Electrical & Computer Engineering

HELP! Guide

Fall 2006/Spring 2007

Department of Electrical and Computer Engineering
University of Colorado – Boulder
Engineering Center
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Welcome to the ECE Department!

We are pleased you have chosen the Electrical and Computer Engineering department. There are two baccalaureate degrees offered by the Department, B.S. in Electrical Engineering and B.S. in Electrical and Computer Engineering. Both are accredited by ABET (Accreditation Board for Engineering and Technology.

This HELP! Guide has been written to assist you in understanding Department curriculum requirements and regulations. You should also be familiar with the Advising Guides published by the Dean's Office. In some cases, the rules of the Department differ from those of the College; the Department rules supersede in that case. You are responsible for knowing both sets of rules.

Because the curriculum is continually changing, in general you will be expected to follow the curriculum in effect when you entered the program as reflected in this HELP! Guide. If, for some reason, that becomes impossible, you must petition to follow a different curriculum.

The ECE faculty and staff are here to help you with whatever problems you may have along the way. You should become familiar with the people listed in the box on this page.

As a freshman, you should see any of the freshman advisors or the Undergraduate Staff Advisor whenever you have questions. At the beginning of your sophomore year, you will be assigned a permanent faculty advisor for the remainder of your program.

If you have questions about curriculum requirements, department regulations, course sequences, etc., the Undergraduate Staff Advisor is the one to contact. She can perform a degree audit which will tell you the courses you have already completed and also which courses you still need to take to complete your degree requirements.

If you have technical questions about course content or desirability of certain courses in the marketplace see a freshman advisor or your faculty advisor. Your faculty advisor may also assist you with career counseling and other similar topics.

The semester-by-semester schedule listed in this Guide is intended as a guideline; few students find that they can follow it exactly. When rearranging courses to fit your particular needs, be sure to consider how postponing a course that is a prerequisite to others will affect the remainder of your schedule. You will find that some courses may be moved without penalty while postponing others will delay your graduation by a semester or more.

College is very different from high school. You are expected to take much more initiative in such things as arranging your own schedule, gathering information, and seeking help when needed.

If you find you need help – whether for academic or personal difficulties – there are lots of resources available on this campus. Please come see us before the problem becomes serious. If we can't help you solve your problem, we can certainly refer you to someone who can help.

Information is also available on the ECE Department web page at:
http://ece.colorado.edu
Check regularly for updated schedules, course information, faculty office hours and locations, job postings, and much more.

Electrical & Computer Engineering Advisors

Associate Chair and Head of the Undergraduate Program:		
Prof. Ruth Dameron	EE 1B67	303-492-8369
Undergraduate Staff Advisor:		
Ms. Valerie Matthews	EE 1B51	303-492-7671
Freshman Advisors:		
Prof. James Avery	OT 240	303-492-6310
Prof. Dejan Filipovic	OT 243	303-735-6319
Prof. Thomas Mullis	OT 335	303-492-8718
Prof. Wounjhang Park	EE 248	303-735-3601
Transfer Credit Evaluator:		
Prof. Clifford T. Mullis (fall)	OT 335	303-492-8718
Prof. Ed Kuester (spring)	OT 248	303-492-5173
Academic and Career Advisors:		
Your assigned faculty advisor or any ECE faculty member		

Mission and Objectives for the EE/ECE Undergraduate Programs

Electrical and Computer Engineering Department Overview
The department was founded in the 1890's, in the earliest days of the College of Engineering. Today it has 39 tenured and tenure-track professors, 10 professors with secondary appointments to the department, 3 research professors, and over 10 adjunct professors, instructors, and lecturers.

Two of our faculty are members of the National Academy of Engineering, fourteen are Institute of Electrical and Electronics Engineers (IEEE) Fellows, three are Optical Society of America Fellows and eight are members of Eta Kappa Nu, the national Electrical and Computer Engineering honors society.

Our faculty are active in research, with research expenditures totaling about $5.2 million annually. Our research is concentrated in ten different areas, from biomedical engineering to VLSI/CAD.

Mission Statement
The Department of Electrical and Computer Engineering at the University of Colorado at Boulder is the premier undergraduate and graduate EE/ECE program in the state of Colorado and all adjoining states, as measured by reputation, national rankings, and department size. The primary mission of the ECE department is:

- To provide relevant and highly-respected undergraduate EE and ECE degree programs to on-campus students,
- To provide excellent graduate degree programs in electrical and computer engineering,
- To advance industry in the state of Colorado and the nation, as well as the accumulated knowledge of mankind, through our high quality research programs, and
- To use our on-campus educational activities to provide high-quality continuing education programs for off-campus students.

It is widely acknowledged that an engineering undergraduate education is a strong foundation for a successful career in many different disciplines including, of course, engineering, but additionally management, business, law, medicine and even politics. While our primary focus is on engineering careers we are pleased when our graduates take, into diverse careers, their foundations in analysis, problem solving and understanding of complex systems.

Our curriculum is designed to help our graduates become viable in a globally competitive work environment. Our graduates are able to establish a portfolio of up-to-date skills, abilities, and accomplishments that distinguish them from the competition. Further, the core disciplines and intellectual skills they develop form the framework for a successful career in an environment where the state of practice advances rapidly.

Employment Opportunities
According to the Bureau of Labor Statistics, electrical, electronics, and computer engineers make up the largest branch of engineering. They are found in professional, scientific, and technical services firms, government agencies, manufacturers of computer and electronic products and machinery, wholesale trade, communications, and utilities firms. On the CU-Boulder campus, recruiters request interviews with electrical engineering and computer engineering graduates in numbers several times those of other majors, even other engineering majors.

Our graduates go to work for both large engineering companies (Lockheed Martin, IBM, Agilent, Hewlett Packard, Xilinx, Intel, Northrup Grumman, Ball Aerospace, Maxtor, Seagate, Sun Mircosystems, National Instruments, Texas Instruments, Apple Computers, Micron) and smaller, local firms such as SpectraLogic and Level 3 Communications. Some of our graduates go on to graduate school and a few of our faculty even graduated from our program!

Electrical & Computer Engineering Disciplines

Biomedical Engineering
Biomedical engineering is concerned with the development and manufacture of prostheses, medical devices, diagnostic devices, drugs, and other therapies. It is more concerned with biological, safety, and regulatory issues than other disciplines in engineering. Our faculty are currently doing research in bioelectromagnetics which involves the use of electromagnetic fields to probe biological functions, MRI, and other diagnostic tools.

Communications and Signal Processing
Communication engineering and information theory are concerned with the efficient representation and reliable transmission and/or storage of information. Communications engineers develop: digital audio, pattern recognition, speech processing and recognition, audio and image compression, medical imaging, digital filtering, and more.

Computer Engineering
A computer engineer is an electrical engineer with a focus on digital logic systems, and less emphasis on radio frequency or power electronics. From a computer science perspective, a computer engineer is a software architect with a focus on the interaction between software programs and the underlying hardware components.

Dynamics and Controls
Control techniques are used whenever some quantity, such as speed, temperature, or force must be made to behave in some desirable way over time. Currently, our dynamics and controls group are working on diverse problems such as developing controllers for aircraft, spacecraft, information storage systems, human-machine interfaces, manufacturing processes, and power systems.

Electromagnetics, RF, and Microwaves
This specialty area is concerned with the use of the electromagnetic spectrum. In particular, our faculty focus on current commercial and military needs such as active circuits, antennas for communications and radar, theoretical and numerical techniques for analysis of high-frequency circuits and antennas, and artificial electromagnetic materials.

Nanostructures and Devices
Solid-state devices form the basis of integrated circuits, which have a variety of electronic, optoelectronic, and magnetic applications. The research in this field is concerned with design, fabrication, and characterization of novel materials and devices with sub-micron feature sizes. Their potential applications include very high-speed devices, optical sources and detectors, optoelectronic components and all-optical devices. The design and fabrication of devices and integrated circuits are inextricably related to device physics, solid-state materials, and sophisticated processing techniques.

Optics and Photonics
This area emphasizes the design, fabrication, and characterization of materials, devices and systems for the generation, transmission, amplification, detection, and processing of light signals. These are enabling and pervasive technologies applied in fields like communications, sensing, bio-medical instrumentation, consumer electronics and defense.

Power Electronics and Renewable Energy Systems
Power electronics is the technology associated with the efficient conversion, control and conditioning of electronic power by static means from its available input form into the desired electrical output form. In contrast to electronic systems concerned with transmission and processing of signals and data, in power electronics substantial amounts of electrical energy are processed.

VLSI/CAD
Very Large Scale Integration – a term applied to most modern integrated circuits which comprise from hundreds to thousands to millions of individual components. Research in this area works toward developing new algorithms and design methodologies to efficiently design VLSI ICs.

Program Objectives for a BS Degree in Electrical Engineering (EEEN)
Department of Electrical and Computer Engineering

EE-1 *Graduates will be situated in growing careers involving the design, development or support of electrical or electronic systems, devices, instruments, or products, or will be successfully pursuing an advanced degree.*

Graduates attaining the EE degree will have comprehensive knowledge and experience in the concepts and design of electrical and electronic devices, circuits, and systems. This is achieved through a sequence of required courses in these areas, culminating in a major design project incorporating realistic engineering constraints. Moreover, graduates will have advanced, specialized knowledge and skills in elective areas such as communications and digital signal processing, control systems, analog and digital integrated circuit design, semiconductor devices and optoelectronics electromagnetics and wireless systems, power electronics and renewable energy, bioelectronics, and digital systems.

EE graduates will have attained other professional skills that will be useful throughout their careers, including verbal and written communication and the ability to function on multi-disciplinary teams.

The EE curriculum is rich in laboratory work. EE graduates will have achieved extensive practical experience in the laboratory techniques, tools, and skills that provide a bridge between theory and practice.

EE-2 *Graduates will have advanced in professional standing based on their technical accomplishments, and will have accumulated additional technical expertise to remain globally competitive.*

EE graduates experience a curriculum that contains a broad core of classes focused on mathematical and physical principles that are fundamental to the field of electrical engineering. Hence, they understand the physical and mathematical principles underlying electrical and electronic technology, and are able to analyze and solve electrical engineering problems using this knowledge. In addition to basic classes in mathematics, science, and computing, the EE curriculum includes a sequence of courses in analog and digital electronic circuits and systems, and electromagnetic fields.

EE-3 *Graduates will have demonstrated professional and personal leadership and growth.*

To lay the foundation for a long career in a rapidly changing field, a broad background of fundamental knowledge is required. This is achieved in the EE curriculum through a sequence of required classes in mathematics, physics, chemistry, and he EE core. In addition, the graduate must be capable of lifelong learning; this is taught through assignments and projects that require independent research and study.

