Electronic Devices and Circuits (3.0:2:2) Prerequisite: ECEN 250 Introduction to semiconductor devices. Principles of rectifiers, zener diodes, and other pn junction devices. Diode applications such as voltage rectifiers, voltage multipliers, voltage regulators, clippers, and clampers. Principles, biasing, modeling, and small signal applications of bipolar junction transistors and field effect transistors. Students must design, build, and demonstrate electronic equipment that meets given specifications. A student presentation is required. Laboratory exercises are included. (Fall, Winter)</p>
<p>CS 499 Senior Project (3.0:1:0) Prerequisite: CS 364 Directed individual or group research and study of a topic in computer science not covered by the curriculum. The topic shall be such that the student shall apply material covered by the curriculum to understand a new topic. (Fall, Winter, Spring)</p>	<p>ECEN 360 Computer Input/Output (3.0:2:2) Prerequisite: CS 165, ECEN 224 Applications, architecture, programming and interfacing of commercial microprocessors and microcontrollers. Laboratory exercises are included. (Fall, Winter)</p>
<p>CS 499A Senior Project Part A (2.0:1:0) Prerequisite: CS 364 Directed individual or group research and study of a topic in Computer Science not covered by the curriculum. The topic shall be such that the student shall demonstrate he/she has learned how to learn. Part A of the senior project includes proposal preparation, research, requirements specification, and other activities as specified in the proposal. (Fall, Winter, Spring)</p>	<p>ECEN 380 Signals and Systems (3.0:2:2) Prerequisite: ECEN 250, Math 316 The main goal of this class is to develop the classical signals and systems analysis theory for both continuous and discrete-time cases. The course includes: signals and systems and their properties, linear time-invariant systems, stability analysis, sampling of continuous-time signals, z-transform, discrete Fourier transform, time and frequency domain representations of discrete-time signals and systems, and introductory concepts in communications. (Winter, Fall)</p>
<p>CS 499B Senior Project Part B (1.0:1:0) Prerequisite: CS 499B Completion of the senior project started in CS 499A as specified in the proposal and requirements specification (Fall, Winter, Spring)</p>	<p>ECEN 390 Electricity and Magnetism (3.0:2:2) Prerequisite: ECEN 250, Math 316 This course is an introduction to electromagnetic waves and fields. Students will learn the properties of electric and magnetic field theories and their applications. These applications include transmission lines, capacitors, inductors, electrical motors and generators, photonics, and antennas. Laboratory experiments are included. (Fall, Spring)</p>
<p>CS 499S Senior Project Supplemental (1.0-2.0:0:0) Prerequisite: Instructor consent; co-registered in CS 499 An extension of CS 499, Senior Project. Allows the Senior Project student to engage in a more significant project by registering for an extra one or two credits. (Fall, Winter, Spring)</p>	<p>ECEN 398 Internship (1.0-7.0:0:0) Prerequisite: Instructor Permission and at least three of: ECEN 324, ECEN 340, ECEN 350, ECEN 360. Full-time employment as a computer engineering intern for one semester or more. (Fall, Winter, Spring)</p>
<p>ECEN 150 Electric Circuit Analysis I (3.0:2:2) Prerequisite: Proficiency in algebra, exposure to trigonometry Introduction to electrical and computer engineering. Analysis and design of DC and AC circuits. Resistors, capacitors, inductors, transformers, and batteries. Ohms Law, power and network theorems. Steady state and frequency domain analysis. A student project and presentation is required. Laboratory exercises are included. (Fall, Winter, Spring)</p>	<p>ECEN 420 RF Circuits (3.0:2:2) Prerequisite: ECEN 350 This course is an introduction to RF circuits. Students will learn the basics of key RF components including high frequency transistors, filters, mixers, oscillators, and phase locked loops. Students will also be introduced to laboratory test equipment, network analysis and the fundamentals of transmission lines. Finally the students will understand basic high frequency test equipment. Laboratory experiments are included. (Winter, Spring)</p>
<p>ECEN 224 Fundamentals of Digital Systems (3.0:2:2) Prerequisite: CS 124 Theory, design, and implementation of combinational and sequential logic. Students must design and build a project that uses sequential logic and a programmable logic device. A student presentation is required. Laboratory exercises are included. (Fall, Winter, Spring)</p>	<p>ECEN 430 Power Electronics (3.0:2:2) Prerequisite: ECEN 350, ECEN 380 Introduction to power semiconductor devices, magnetic circuits, transformers, half-wave and full-wave diode and phase rectifiers, and switching converters. (Fall, Spring)</p>
<p>ECEN 250 Electric Circuit Analysis II (4.0:3:2) Prerequisite: ECEN 150, Co-req: Math 316 Analysis and design of DC and AC circuits. Transient analysis using differential equations. Laboratory exercises are included. (Winter, Spring)</p>	
<p>ECEN 305 Principles of Electrical Engineering (3.0:3:1) Prerequisite: PH 220 Introduction to DC and AC circuits, digital logic, semiconductor devices, and motors. Laboratory exercises are included. Intended for Mechanical Engineering majors. (Fall, Winter, Spring)</p>	

ECEN 440 Data and Computer Communications

(3.0:2:2)

Prerequisite: ECEN 250, ECEN 324

Fundamentals of data and computer communications focusing on the physical and data link layers of the OSI architecture. Laboratory exercises are included.

(Fall, Spring)

ECEN 450 Advanced Digital Design and VLSI

(3.0:2:2)

Prerequisite: ECEN 340 and ECEN 350

Advanced digital design concepts including multi-clock domain designs, meta-stability, signal integrity and functional verification of HDL models. VLSI concepts including the translation of HDL to gates to transistors and then to functional silicon. CMOS transistor concepts with special attention to the digital CMOS silicon manufacturing process. Formal validation of silicon components.

(Fall, Winter)

ECEN 460 Real-Time and Embedded Systems

(3.0:2:2)

Prerequisite: ECEN 360

Hardware/software interface, real-time kernel internals, implementation of high-level language constructs, issues in real-time application software development.

(Fall, Spring)

ECEN 470 Feedback Control of Dynamic Systems

(3.0:2:2)

Prerequisite: MATH 316

Dynamic modeling, dynamic response, analysis and design of feedback control.

(Fall, Winter)

ECEN 480 Digital Signal Processing

(3.0:2:2)

Prerequisite: ECEN 324, Math 316

Time and frequency domain analysis of discrete time systems subjected to periodic or non-periodic input signals. Digital signal processing, fast Fourier transforms, digital filter design, spectrum analysis and applications. Laboratory exercises are included.

(Winter, Spring)

ECEN 490 Special Topics

(3.0:2:2)

Prerequisite: Instructor Permission

In-depth study of a topic in computer engineering that interests students and faculty.

Laboratory exercises are included where appropriate.

(Offered as Needed)

ECEN 499 Senior Project

(3.0:2:2)

Prerequisite: Instructor Permission and at least two 400 level courses.

Culminating design experience based on skills learned in advanced technical courses.

Students work in teams to plan, design, test and demonstrate a major project.

(Fall, Winter, Spring)