The curriculum includes a significant component of electives in the humanities and social sciences. EE graduates will have knowledge of the broader contemporary issues that impact engineering solutions in a global and societal context. They will have the verbal and written communications skills necessary for a successful career in industry or academia. Graduates also understand the meaning and importance of professional and ethical responsibility.

Program Objectives for a BS Degree in Electrical & Computer Engineering (ECEN)
Department of Electrical and Computer Engineering

ECE-1 *Graduates will be situated in growing careers involving the design, development or support of electrical, electronic, and computer hardware and software systems, software engineering, devices instruments, or products, or will be successfully pursuing an advanced degree..*

Graduates attaining the ECE degree will have comprehensive knowledge and experience in the concepts and design of electrical, electronic, and computer devices, circuits, and systems. Besides emphasizing computer hardware and software, the ECE curriculum also emphasizes design, integration, implementation, and application of computer systems, as well as experience in software development. This is achieved through a sequence of required courses in these areas, culminating in a major design project incorporating realistic engineering constraints. The curriculum also provides opportunities for specialization in areas such as compiler design, embedded systems, software engineering, and VLSI design, as well as in the electrical engineering specialties.

ECE graduates will have attained other professional skills that will be useful throughout their careers, including verbal and written communication and the ability to function on multi-disciplinary teams.

The ECE curriculum is rich in laboratory work. ECE graduates will have achieved extensive practical experience in the laboratory techniques, tools, and skills that provide a bridge between theory and practice.

ECE-2 *Graduates will have advanced in professional standing based on their technical accomplishments and will have accumulated additional technical expertise to remain globally competitive.*

ECE graduates experience a curriculum that contains a broad core of classes focused on mathematical and physical principles that are fundamental to the fields of electrical and computer engineering. Hence, they understand the physical and mathematical principles underlying electrical and electronic technology and computer systems, and are able to analyze and solve electrical and computer engineering problems using this knowledge. In addition to basic classes in mathematics, science, and computing, the ECE curriculum includes a sequence of courses in analog and digital electronic circuits and systems, electromagnetic fields, probability, computer software, and computer design and architecture.

ECE-3 *Graduates will have demonstrated professional and personal leadership and growth.*

To lay the foundation of a long career in a rapidly changing field, a broad background of fundamental knowledge is required. This is achieved in the ECE curriculum through a sequence of required classes in mathematics, physics, chemistry, and the ECE core. In addition, the graduate must be capable of lifelong learning; this is taught through assignments and projects that require independent research and study.

The curriculum includes a significant component of electives in the humanities and social sciences. ECE graduates will have knowledge of the broader contemporary issues that impact engineering solutions in a global and societal context. They will have the verbal and written communications skills necessary for a successful career in industry or academia. Graduates also understand the meaning and importance of professional and ethical responsibility.

Basic Program Requirements

Electrical Engineering Curriculum
Electrical & Computer Engineering Curriculum
Pre-Requisites and Co-Requisites
Are You Graduating?
Advising Resources

COURSES REQUIRED FOR B.S. IN *ELECTRICAL ENGINEERING* (128 HOURS)

Math (16 hours)

APPM 1350	4	Calculus 1 for Engineers
APPM 1360	4	Calculus 2 for Engineers
APPM 2350	4	Calculus 3 for Engineers
APPM 2360	4	Linear Algebra & Diff. Equations

Science (12 hours)

CHEN 1211	3	General Chemistry for Engineers
CHEM 1221	2	General Chemistry Lab
PHYS 1110	4	General Physics 1
PHYS 2130	3	General Physics 3

Freshman Elective (3-5 hours) - freshmen choose one: □

ECEN 1400	3	Introduction to Digital and Analog Electronics
GEEN 1400	3	Freshman Projects
CHEM 1131	5	General Chemistry 2
EBIO 1210	3	General Biology 1 *plus*
EBIO 1230	1	General Biology Lab 1
		or
MCDB 1150	3	Intro to Molecular Biology *plus*
MCDB 1151	1	Intro to Molecular Biology Lab

Introductory freshman course from other engr. Dept.

Freshman Seminar (1 hour) - freshmen choose one: □

ECEN 1100	1	Freshman Seminar
GEEN 1500	1	Introduction to Engineering

Introductory freshman seminar from other engr. dept.

Computer Science (4 hours)

CSCI 1300	4	Computer Science 1: Programming

Electrical Engineering Core (38 hours)*

ECEN 2120	5	Computers as Components
ECEN 2250	5	Circuits/Electronics 1
ECEN 2260	5	Circuits/Electronics 2
ECEN 3100	5	Digital Logic
ECEN 3250	5	Circuits/Electronics 3
ECEN 3300	5	Linear Systems
ECEN 3400	5	Electromagnetic Fields & Waves
ECEN 3810	3	Introduction to Probability**

** (may substitute MATH 4510 or APPM 3570 only)

ECE Electives (6 hours) - choose two: □□

ECEN 3170	3	Energy Conversion
ECEN 3320	3	Semiconductor Devices
ECEN 3410	3	Electromagnetic Waves & Trans.

*Students are not allowed to register for Capstone Laboratory until all Electrical Engineering Core courses are passed with a grade of C- or better.

Theory distribution courses (9 hours) - choose three from at least two different subject areas: □□□

Unused ECE Elective from list

ECEN 4106	3	Photonics
ECEN 4138	3	Control System Analysis
ECEN 4167	3	Energy Conversion 2
ECEN 4242	3	Communication Theory
ECEN 4345	3	Intro. To Solid State
ECEN 4553	3	Intro. To Compiler Construction
ECEN 4583	3	Software Systems Development
ECEN 4593	3	Computer Organization
ECEN 4623	3	Real-Time Embedded Systems
ECEN 4632	3	Digital Filtering
ECEN 4645	3	Intro. to Optical Electronics
ECEN 4703	3	Discrete Mathematics
ECEN 4797	3	Introduction to Power Electronics
ECEN 4811	3	Neural Sigs & Functional Brain Img.
ECEN 4821	3	Neural Systems & Physiological Ctrl.
ECEN 4827	3	Analog IC Design
ECEN 4831	3	Brains, Minds, & Computers

Capstone Design Lab (3 hours)

ECEN 4610	3	Capstone Laboratory*

Additional Laboratory Courses (4-6 hours) - choose two: □□

ECEN 4375	3	Microstructures Lab
ECEN 4517	2	Power Electronics Lab
ECEN 4532	3	Digital Signal Processing Lab
ECEN 4606	3	Undergrad Optics Lab
ECEN 4613	3	Embedded Systems Design
ECEN 4633	3	Hybrid Embedded Systems
ECEN 4634	2	Transmission Lab
ECEN 4638	2	Controls Lab
ECEN 4652	2	Communications Lab

Humanities & Social Sciences (21 hours)

	12	A&S Core Lower division
	6	A&S Core Upper division
WRTG 3030	3	Writing on Science & Society or equiv.

Free Electives (6 hours maximum)

Student's choice of courses up to a maximum of 6 semester credit hours.

Technical Electives (variable)

3000-level or above of approved engineering, math, or physics courses or others by petition. Number of hours needed varies with hours in other categories.

TOTAL HOURS = 128

Sample Schedule for Electrical Engineering *Program*

Freshman Year

Fall			
Course		*Title*	*Hrs.*
PHYS	1110	Physics 1	4
APPM	1350	Calculus 1	4
CSCI	1300	CS1: Programming	4
ECEN	1100	Freshman Seminar	1
		Humanities & Social Sciences	3
		Total Credit Hours	16

Spring			
Course		*Title*	*Hrs.*
CHEN	1211	General Chemistry for Engineers	3
CHEM	1221	Engineering General Chemistry Lab	2
APPM	1360	Calculus 2	4
		Freshman Elective	3
		Humanities & Social Sciences	3
		Total Credit Hours	15

Sophomore Year

Fall			
Course		*Title*	*Hrs.*
APPM	2360	Linear Algebra/Diff. Eq.	4
ECEN	2120	Computers as Components	5
ECEN	2250	Circuits/Electronics I	5
		Humanities & Social Sciences	3
		Total Credit Hours	17

Spring			
Course		*Title*	*Hrs.*
APPM	2350	Calculus 3	4
ECEN	2260	Circuits/Electronics 2	5
ECEN	3100	Digital Logic	5
		Humanities & Social Sciences	3
		Total Credit Hours	17

Junior Year

Fall			
Course		*Title*	*Hrs.*
ECEN	3300	Linear Systems	5
ECEN	3400	EM Fields	5
ECEN	3810	Probability	3
		Free Elective	3
		Total Credit Hours	16

Spring			
Course		*Title*	*Hrs.*
PHYS	2130	Modern Physics	3
ECEN	3250	Circuits/Electronics 3	5
		ECE Elective	3
		Technical Elective	3
WRTG	3030	Writing on Science & Society or equiv.	3
		Total Credit Hours	17

Senior Year

Fall			
Course		*Title*	*Hrs.*
		ECE Elective	3
		ECE Theory Elective	3
		ECE Theory Elective	3
		ECE Lab Elective	2
		Technical Elective	3
		Humanities & Social Sciences	3
		Total Credit Hours	17

Spring			
Course		*Title*	*Hrs.*
		ECE Theory Elective	3
		ECE Lab Elective	2
ECEN	4610	Capstone Laboratory*	3
		Free Elective	2
		Humanities & Social Sciences	3
		Total Credit Hours	13

The above schedule is intended only as a sample. Few students find that they can follow it exactly. In fact, only about 40% of our students elect to complete their requirements in eight semesters, and fewer than 20% graduate with exactly 128 hours.

*Capstone Laboratory may be taken as soon as EE core courses are completed with a grade of C- or better. Enrollment during the Capstone semester should be restricted to a maximum of 15 credit hours.

COURSES REQUIRED FOR B.S. IN *ELECTRICAL & COMPUTER ENGINEERING* (128 HOURS)

Math (16 hours)

APPM 1350	4	Calculus 1 for Engineers
APPM 1360	4	Calculus 2 for Engineers
APPM 2350	4	Calculus 3 for Engineers
APPM 2360	4	Linear Algebra & Diff. Equations

Science (12 hours)

CHEN 1211	3	General Chemistry for Engineers
CHEM 1221	2	General Chemistry Lab
PHYS 1110	4	General Physics 1
PHYS 2130	3	General Physics 3

Freshman Elective (3-5 hours) - freshmen choose one: ☐

ECEN 1400	3	Intro to Digital & Analog Electron.
GEEN 1400	3	Freshman Projects
CHEM 1131	5	General Chemistry 2
EBIO 1210	3	General Biology 1 *plus*
EBIO 1230	1	General Biology Lab 1
		or
MCDB 1150	3	Intro to Molecular Biology *plus*
MCDB 1151	1	Intro to Molecular Biology Lab

Introductory freshman course from other engr. dept.

Freshman Seminar (1 hour) - freshmen choose one: ☐

ECEN 1100	1	Freshman Seminar
GEEN 1500	1	Introduction to Engineering

Introductory freshman seminar from other engr. dept.

Computer Science (8 hours)

CSCI 1300	4	Computer Science 1: Programming
CSCI 2270	4	CS 2: Data Structures

Electrical Engineering Core (38 hours)

ECEN 2120	5	Computers as Components
ECEN 2250	5	Circuits/Electronics 1
ECEN 2260	5	Circuits/Electronics 2
ECEN 3100	5	Digital Logic
ECEN 3250	5	Circuits/Electronics Lab 3
ECEN 3300	5	Linear Systems
ECEN 3400	5	Electromagnetic Fields & Waves
ECEN 3810	3	Introduction to Probability**

** (may substitute MATH 4510 or APPM 3570 only)

Computer Engineering Core (6 hours)

ECEN 4593	3	Computer Organization
ECEN 4703	3	Discrete Mathematics

*Students are not allowed to register for Capstone Laboratory until all Electrical Engineering Core courses and ECEN 4593 are passed with a grade of C- or better.

TOTAL HOURS = 128

Non-computer Theory Course (3 hours) - choose one: ☐

ECEN 3170	3	Energy Conversion
ECEN 3320	3	Semiconductor Devices
ECEN 3410	3	Electromagnetic Waves & Trans
ECEN 4106	3	Photonics
ECEN 4138	3	Control Systems Analysis
ECEN 4167	3	Energy Conversion 2
ECEN 4242	3	Communication Theory
ECEN 4345	3	Introduction to Solid State
ECEN 4632	3	Digital Filtering
ECEN 4645	3	Intro to Optical Electronics
ECEN 4797	3	Introduction to Power Electronics
ECEN 4811	3	Neural Sigs & Functional Brain Img.
ECEN 4821	3	Neural Systems & Physiological Ctrl.
ECEN 4827	3	Analog IC Design
ECEN 4831	3	Brains, Minds & Computers

Non-computer Lab Course (2-3 hours) choose one: ☐

ECEN 4375	3	Microstructures Lab
ECEN 4517	2	Power Lab 1
ECEN 4532	3	Digital Signal Processing Lab
ECEN 4606	3	Undergrad Optics Lab
ECEN 4634	2	Transmission Lab
ECEN 4638	2	Controls Lab
ECEN 4652	2	Communication Lab

Capstone Design Lab

ECEN 4610	3	Capstone Laboratory*

Software Elective (3-4 hours) choose one: ☐

ECEN 4583	3	Software System Development
ECEN 4563	3	Compiler Code Generation
CSCI 3287	3	Database & Information Systems
CSCI 3308	3	Software Engr. Methods & Tools
CSCI 4273	3	Network Systems
CSCI 3753	4	Operating Systems
CSCI 4753	3	Computer Performance Modeling
CSCI 4576	4	High-Performance Scientific Comp 1
CSCI 4586	4	High-Performance Scientific Comp 2

Humanities & Social Sciences (21 hours)

	12	A&S Core Lower division
	6	A&S Core Upper division
WRTG 3030	3	Writing on Science & Society or equiv.

Free Electives (6 hours maximum)

Student's choice of courses up to a maximum of 6 semester credit hours.

Technical Electives (variable)

3000-level or above or approved engineering, Math, or physics courses or others by petition. Number of hours needed varies with hours in other categories.

Sample Schedule for Electrical and Computer Engineering *Program*

Freshman Year

Fall			
Course		*Title*	*Hrs.*
PHYS	1110	Physics 1	4
APPM	1350	Calculus 1	4
CSCI	1300	CS1: Programming	4
ECEN	1100	Freshman Seminar	1
		Humanities & Social Sciences	3
		Total Credit Hours	16

Spring			
Course		*Title*	*Hrs.*
CHEN	1211	General Chemistry for Engineers	3
CHEM	1221	General Chemistry Lab	2
APPM	1360	Calculus 2	4
		Freshman Elective	3
		Humanities & Social Sciences	3
		Total Credit Hours	15

Sophomore Year

Fall			
Course		*Title*	*Hrs.*
APPM	2360	Linear Algebra/Diff. Eq.	4
ECEN	2120	Computers as Components	5
ECEN	2250	Circuits/Electronics I	5
		Humanities & Social Sciences	3
		Total Credit Hours	17

Spring			
Course		*Title*	*Hrs.*
APPM	2350	Calculus 3	4
ECEN	2260	Circuits/Electronics 2	5
ECEN	3100	Digital Logic	5
		Humanities & Social Sciences	3
		Total Credit Hours	17

Junior Year

Fall			
Course		*Title*	*Hrs.*
ECEN	3300	Linear Systems	5
ECEN	3400	EM Fields	5
ECEN	3810	Probability	3
CSCI	2270	CS2: Data Structures	4
		Total Credit Hours	17

Spring			
Course		*Title*	*Hrs.*
		Software Elective	3
ECEN	3250	Circuits/Electronics 3	5
ECEN	4593	Computer Organization	3
WRTG	3030	Writing on Science & Society or equiv.	3
		Total Credit Hours	14

Senior Year

Fall			
Course		*Title*	*Hrs.*
PHYS	2130	Modern Physics	3
		Tech Elective	3
		ECE Theory Elective	3
		ECE Lab Elective	2
		Free Elective	3
		Humanities & Social Sciences	3
		Total Credit Hours	17

Spring			
Course		*Title*	*Hrs.*
ECEN	4703	Discrete Mathematics	3
ECEN	4610	Capstone Laboratory*	3
		Technical Elective	3
		Free Elective	3
		Humanities & Social Sciences	3
		Total Credit Hours	15

The above schedule is intended only as a sample. Few students find that they can follow it exactly. In fact, only about 40% of our students elect to complete their requirements in eight semesters, and fewer than 20% graduate with exactly 128 hours.

*Capstone Laboratory may be taken as soon as EE core courses and ECEN 4593 are completed with a grade of C- or better. Enrollment during the Capstone semester should be restricted to a maximum of 15 credit hours.

Humanities and Social Sciences Requirements

Students must complete a *minimum* of 18 credit hours in approved courses in the Humanities and Social Sciences *and* 3 credit hours in approved, upper division Writing courses.

A. Writing: 3 credit hours in one of the following upper division courses: WRTG 3030, WRTG 3035, GEEN 3000, HUEN 3100, or other writing courses as approved by petition.

AND

B. H&SS: 18 credit hours of approved courses, of which 6 must be at the 3000 level or higher.

Courses approved for the 18 credit-hour H&SS requirement:

1) Any course included in any of the following eight categories of courses in the A&S Core Curriculum:
1. Contemporary Societies
2. Critical Thinking
3. Culture & Gender Diversity
4. Foreign Language
5. Historical Context
6. Ideals and Values
7. Literature and the Arts
8. United States Context

Exceptions: Critical Thinking courses taught in the following departments do NOT count for H&SS credit: ASTR, CHEM, EBIO, MATH, MCDB, PHYS.

The particular courses included in these categories are easily found from the Arts and Sciences Core Curriculum web page and through the PLUS system.

2) The College is eager to see meaningful groupings of courses in related subjects and hence will approve H&SS electives, even if they are not courses in the A&S Core, when they are grouped so as to form a coherent plan of study. Prior approval is granted for any group of four courses that would count toward a minor field in any of the following departments in the College of Arts & Sciences: Economics, Ethnic Studies, History, Linguistics, Philosophy, Political Science, Religious Studies, or Women's Studies.

3) All courses taught through the Herbst Program of Humanities for Engineers and have "HUEN" as their prefix are approved.

4) Any exceptions must be approved by petition to the Undergraduate Education Council of the College of Engineering.

For assistance in planning, see the Arts & Sciences Core Curriculum website and PLUS. If you have further questions, see the ECE Undergraduate Staff Advisor.

Herbst Program for Humanities

The Herbst Program of Humanities aspires to improve the education of engineers in the humanities. It thus offers courses that help to fulfill the graduation requirements for H&SS electives and for writing. More broadly, it seeks to show young students both the importance and the excitement of good courses in the humanities.

Good courses in the humanities explore many questions, but among these is the question of what the human good really is. Every action, including every use of science, is guided by some idea of what is good; the humanities investigate these very different ideas of the good. After all, before traveling, we ought to know where we should be going. These issues, and others like them, are explored in Herbst classes through short stories, novels, poetry, art, music, and philosophical texts.

The centerpiece of the Herbst Program is a two-semester sequence open to Juniors and Seniors. These seminars are limited to 12 students and are devoted to roundtable discussions of original texts, primarily in literature and philosophy, but with secondary attention to art, music, and architecture. These seminars also help our students improve their writing skills, gain confidence and skill in civil discourse on controversial issues, see more clearly the inadequacy of dogmatic responses to complex questions, and develop intellectual rigor on non-technical issues. Students must apply to participate in the Junior Seminars, which also satisfy the University's required writing course.

The Herbst Program also offers courses at other levels. HUEN 1010 is similar to HUEN 3100 in being a text-based seminar, but it is designed for freshmen. In HUEN 1100, *History of Science & Technology, o*riginal source material and textbook readings provide insight into science and technology in changing historical, social, and political contexts. For Freshmen and Sophomores, Herbst offers *Tradition and Identity, HUEN 2010,* which explores the following questions: Why am I who I am, and why do I desire my future to look a certain way? What ways, both positively and negatively, does tradition determine/influence the possibilities of my individuality?

For a full list of courses and other information, see http://engineering.colorado.edu/herbst/.

Prerequisites, Co-Requisites, and Cross Listings

No.	*Title*	*Prerequisites*	*Cross Listing*
1100	Freshman Seminar	None	
1400	Methods & Problems in ECE	APPM 1350 (co-req)	
2120	Computers as Components	CSCI 1300	
2250	Circuits/Electronics 1	APPM 1360, APPM 2360 (co-req)	
2260	Circuits/Electronics 2	ECEN 2250, APPM 2360	
3100	Digital Logic	CSCI 1300	
3170	Energy Conversion 1	ECEN 3250	
3250	Circuits/Electronics 3	ECEN 2260	
3300	Linear Systems	APPM 2360, ECEN 2260	
3320	Semiconductor Devices	ECEN 3250	
3400	Electromagnetic Fields and Waves	APPM 2350, ECEN 2260, PHYS 1110	
3410	Electromagnetic Waves & Transmission	ECEN 3400	
3810	Introduction to Probability	APPM 2350, APPM 2360	
4106	Photonics	ECEN 3300, PHYS 2130	
4138	Control Systems Analysis	ECEN 3300	
4167	Energy Conversion 2	ECEN 3170	
4242	Communication Theory	ECEN 3300, ECEN 3810	
4345	Introduction to Solid State	ECEN 3400	
4375	Microstructures Laboratory	ECEN 3320	
4517	Power Laboratory	ECEN 3170	
4532	DSP Laboratory	ECEN 3300, ECEN 4632 (co-req)	
4553	Introduction to Compiler Construction	ECEN 2120	CSCI 4555
4583	Software Systems Development	CSCI 2270	
4593	Computer Organization	ECEN 2120, ECEN 3100	CSCI 4593
4606	Optics Laboratory	ECEN 3400 *or* PHYS 4510	
4610	Capstone Laboratory	ECEN 2120, ECEN 2250, ECEN 2260, ECEN 3100, ECEN 3250, ECEN 3300, ECEN 3400, ECEN 3810, and ECEN 4593 (ECE majors only)	
4613	Embedded Systems Design	ECEN 2120, ECEN 3100 (ECEN 3250, ECEN 4593 recommended)	
4623	Real-Time Embedded Systems	ECEN 2120, ECEN 3100, (ECEN 4613 recommended)	
4632	Introduction to Digital Filtering	ECEN 3300, ECEN 3810	
4633	Hybrid Embedded Systems	ECEN 2120, ECEN 3100, ECEN 4593	
4634	Transmission Laboratory	ECEN 3410	
4638	Control Systems Laboratory	ECEN 3300, ECEN 4138(co-req)	
4645	Introduction to Optical Electronics	ECEN 3410	
4652	Communication Laboratory	ECEN 4242 (co-req)	
4703	Discrete Mathematics	ECEN 2120, ECEN 3810	
4797	Introduction to Power Electronics	ECEN 3250	
4811	Neural Signals and Functional Brain Imaging	ECEN 2260 or equiv.	ASEN 4216
4821	Neural Systems and Physiological Control	ECEN 2260 or equiv.	ASEN 4426
4827	Analog IC Design	ECEN 3250	
4831	Brains, Minds, and Computers	ECEN 2260	ASEN 4436

See prerequisite chart on the following page

Prerequisites for ECEN Program Courses

Prerequisite courses --->	APPM 1350	APPM 1360	APPM 2360	APPM 2350	PHYS 1110	PHYS2130	CSCI 1300	CSCI 2270	ECEN 2120	ECEN 2250	ECEN 2260	ECEN 3100	ECEN 3250	ECEN 3300	ECEN 3400	ECEN 3810	ECEN 3170	ECEN 3410	ECEN 3320	ECEN 4593	ECEN 4632	ECEN 4613	ECEN 4138	ECEN 4242	Notes
APPM 1350																									none
APPM 1360	X																								
APPM 2360	X	X																							
APPM 2350	X	X																							
CSCI 1300																									none
CSCI 2270							X																		
PHYS 2130	X	X	X	X	X					X					X										
ECEN 1100																									none
ECEN 1400	C																								
ECEN 2120							X																		
ECEN 2250	X	X	C																						
ECEN 2260	X	X	X							X															
ECEN 3100							X		X																
ECEN 3170	X	X	X							X	X		X												
ECEN 3250	X	X	X							X	X														
ECEN 3300	X	X	X							X	X														
ECEN 3320	X	X	X							X	X		X												
ECEN 3400	X	X	X	X	X																				
ECEN 3410	X	X	X	X	X										X										
ECEN 3810	X	X	X	X																					
ECEN 4106	X	X	X	X	X	X				X	X			X	X										
ECEN 4138	X	X	X							X	X			X											
ECEN 4167	X	X	X							X	X		X				X								
ECEN 4242	X	X	X	X						X	X			X		X									
ECEN 4345	X	X	X	X	X										X										
ECEN 4375	X	X	X							X	X		X						X						
ECEN 4517	X	X	X							X	X		X				X								
ECEN 4532	X	X	X	X						X	X			X		X					X				
ECEN 4553							X		X																
ECEN 4583							X	X																	
ECEN 4593							X		X			X													
ECEN 4606	X	X	X	X	X										X										*1
ECEN 4610	X	X	X	X	X		X		X	X	X	X	X	X	X	X				E					
ECEN 4613	R	R	R				X		X	R	R	X	R							R					
ECEN 4623							X		X			X										R			
ECEN 4632	X	X	X	X						X	X			X		X									
ECEN 4633							X		X			X								X					
ECEN 4634	X	X	X	X	X										X			X							
ECEN 4638	X	X	X							X	X			X									C		
ECEN 4645	X	X	X	X	X										X			X							
ECEN 4652	X	X	X	X						X	X			X		X								C	
ECEN 4703	X	X	X	X			X		X							X									
ECEN 4797	X	X	X							X	X		X												
ECEN 4811	X	X	X							X	X														*2
ECEN 4821	X	X	X							X	X														*2
ECEN 4827	X	X	X							X	X		X												
ECEN 4831	X	X	X							X	X														

C = corequisite
E = ECE majors only
R = recommended

*1 = may sub PHYS 4510 for ECEN 3400
*2 = or equivalent to ECEN 2260 (ECON 3030, MCEN 3017)

ARE YOU GRADUATING?

To be eligible for a Bachelor of Science degree from this Department, you must meet the following requirements:

1. Successfully complete a minimum of 128 semester credit hours according to the curriculum in effect at the time the student was officially admitted to the EEEN or ECEN degree program. The last 45 credit hours must be earned after admission to the College of Engineering and Applied Science as a degree student unless exempted by prior petition.

2. Achieve a cumulative grade point average of 2.00 or better in all courses taken at the University of Colorado (all campuses) as well as a grade point average of 2.00 or better in all courses taken from, or cross listed in, the Department of Electrical and Computer Engineering.

3. Satisfy any outstanding MAPS deficiencies. These deficiencies should have been resolved in the first year or two of enrollment in the College, but students cannot graduate without having met the basic requirements in effect at the time of their admission.

4. Meet with the Undergraduate Staff Advisor the semester prior to the semester of intended graduation for a comprehensive review and approval of remaining courses needed to satisfy graduation requirements.

5. Notify the Engineering Dean's Office of your intent to graduate by filling out an Application for Diploma Card and taking it to the Dean's Office. This needs to be done at the beginning of your final semester.

6. A graduation list is posted near the Dean's Office (AD 110) and the ECE Undergraduate Office (EE 1B51) about a month after the beginning of each semester. Students intending to graduate should make certain that their names are listed. Any omissions or changes should be reported to both the Dean's Office and the ECE Undergraduate Office as soon as possible.

7. Obtain the recommendation of the ECEN faculty and the College faculty. This is handled by the department and college staff. You will be notified if you have not been recommended and the specific reasons.

8. If you are completing a minor, a Minor Completion form must be submitted to the Dean's Office.

It is the responsibility of each student to be certain that all degree requirements have been met and to keep the Department and the Engineering Dean's Office informed of any change in graduation plans.

Advising Resources

There are a vast number of advising resources available to students at CU-Boulder, but students frequently do not know about them. Please do not hesitate to contact any of these places for assistance.

Electronic Advising System
The advising system used by the ECE department to track student progress is Degreement by Optioventory. Use your IdentiKey login to access the system. The web address is https://ece.colorado.edu/gmsas/. This system provides a degree audit, planning, and more.

College of Engineering Advising Guides
These College guides, published by the Engineering Dean's office, are a series of individual sheets which cover a wide range of topics, including everything from academic honesty and ethics to scholarships to descriptions of every degree program offered in the College. They are located in a wall-mounted display in the front hallway of the Engineering Center just southeast of the revolving doors. These guides are also available online at http://engineering.colorado.edu/students/advising.htm.

Engineering Peer Advocates Office
This office provides services which include academic advising, assistance with major selection, tutoring, and test files as well as providing general information about study skills, test anxiety, resume writing, study abroad opportunities and much more. The office is staffed by sophomores, juniors, and seniors who have been trained to answer questions about anything that may affect you as an engineering student. It is located in ECCR 263 (303-492-0828), and is open and free to all current and prospective engineering students.

Pre-Professional Advising Center
Located in Old Main, room 1B90 (303-735-3000), the advisors provide support services to all CU-Boulder students preparing for careers in the medical sciences, health professions, and law.

Career Counseling in Career Services
The professional career counselors can help students and alumni clarify career interests, values and work-related skills; explore potential careers and employers; and refine job seeking, interviewing, and resume preparation skills. They host Career Fairs and Internship Fairs, sponsor resume writing workshops, and hold mock interview sessions. Career Services is located in Willard Hall, Room 34 (303-492-6541), or you may visit their website at http://www.colorado.edu/careerservices/index.html

Career Services Online (CSO)
Search jobs and internship listings, apply for on-campus interviews, and get weekly e-mail updates about career events. Sign up at http://careerservices.colorado.edu

Counseling and Psychological Services: A Multicultural Center
This center provides a variety of programs and assistance to address general academic or personal issues. They are located in Willard Hall, room 134, or call 303-492-6766.

Women In Engineering Program (WIEP)
This program was created to recruit and retain women students in the College of Engineering and Applied Science. WIEP conducts activities and programs that help make the educational experience rewarding for all students. The office is located in ECCE 113A (303-492-0083). You can get further information about WIEP http://engineering.colorado.edu/wiep.

Multicultural Engineering Program (MEP)
The Multicultural Engineering Program is an academic excellence community dedicated to the success of multicultural and first generation students historically underrepresented in engineering and applied science. The MEP Resource Center serves as a central meeting place for forming study groups and networking while providing access to MEP staff, computer stations, and more. The MEP office is located in ECCE 100 (303-492-6606). For additional information please visit the website: http://www.colorado.edu/engineering/MEP/.

Program Enrichment Options

Co-Op Program
Certificate Programs
Biomedical Engineering Option
Concurrent BS/MS Program

CO-OP Program

How does the co-op program work?
Co-op students participate on a year-round schedule that combines professional related work experiences with classroom work. Normally a student co-ops for a total of four semesters plus an optional internship semester during the summer between the Freshman and Sophomore years. The program is designed so a student can earn the B.S. degree in five years by following either Schedule A or Schedule B. Deviations from these schedules are possible, but the student should have any other proposed schedule checked by the Undergraduate Staff Advisor to ensure that all required courses will be available when the student is on campus to take them. Normally a company would hire two co-op students, one on Schedule A and one on Schedule B. This way there will always be one student employed at the company.

When can I join the co-op program?
Students entering the program must have had at least one semester of physics, two semesters of circuits, the introductory CS computer programming course, Digital Logic, Circuits I, Computers as Components, plus three semesters of calculus, and a semester of linear algebra/differential equations. You may register at the beginning of your Sophomore year, but normally your first co-op semester would be either the summer after your sophomore year or the spring of your junior year. See the Sample Co-Op schedules on the following pages.

How much can I expect to be paid?
Wages of co-op students are usually determined by the location and type of work to which they are assigned. Salary would be negotiated between you and the company proposing to hire you as a co-op student. During co-op semester, wages are received by the students directly from their employers. Salaries are generally in the $16 - $24 range.

How are students selected for employment once they have been admitted to the program?
Students volunteer for the co-op program. To qualify for admission to the program, a student must be in good academic standing, have a cumulative grade point average of at least 2.85, and be free from any restrictions that prevent a co-op assignment. At this point only U.S. citizens and international students with resident alien status are eligible for admission to the program. Students prepare a resume following a specified format, and these resumes are reviewed by companies interested in hiring co-op students. Students who meet the employer's criteria and have an interest in the position will be referred to the hiring company for consideration. Companies select those candidates they wish to interview and arrange for interviews. After reviewing resumes and/or portfolios, normal hiring procedures are followed. Some employers choose to interview at their location, some on campus at the College of Engineering and others schedule phone interviews with student candidates due to geographic limitations.

How am I evaluated during the program?
Once a co-op student has been hired the employer evaluates the student through regular performance reports. These evaluations are used as a basis for counseling and advising the student in their professional development. At the same time the Co-op Director tracks student progress through their participation in ECEN 3930, ECE Co-Op Education.

What are the duties and responsibilities of the company that employs a co-op student?
Participating employers are expected to provide work experiences directly related to the student's field of study, provide appropriate supervision and related appraisal of the student's performance, provide assistance in helping the student achieve his/her identified learning objective, pay a wage which is commensurate with the full-time co-op position, and evaluate the student's performance and then discuss the assessment with him/her.

Note about Student Applications and Resumes
You should submit your application and resume to the Undergraduate Staff Advisor. You will be notified when your application has been accepted. At that point you should e-mail a copy of your resume in Adobe Acrobat .pdf format to the Program Director to be posted (confidentially, only prospective employers will have access) on the web for examination by prospective employers. For more information about the Co-Op program go to http://ece.colorado.edu/coop.

Electrical Engineering Sample Co-Op Schedule
Schedule A

Freshman Year

Fall

Course		*Title*	*Hrs.*
PHYS	1110	Physics 1	4
APPM	1350	Calculus 1	4
CSCI	1300	CS1: Programming	4
ECEN	1100	Freshman Seminar	1
		Humanities & Social Sciences	3
		Total Credit Hours	16

Spring

Course		*Title*	*Hrs.*
CHEN	1211	General Chemistry for Engineers	3
CHEM	1221	General Chemistry Lab	2
APPM	1360	Calculus 2	4
		Freshman Elective	3
		Humanities & Social Sciences	3
		Total Credit Hours	15

Sophomore Year

Fall

Course		*Title*	*Hrs.*
APPM	2360	Linear Algebra/Diff. Eq.	4
ECEN	2120	Computers as Components	5
ECEN	2250	Circuits I	5
		Humanities & Social Sciences	3
		Total Credit Hours	17

Spring

Course		*Title*	*Hrs.*
APPM	2350	Calculus 3	4
ECEN	2260	Circuits 2	5
ECEN	3100	Digital Logic	5
		Humanities & Social Sciences	3
		Total Credit Hours	17

Summer

Co-Op Session

Fall

Co-Op Session

Junior Year

Spring

Course		*Title*	*Hrs.*
ECEN	3300	Linear Systems	5
ECEN	3400	EM Fields	5
ECEN	3810	Probability	3
		Free Elective	2
		Total Credit Hours	15

Fall

Co-Op Session

Spring

Course		*Title*	*Hrs.*
PHYS	2130	Modern Physics	3
ECEN	3250	Circuits 3	5
		ECE Elective	3
		Free Elective	3
WRTG	3030	Writing on Science & Society	3
		Total Credit Hours	17

Summer

Co-Op Session

Senior Year

Fall

Course		*Title*	*Hrs.*
		ECE Elective	3
		ECE Theory Elective	3
		ECE Theory Elective	3
		ECE Lab Elective	2
		Technical Elective	3
		Humanities & Social Sciences	3
		Total Credit Hours	17

Spring

Course		*Title*	*Hrs.*
		ECE Theory Elective	3
		ECE Lab Elective	2
ECEN	4610	Capstone Laboratory	3
		Technical Elective	3
		Upper Division H&SS	3
		Total Credit Hours	14

Electrical Engineering Sample Co-Op Schedule
Schedule B

Freshman Year

Fall

Course		Title	Hrs.
PHYS	1110	Physics 1	4
APPM	1350	Calculus 1	4
CSCI	1300	CS1: Programming	4
ECEN	1100	Freshman Seminar	1
		Humanities & Social Sciences	3
		Total Credit Hours	16

Spring

Course		Title	Hrs.
CHEN	1211	General Chemistry for Engineers	3
CHEM	1221	General Chemistry Lab	2
APPM	1360	Calculus 2	4
		Freshman Elective	3
		Humanities & Social Sciences	3
		Total Credit Hours	15

Sophomore Year

Fall

Course		Title	Hrs.
APPM	2360	Linear Algebra/Diff. Eq.	4
ECEN	2120	Computers as Components	5
ECEN	2250	Circuits I	5
		Humanities & Social Sciences	3
		Total Credit Hours	17

Spring

Course		Title	Hrs.
APPM	2350	Calculus 3	4
ECEN	2260	Circuits 2	5
ECEN	3100	Digital Logic	5
		Humanities & Social Sciences	3
		Total Credit Hours	17

Junior Year

Fall

Course		Title	Hrs.
ECEN	3300	Linear Systems	5
ECEN	3400	EM Fields	5
ECEN	3810	Probability	3
		Free Elective	2
		Total Credit Hours	15

Spring

Co-Op Session

Summer

Co-Op Session

Fall

Course		Title	Hrs.
PHYS	2130	Modern Physics	3
ECEN	3250	Circuits 3	5
		ECE Elective	3
		Free Elective	3
WRTG	3030	Writing on Science & Society	3
		Total Credit Hours	17

Spring

Co-Op Session

Summer

Co-Op Session

Senior Year

Fall

Course		Title	Hrs.
		ECE Elective	3
		ECE Theory Elective	3
		ECE Theory Elective	3
		ECE Lab Elective	2
		Technical Elective	3
		Humanities & Social Sciences	3
		Total Credit Hours	17

Spring

Course		Title	Hrs.
		ECE Theory Elective	3
		ECE Lab Elective	2
ECEN	4610	Capstone Laboratory	3
		Technical Elective	3
		Upper Division H&SS	3
		Total Credit Hours	14

Electrical and Computer Engineering Sample Co-Op Schedule
Schedule A

Freshman Year

Fall

Course		Title	Hrs.
PHYS	1110	Physics 1	4
APPM	1350	Calculus 1	4
CSCI	1300	CS1: Programming	4
ECEN	1100	Freshman Seminar	1
		Humanities & Social Sciences	3
		Total Credit Hours	16

Spring

Course		Title	Hrs.
CHEN	1211	General Chemistry for Engineers	3
CHEM	1221	General Chemistry Lab	2
APPM	1360	Calculus 2	4
		Freshman Elective	3
		Humanities & Social Sciences	3
		Total Credit Hours	15

Sophomore Year

Fall

Course		Title	Hrs.
APPM	2360	Linear Algebra/Diff. Eq.	4
ECEN	2120	Computers as Components	5
ECEN	2250	Circuits I	5
		Humanities & Social Sciences	3
		Total Credit Hours	17

Spring

Course		Title	Hrs.
APPM	2350	Calculus 3	4
ECEN	2260	Circuits 2	5
ECEN	3100	Digital Logic	5
		Humanities & Social Sciences	3
		Total Credit Hours	17

Summer

Co-Op Session

Fall

Co-Op Session

Junior Year

Spring

Course		Title	Hrs.
ECEN	3300	Linear Systems	5
ECEN	3400	EM Fields	5
ECEN	3810	Probability	3
CSCI	2270	CS2: Data Structures	4
		Total Credit Hours	17

Fall

Co-Op Session

Spring

Course		Title	Hrs.
		Software Elective	3
ECEN	3250	Circuits 3	5
ECEN	4593	Computer Organization	3
WRTG	3030	Writing on Science & Society	3
		Total Credit Hours	14

Summer

Co-Op Session

Senior Year

Fall

Course		Title	Hrs.
PHYS	2130	Modern Physics	3
ECEN	4610	Capstone Laboratory	3
		ECE Theory Elective	3
		ECE Lab Elective	2
		Free Elective	3
		Humanities & Social Sciences	3
		Total Credit Hours	17

Spring

Course		Title	Hrs.
ECEN	4703	Discrete Mathematics	3
		Technical Elective	3
		Technical Elective	3
		Free Elective	3
		Upper Division H&SS	3
		Total Credit Hours	15

Electrical and Computer Engineering Sample Co-Op Schedule
Schedule B

Freshman Year

Fall

Course		Title	Hrs.
PHYS	1110	Physics 1	4
APPM	1350	Calculus 1	4
CSCI	1300	CS1: Programming	4
ECEN	1100	Freshman Seminar	1
		Humanities & Social Sciences	3
		Total Credit Hours	16

Spring

Course		Title	Hrs.
CHEN	1211	General Chemistry for Engineers	3
CHEM	1221	General Chemistry Lab	2
APPM	1360	Calculus 2	4
		Freshman Elective	3
		Humanities & Social Sciences	3
		Total Credit Hours	15

Sophomore Year

Fall

Course		Title	Hrs.
APPM	2360	Linear Algebra/Diff. Eq.	4
ECEN	2120	Computers as Components	5
ECEN	2250	Circuits I	5
		Humanities & Social Sciences	3
		Total Credit Hours	17

Spring

Course		Title	Hrs.
APPM	2350	Calculus 3	4
ECEN	2260	Circuits 2	5
ECEN	3100	Digital Logic	5
		Humanities & Social Sciences	3
		Total Credit Hours	17

Junior Year

Fall

Course		Title	Hrs.
ECEN	3300	Linear Systems	5
ECEN	3400	EM Fields	5
ECEN	3810	Probability	3
CSCI	2270	CS2: Data Structures	4
		Total Credit Hours	17

Spring

Co-Op Session

Summer

Co-Op Session

Fall

Course		Title	Hrs.
		Software Elective	3
ECEN	3250	Circuits 3	5
ECEN	4593	Computer Organization	3
WRTG	3030	Writing on Science & Society	3
		Total Credit Hours	14

Spring

Co-Op Session

Summer

Co-Op Session

Senior Year

Fall

Course		Title	Hrs.
PHYS	2130	Modern Physics	3
ECEN	4610	Capstone Laboratory	3
		ECE Theory Elective	3
		ECE Lab Elective	2
		Free Elective	3
		Humanities & Social Sciences	3
		Total Credit Hours	17

Spring

Course		Title	Hrs.
ECEN	4703	Discrete Mathematics	3
		Technical Elective	3
		Technical Elective	3
		Free Elective	3
		Upper Division H&SS	3
		Total Credit Hours	15

Certificate Programs

Certificate programs are similar to minor programs, and upon completion will be identified on the student's transcript immediately following the semester in which the certificate was completed. It is possible that course work used to satisfy the certificate can also be used for free electives, technical electives, or humanities/social sciences electives. Check with the Undergraduate Advisor to determine how a certificate program fits in with your degree plans.

Embedded System Design
Commercially available digital systems (microprocessors, microcontrollers, memory chips, interface systems, and systems that handle image, voice, music, and other types of signals) have experienced explosive growth in the electronics industry. These devices are increasingly powerful, cheap, and flexible as design components. The certificate in embedded systems offers students the hardware and software knowledge and skills needed to design and implement these systems. The curriculum consists of two core courses and one elective course from an approved list. The two core courses are:

ECEN	4613	Embedded System Design
ECEN	4623	Real-Time Embedded Systems

The list of approved electives is periodically updated and currently includes:

ECEN	4610	Capstone Laboratory
ECEN	4033	Software Engineering of Stand-Alone Programs
ECEN	4633	Hybrid Embedded Systems
ECEN	4583	Software Systems Development

Software Engineering
Experienced software professionals work in a field that has maintained a relentlessly rapid rate of change for decades making it impossible to stay current in all aspects of software engineering. Those with limited experience find that the challenges of work assignments exceed their preparation from most undergraduate degree programs. In a typical computer-related undergraduate curriculum, it is not possible to devote enough credit hours specifically to software engineering to address all of the aspects of engineering complex systems including, for example, design for maintainability, concurrency, and distributed systems. The professional certificate in software engineering covers the body of knowledge necessary to develop products more predictably and reliably for stand-alone programs as well as for software in more complex environments. The curriculum consists of three core courses:

ECEN	4033	Software Engineering of Stand-Alone Programs
		or
ECEN	4583	Software Systems Development
		and
ECEN	4043	Software Engineering of Multi-Program Systems
ECEN	4053	Software Engineering of Distributed Systems

College of Arts and Sciences
Arts and Sciences offers certificate programs in the following areas: Actuarial Studies, British Studies, Central and Eastern European Studies, Cognitive Sciences, Lesbian, Gay, Bisexual, and Transgender Studies, Medieval and Early Modern Studies, Neurosciences and Behavior, Peace and Conflict Studies, and Western American Studies. Completion of specified course work in these programs entitles students to a certificate issued by the Dean of Arts & Sciences. Students interested in these programs should contact the appropriate program.

ATLAS
The Alliance for Technology, Learning, and Society (ATLAS) offers two certificates: *Technology, Arts, and Media (TAM)* and *Multidisciplinary Applied Technologies (MAT)*. Both require 18 credit hours. For additional information, call 303-735-6588 or visit the website: http://www.colorado.edu/ATLAS.

International Engineering Certificate in German
This is a new undergraduate academic program established at CU-Boulder in 2003. It offers students enrolled in an engineering degree program the opportunity to obtain an interdisciplinary certificate in International Engineering and German. The program prepares engineers for a global economy through language, cultural awareness, and international work experience. Students who have had German language instruction in high school, as well as students with other language experience who would like to begin studying German may apply. If interested, please contact the Dean's Office at 303-492-5071, or visit the website at http://ecadw.colorado.edu/engineering/academics/german.htm.

Biomedical Engineering Option (BME)

The Biomedical Engineering (BME) option, available to both electrical and computer engineering majors, focuses on the application of biophysical and engineering concepts to the improvement and protection of human health. Successful completion of this option is noted on a student's transcript and meets most medical school admission requirements.

Coursework in the Electrical and Computer Engineering curriculum is coupled with specialized courses linking electrical engineering to biomedical applications such as neural signals and systems, bioeffects of electromagnetic fields, therapeutic and diagnostic uses of bioelectric phenomena and medical image processing. Undergraduates may also elect independent study courses in these areas.

Students interested in the BME option may receive elective credit for two semesters of biology if they also complete two bioengineering courses from the ECE offerings. One of these ECE courses also may be used to satisfy distribution requirements. The basic BME option includes two semesters of biology and two junior or senior bioengineering courses in the ECE Department taken in lieu of other electives. Several of these BME electives are also applicable to the Boulder campus Neurosciences Program. ECE Biomedical Engineering courses regularly offered include:

ECEN	4811/5811	Neural Signals and Functional Brain Imaging
ECEN	4821/5821	Neural Systems and Physiological Control
ECEN	4831/5831	Brains, Minds, and Computers
ECEN	40x1/50x1	Special Topics in Biomedical Engineering

For more information on the content of the BME-ECE courses and pre-medical studies in ECE contact Professor Howard Wachtel, wachtel@colorado.edu, OT 433. For specific advice on fitting the BME Option into an existing ECE program contact the Undergraduate Staff Advisor.

Study Abroad Program

A very special opportunity is available to engineering students through the Office of International Education. Study Abroad Programs, usually undertaken in the student's junior year, have been established with several universities around the world offering technical as well as elective social science and humanities courses. In recent years, ECE students have gone to Germany, Italy, France, and England to study. Programs can be arranged for either one semester or one academic year.

A formal exchange program has been established with the University of East Anglia (UEA) in Norwich, England, and a number of students from both CU-Boulder and UEA have participated. Course equivalents have been established so that, before they travel, students know what courses they will be taking and exactly how the credits will count. No CU student has lost a single credit hour by participating in this particular exchange program.

In most cases, students going abroad are "registered" on the Boulder campus so they maintain all of the rights of a resident student, including financial aid. The exchange agreement with UEA stipulates that students pay tuition to their home universities; all CU-Boulder students pay the in-state rate. Therefore, even with travel costs included, it is only slightly more expensive for in-state students to spend a year in England than in Boulder and several thousand dollars less expensive for out-of-state students.

An international perspective will be increasingly important in the marketplace of the future. Students who are able to take advantage of such opportunities as studying abroad will have a distinct head start in the business world as well as a unique experience to offer future employers. The personal advantages of spending a year in a different cultural setting are immeasurable.

The Department strongly encourages all students to consider participating in the Study Abroad Program. All interested ECE students should contact the ECE Undergraduate Office prior to applying to the program. More information is available at the Office of International Education, Environmental Design Building, Room 92, 492-7741.

Semester at Sea

The semester at sea is a study abroad program designed to incorporate a global semester into your undergraduate curriculum. Administered through the Office of International Education, and managed by the University of Pittsburgh's Institute for Shipboard Education, students explore and learn valuable insights into the various societies visited and allows students to analyze and discuss their observations in formal classes on the shipboard campus. Set sail aboard the SS Universe Explorer each semester and summers.

Contact the Office of International Education for more information in the Environmental Design Building, Room 1B45, (303) 492-7741 or visit their website at http://www.colorado.edu/OIE/StudyAbroad/index.html

Concurrent BS/MS Program

Students with strong academic records who plan to continue in the Graduate School for a Master's in the same discipline usually find it advantageous to apply for admission to the concurrent BS/MS degree program.

Purpose of the Program
The concurrent BS/MS program in Electrical and Computer Engineering enables especially well-qualified students to be admitted to the MS program during the junior year of their BS program, and to work thereafter towards both the BS and MS degrees in Electrical and Computer Engineering. This program allows for early planning of the MS portion of the student's education, taking graduate courses as part of the BS degree, more flexibility in the order in which courses are taken, and more efficient use of what would otherwise be a final semester with a light credit hour load. Due to the tighter coordination of courses within the ECE Department than is possible for students who come to UCB from other institutions to pursue the MS degree, up to six (6) credit hours may be counted toward both the BS and MS degree programs.

Admission to the Program
Application for admission to the Concurrent BS/MS program in the ECE Department may be made at any time during or after the student enters his or her junior year. Minimum requirements for admission to the concurrent program are: (i) completion of the eight core EE courses, (II) a minimum overall GPA of 3.25, (iii) a minimum GPA of 3.25 in ECE Department courses, and (iv) at least three (3) letters of recommendation must be provided by the applicant (at least two (2) must be from ECE faculty at UCB). Transfer students in place of requirement (i) above, must have taken at least two (2) of the core ECE courses at the Boulder campus and have completed coursework at another institution (or other institutions) which is approved for the transfer credit equivalent to all ECE core courses not taken on the Boulder campus, and must have completed at least 15 credit hours of total courses at UCB in order to qualify for admission.

Staying in the Program
The student must maintain a GPA of at least 3.0 over all undergraduate courses taken, and a GPA of at least 3.0 in all graduate courses taken in order to remain in good standing in the program.

Regulations
Until a student in this program reaches a total of 128 credit hours of courses applicable to the BS or MS degree in Electrical and Computer Engineering taken and passed (each with a grade of D or better), he/she will be governed by the rules and regulations applicable to any undergraduate student in the ECE Department, unless specified otherwise in the regulations described herein. After a student has accumulated a total of 128 applicable credit hours, he/she will be governed by the rules and regulations applicable to any graduate student in the ECE Department, unless specified otherwise in the regulations described herein. It is the intention of the department that, as far as possible, a student in this program is treated on the same bases as any other student in the department at a comparable stage of their academic career.

Overlapping Credit
With the recommendation of the student's academic advisor and the approval of the ECE Graduate Coordinator, as many as six (6) credit hours of ECE Department courses at the 5000 level or above may be counted both toward the undergraduate degree requirements and the requirements for the MS degree. In theory, therefore, the minimum number of credits for the Concurrent BS/MS degree will be 152.

Advising
Students in the Concurrent BS/MS program must have a faculty advisor with whom they must consult to compose a degree plan, including a list of courses to be taken from the senior year through the end of the program. This plan must be filed with the ECE Department Coordinator for Undergraduate Studies by the end of the third week of the first semester in which the student has been admitted into the program.

Other Information

Department Regulations and Other Useful Information
Other Important Publications
Miscellaneous Curriculum Notes
Minimum Academic Preparation Standards (MAPS)
Faculty Directory

Department Regulations and Other Useful Information

Students with questions concerning Departmental regulations and requirements should check with the Undergraduate Staff Advisor first. In some cases, Department regulations differ from those of the College of Engineering. Students should make themselves aware of the following regulations as well as the regulations in the College Advising Guides.

Advanced Placement/College-Level Examination Program

AP and CLEP credit is handled as transfer credit. For students who have taken an advanced placement course in high school and who make the required score in the College Entrance Examination Board's Advanced Placement examination, advanced placement and college credit will be granted if the subject would normally be part of the student's curriculum. If the student elects to take the equivalent college course, the credit for that course will replace the advanced placement credit. All advanced placement credit must be validated by satisfactory achievement in subsequent courses.

For a listing of AP examinations, score required for credit, and equivalent courses at CU-Boulder, please refer to the current University of Colorado at Boulder Catalog. You may also find this information at: http://www.colorado.edu/prospective/freshman/requirements/ap.html

Course Forgiveness

The University currently has in place a pilot program to give students the opportunity to repeat courses in which they received a grade of D+ or lower. Once completed, the original grade will be removed from both total credit hour and GPA computations; however, it will remain on the student's transcript. Students may use this program for a maximum of 10 credit hours. Check the course forgiveness website for updates and complete rules. http://registrar.colorado.edu/students/registration/course_forgiveness.html. This is not available for independent study.

Course Repetition

A course in which a grade of C- or better has been received may not be repeated.

Discovery Learning Apprenticeships

Undergraduate students are encouraged to apply for the opportunity to conduct research via a Discovery learning apprenticeship. Students can earn an hourly wage while engaging in research with college faculty and graduate students. Positions are announced in April for the following fall term and spring term. Students must apply and selection for positions is competitive. For more information, an application and a list of current discovery learning projects visit http://engineering.colorado.edu/activelearning/discovery.htm.

Double Degrees

It is possible to obtain bachelor's degrees in two engineering disciplines or one in EE (or ECE) and one in a second degree. Students must satisfy curricula for both programs and complete a minimum of 30 additional hours beyond the largest minimum required by either program.

Of the 30 additional semester credit hours, double degree students must complete 24 semester credit hours in courses offered by the secondary academic department or in courses approved in advance by the department as substitutes. Transfer students pursuing double degrees must complete a minimum of 75 semester credit hours as a degree student in the College of Engineering and Applied Science and must satisfy all other stipulations regarding total hours required and approval of all coursework by both departments concerned.

E-Mail Communication

E-mail is an official means of communication within the CU-Boulder community. Therefore, the University has the right to send communication to students via e-mail and expect that those communications will be received and read in a timely fashion. The campus recommends checking e-mail once per week, at minimum, because some communications may be time critical.

Additionally, the department maintains e-mail lists for communication with its students. You will be automatically placed on this list when you are accepted into the department. If you wish to be removed from this list, contact the Undergraduate Staff Advisor.

Engineering Management Courses

Engineering Management courses equip students with technical management expertise. Areas of technical management emphasis are in quality and process, research and development, operations, and project management. Engineering Management courses may be used to satisfy technical elective requirements for a B.S. degree.

Free Electives

The Electrical Engineering curriculum includes a maximum of 5 credit hours of free electives and the Electrical and Computer Engineering curriculum has a maximum of 6 credit hours. Free electives may be any course that covers different material than other courses the student has taken. For example, a student may not take APPM 1350 Calculus 1 for Engineers and MATH 1300 Analytic Geometry/Calculus and receive credit for both.

Grades

Faculty within this College have the option of awarding grades with a plus (+) or minus (-) designation, except for A+. Faculty who teach courses have complete authority for calculating and assigning final grades in courses they teach.

A final grade of "D-" or better in a course is sufficient to satisfy degree requirements unless the course is a prerequisite for another course in the student's program (see Prerequisite Requirements).

GPA

In addition to other University requirements, each student must satisfy the following at the time of graduation: a cumulative grade point average of 2.00 in all courses taken on any campus at the University of Colorado; a cumulative grade point average of 2.00 in all departmental courses (labeled ECEN xxxx or cross-listed with ECEN) taken on any campus at the University of Colorado.

"Courses taken" means all courses for which a letter grade has been received, including all grades for repeated courses.

Graduate-Level Courses

Courses at the ECEN or CSCI 5000-level are closed to undergraduates with a GPA of less than 2.85 except by petition. Other campus departments may have different restrictions. Courses at the 6000-and 7000-level are closed to all undergraduate students. Graduate level courses applied towards the graduation requirement for the B.S. degree cannot be used again toward a graduate degree, either here or at another school. The only exception to this rule is students who are enrolled in the Concurrent BS/MS program. See the section about the Concurrent BS/MS program for further details.

Graduation Check

Each student should make an appointment with the Undergraduate Staff Advisor one semester prior to the semester in which he or she plans to graduate to review credits toward graduation. Even though all students are invited to review credits several times throughout their studies, this final graduation check is mandatory. If a student has not been through the graduation check and problems are found at graduation, an extra semester may be necessary.

Graduation Requirements

A complete listing of all requirements for graduating from the department of Electrical and Computer Engineering is in the section titled "Graduation Requirements" on a separate page in this *HELP! Guide*.

Honors

Students with cumulative GPA between 3.75 and 3.89 at the end of the semester prior to graduation will be awarded the designation "With Distinction" on their diploma. A GPA of 3.90 or higher earns the citation "With High Distinction." At least 50 hours must have been earned at the Boulder campus and grades earned during the semester of graduation will not be considered.

Eligible students are also encouraged to participate in the College of Arts and Sciences Honors Program. Criteria for the designations of cum laude, magna cum laude, and summa cum laude are set by the Honors Council and are recorded on the student's diploma and in the commencement program. This is a separate program and both distinction and cum laude can be earned. Interested students should consult with the Director of the Engineering Honors Program for detailed information.

Independent Study

Upper division independent study (ECEN 3840/4840) may be used as a technical elective to fulfill graduation requirements without petitioning. If it is used to fulfill any other requirement, it must be approved ahead of time by petition. Any Independent Study course sponsored by a faculty member in another department must be approved by petition and may not be used to fulfill the senior theory or lab requirements.

If interested, an *Independent Study Agreement* form must be completed and signed by both the student and the sponsor of the Independent Study or Undergraduate Research. These forms are available in the ECEN Department Office (ECEE 1B55). In most cases, students will contact faculty in an area the student is interested in pursuing. Sometimes, a faculty will approach a student who has excelled in a particular course. Students should use the faculty list section of this *HELP! Guide* to determine what faculty to contact.

No Credit

A course taken for no credit cannot be used for fulfilling graduation requirements. Once a course has been taken for no credit it cannot be repeated for a grade. Students are still subject to course tuition and fee expenses when registering for a course with the NC option.

Pass/Fail (P/F)

Pass/fail credit will not be permitted for any courses used for fulfilling graduation requirements.

Petitions

Any exceptions to department or college rules must have prior approval by petition. All petitions must be submitted to the Undergraduate Staff Advisor for departmental approval. Petitions involving exceptions to College rules will then be submitted to the Dean's Office for approval. It is the student's responsibility to find out if a petition has or has not been approved. Blank petition forms are available in the ECE Department Office (EE (1B55), the ECE Undergraduate Office (EE 1B51), and the Dean's Office (AD 100).

Prerequisite Requirements

The minimum passing grade for a course that is considered a prerequisite for another required course is C-. If a grade of D+ or lower is received in a course which is prerequisite to another, the student is required to repeat the course until the minimum acceptable course grade has been earned. If a student takes the advanced course, it does not remove the obligation to repeat the prerequisite course, even if the grade earned in the advanced course is a C- or above. The minimum passing grade for a course that is not specifically a prerequisite for another required course is D-. See the list on page 13 or the chart on page 14 for prerequisite courses.

ROTC

Students participating in the ROTC program may receive up to eight (8) semester hours of credit toward fulfilling ECEN BS degree requirements from approved ROTC coursework (5 hours of Free Elective, 3 hours of Humanities/Social Science Elective).

Telecommunications Courses

The graduate Telecommunications Program offers special courses, most of which are usually not suitable as technical electives in the departmental programs. Therefore, a student may use only that Telecommunications course for which he or she has received prior approval, by petition, in his or her degree program. Only one approved Telecommunications course may be applied to the B.S. program. A brochure listing courses offered in the Telecommunications Program may be obtained in the Telecommunications Office (OT 313).

Transfer Credits

The initial transfer credit evaluation is performed by the Office of Admissions upon receiving an official transcript mailed directly from the institution where the credit was earned. Once the Office of Admissions has completed their evaluation, the ECEN Transfer Credit Evaluator, Professor Tom Mullis, ECOT 335, (Professor Edward Kuester, ECOT 248 after fall 2006) can verify the specific courses that apply to the Department's curriculum. Just because the Office of Admissions accepted the credit doesn't' mean ECEN will utilize that credit toward BS degree requirements. The Office of Admissions will not accept course work in which the student received a grade lower than a C-. Nor will Pass/Fail credit be accepted. Credits from an Engineering Technology program normally will not transfer, and no academic credit is normally given for work or co-op experience.

All transfer students should see the Department's Transfer Credit Evaluator, Professor Tom Mullis, ECOT 335 (Professor Edward Kuester, ECOT 248, after fall 2006) about acceptance of transfer credits before classes begin. Acceptance of transfer credits is provisional for one academic year following admission to the ECE Department and until academic competence in subsequent courses has been established. (Those transferring here from UCD or UCCS are *not* considered transfer students, but they should review their credits with the Undergraduate Staff Advisor in order to determine how credits received at another campus will fit into this program.)

Transfer students should understand that all credits received at other universities may not – in fact, most likely will not –apply toward their ECE program. Transfer credits are first reviewed by the University, which accepts those it feels are comparable to courses at CU. Then that list of courses is reviewed by the Transfer Credit Evaluator who approves only those courses which are comparable to courses required by departmental curricula. In most cases, this is only a fraction of total transfer hours.

The number of credit hours for each course may vary by institution and final grades do not transfer between institutions. Also, the completion of these courses does not assure the student of acceptance into an engineering degree program; each institution has its own admission criteria. Lower division courses cannot transfer as upper division courses between two-year and four-year institutions.

Once the Transfer Credit Evaluator has approved transfer hours, the student should deliver a copy of the signed sheet to the Undergraduate Staff Advisor in the Undergraduate Office to be made a part of his or her departmental file.

45-Hour Rule

Students graduating from CU-Boulder must complete their last 45 hours on the Boulder campus or through CAETE (Center for Advanced Engineering & Technology Education). Courses taken through Continuing Education or by correspondence, even though registered for in Boulder, are *not* considered Boulder campus courses. Any exceptions to the 45-hour rule must be approved by petition *in advance* before registering or they will not be counted toward the degree.

OTHER IMPORTANT PUBLICATIONS

University of Colorado Catalog	Degree requirements, academic standards, administrative regulations, university policies and procedures (dry and dull, but important). http://www.colorado.edu/catalog/
College Advising Guides	College of Engineering requirements, rules, regulations (must read). http://ecadw.colorado.edu/engineering/students/advising.htm
Ralphie's Guide to Student Life	A-Z listing of university resources, facilities, and special programs as well as rules, regulations, and policies (wealth of well-organized, entertaining information). http://www.colorado.edu/ralphie/

MISCELLANEOUS CURRICULUM NOTES

- The curricula listings on pages 7 and 9 are not a misprint: It is highly recommended that you take APPM 2360 (Linear Algebra and Differential Equations) before APPM 2350 (Calculus 3). Material covered in APPM 2360 will help you with Circuits 1 and must be taken as a co-requisite.
- WRTG 3035, GEEN 3000, or HUEN 3100 will substitute for WRTG 3030.
- APPM 2380 plus APPM 2480 will substitute for APPM 2360.

MINIMUM ACADEMIC PREPARATION STANDARDS (MAPS)

All students entering the University of Colorado who finished high school in the spring of 1988 or thereafter must meet Minimum Academic Preparation Standards specified by each school or college. The College of Engineering and Applied Sciences has adopted the following standards for admission. These standards are defined in high school units. A unit is one academic year of course work.

1.	English	4 units
2.	Mathematics	4 units (including 2 algebra, 1 geometry, and 1 college prep, eg. trigonometry)
3.	Natural Science	3 units (including 1 unit in chemistry and 1 unit in physics)
4.	Social Science	2 units
5.	Foreign Language	2 units (of the same language)

Policies Concerning MAPS Deficiencies

Students who are admitted to the College of Engineering with a deficiency in one or more of the above categories are required to complete the appropriate courses through courses taken at CU-Boulder or other institutions of higher education or approved credit-by-examination programs *prior to their graduation from college*.

The policies of the Boulder campus with respect to completing MAPS course work after enrollment are as follows:

1. Appropriate missing MAPS course work may be included in the hours for graduation.

2. All course work taken to fulfill MAPS deficiencies must be taken for a letter grade.

3. Students are required to enroll in and complete at least one MAPS course each term, beginning in the first term of enrollment, until all MAPS units are completed. This policy applies to new freshmen, to transfer students, and to students transferring from other academic units on the Boulder campus and from other campuses of the University. Failure to comply with this requirement may result in suspension at the end of the term in which the student ceases taking courses to complete missing MAPS units.

4. All students who first enroll in one academic college or school at CU-Boulder and who subsequently transfer to another college or school are required to meet the MAPS specified for the new unit, irrespective of their completion of MAPS units in their previous college or school.

5. Students in double-degree programs must meet MAPS requirements of both degree-granting programs.

6. Students must consult with a CU-Boulder academic advisor (or read their college's academic survival guide) to determine which specific courses may be used to meet a MAPS requirement.

7. Students who graduate from a foreign high school are exempt from MAPS requirements.

Electrical and Computer Engineering Faculty

Area code 303

Professor	*Office*	*Telephone*	*E-mail*	*Area of Interest*
James Avery	OT 240	492-6310	avery@colorado.edu	Computer Engineering
Susan Avery	CIRES 309	492-7653	savery@colorado.edu	Remote Sensing
Frank Barnes	OT 250	492-8225	barnes@colorado.edu	Bioengr, Nanostructures
Timothy Brown	OT 256	492-1630	timxb@colorado.edu	Sig. Proc., Comm.
Thompson Brown	EE 2B37	492-4190	tomb@colorado.edu	Capstone Laboratory
Daniel Connors	OT 342	735-7199	dconnors@colorado.edu	Computer Engineering
Ruth Dameron	EE 1B67	492-8369	dameron@colorado.edu	Computer Engineering
Howard Demuth	OT 257	492-8876	hdemuth@colorado.edu	Bioengineering
Robert Erickson	EE 1B55	492-7003	rwe@colorado.edu	Power Electronics
Dejan Filipovic	OT 243	735-6319	dejan@colorado.edu	Electromagnetics
Ewald Fuchs	OT 340	492-7010	fuchse@colroado.edu	Power Electronics
Albin Gasiewski	OT 257	492-9688	Al.Gasiewski@colorado.edu	Electromagnetics
John Hauser	OT 437	492-6496	hauser@colorado.edu	Dynamics & Controls
Vincent Heuring	OT 346	492-8751	heuring@colorado.edu	Computer Engineering
Edward Kuester	OT 248	492-5173	kuester@colorado.edu	Electromagnetics
Michael Lightner	OT 352	492-5180	lightner@colorado.edu	VLSI/CAD
Eugene Liu	OT 337	735-6307	liue@colorado.edu	Sig. Proc., Comm.
Arnoldo Majerfeld	OT 246	492-7164	majerfel@colorado.edu	Nanostructures & Devices
Dragan Maksimovic	EE 1B71	492-4863	maksimov@colorado.edu	Power Electronics
Peter Mathys	OT 334	492-7733	mathys@colorado.edu	Sig. Proc., Comm.
Robert McLeod	OT 251	735-0997	mcleod@colorado.edu	Optics & Photonics
David Meyer	OT 438	492-7158	dgm2r@colorado.edu	Dynamics & Controls
Francois Meyer	OT 251	492-5470	fmeyer@colorado.edu	Bioengr., Comm.
Alan Mickelson	EE 5130	492-7539	mickel@colorado.edu	Optics, EM.
Richard Mihran	OT 436	492-8375	mihran@colorado.edu	Bioengineering
Olgica Milenkovic	OT 253	735-3682	milenkov@colorado.edu	Sig. Proc., Comm.
Garret Moddel	EE 148	492-1889	model@colorado.edu	Nanostructures & Devices
C.T. Mullis	OT 335	492-8718	mullis@colorado.edu	DSP, Communication
Todd Murphey	OT 332	492-1090	murphey@colorado.edu	Dynamics & Controls
Lucy Pao	OT 350	492-2360	pao@colorado.edu	Dynamics & Controls
Wounjhang Park	EE 248	735-3601	wpark@colorado.edu	Nanostructures & Devices
Rafael Piestun	EE 246	735-0894	piestun@colorado.edu	Optics & Photonics
Melinda Piket-May	OT 242	492-7448	mjp@colorado.edu	Electromagnetics
Andrew Pleszkun	OT 348	492-3571	arp@colorado.edu	Computer Engineering
Zoya Popovic	OT 252	492-0347	zoya@colorado.edu	Electromagnetics
Fabio Somenzi	OT 435	492-3466	Fabio@colorado.edu	VLSI/CAD
Manish Vachharajani	OT 336	492-0612	manishv@colorado.edu	Computer Engineering
Bart VanZeghbroeck	EE 1B41	492-2809	bart@colorado.edu	Nanostructures & Devices
Mahesh Varanasi	OT 333	492-0258	varanasi@colorado.edu	Sig. Proc., Comm.
Howard Wachtel	OT 433	492-7713	wachtel@colorado.edu	Bioengineering
Kelvin Wagner	EE 233	492-4661	Kelvin@colorado.edu	Optics & Photonics
William Waite	OT 356	492-7204	waite@colorado.edu	Computer Engineering
Regan Zane	EE 1B63	735-1560	Regan.zane@colorado.edu	Power Electronics

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EE Advisor's Grid

		Phys/Chem	Math	ECE/CS Required	Distribution Requirements	Technical Electives	Free Electives	Humanities & Social Sci	Sem Hrs
FRESHMAN	Fall	PHYS 1110-4 Physics 1	APPM 1350-4 Calculus 1	CSCI 1300-4 CS1: Programming				H&SS #1 - 3	16
				ECEN 1100-1 Freshman Sem					
	Spring	CHEN 1211-3 CHEM 1221-2 Chem w/ lab	APPM 1360-4 Calculus 2	Freshman Elective				H&SS #2-3	15
SOPHOMORE	Fall		APPM 2360-4 Lin Alg/Diff EQ	ECEN 2120-5 Computer/Comp				H&SS #3-3	17
				ECEN 2250-5 Circuits 1					
	Spring		APPM 2350-4 Calculus 3	ECEN 2260-5 Circuits 2				H&SS #4-3	17
				ECEN 3100-5 Digital Logic					
JUNIOR	Fall			ECEN 3300-5 Linear Systems			Course #1-2		
				ECEN 3400-5 EM Fields					15
				ECEN 3810-3 Probability					
	Spring	PHYS 2130-3 Modern Physics		ECEN 3250-5 Circuits 3			Course #2-3	WRTG 3030-3	17
				ECE Elective-3					
SENIOR	Fall			ECE Elective-3	Theory #1: ECEN 4____ or Unused ECE Elective	Course #1-3		H&SS #6-3	
					Theory #2: ECEN 4____				17
					Lab #1: ECEN 4____				
	Spring				Theory #3: ECEN 4____	Course #2-3		Upper Division H&SS #7-3	
					Lab #2: ECEN 4____				14
					ECEN 4610-3 Capstone Laboratory				
Hours Required		12	16	52	16	6	5	21	128

ECE Advisor's Grid

		Phys/Chem	Math	ECE/CS Required	Distribution Requirements	Technical Electives	Free Electives	Humanities & Social Sci	Sem Hrs
FRESHMAN	Fall	PHYS 1110-4 Physics 1	APPM 1350-4 Calculus 1	CSCI 1300-4 CS1: Programming				H&SS #1 - 3	16
				ECEN 1100-1 Freshman Sem					
	Spring	CHEN 1211-3 CHEM 1221-2 Chem w/ lab	APPM 1360-4 Calculus 2	Freshman Elective				H&SS #2-3	15
SOPHOMORE	Fall		APPM 2360-4 Lin Alg/Diff Eq	ECEN 2120-5 Computer/Comp				H&SS #3-3	17
				ECEN 2250-5 Circuits 1					
	Spring		APPM 2350-4 Calculus 3	ECEN 2260-5 Circuits 2				H&SS #4-3	17
				ECEN 3100-5 Digital Logic					
JUNIOR	Fall			ECEN 3300-5 Linear Systems					17
				ECEN 3400-5 EM Fields					
				ECEN 3810-3 Probability					
				CSCI 2270-4 CS 2: Data Structures					
	Spring			ECEN 3250-5 Circuits 3				WRTG 3030-3	14
				ECEN 4593-3 Computer Org					
				Software Elective					
SENIOR	Fall	PHYS 2130-3 Modern Physics			Theory ECEN 4____	Course #1-3	Course #1-3	H&SS #6-3	17
					Lab ECEN 4____				
	Spring			ECEN 4610-3 Capstone Laboratory		Courses #2-3	Course #2-3	Upper Division H&SS #7-3	15
				ECEN 4703-3 Discrete Math					
Hours Required		12	16	62	5	6	6	21	128