

Department of Electrical
and Computer Engineering
College of Engineering

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Effective for students beginning degree Summer Sem. 2006 thru Spring Sem. 2007

Admission to the College of Engineering

In addition to the policies of the University concerning admission of students, the following regulations apply to the College of Engineering:

1. Transfer students from other colleges or universities will be referred to the College of Engineering Admission Committee for evaluation. Criteria considered in admission decisions for transfer students include resources available in the requested department and the transfer GPA, along with an evaluation of the program of the former college or university.

2. Students registered on campus (including General Studies), must be approved by the Engineering Admission Committee before transferring to the College of Engineering. Students in this category must have demonstrated, through courses taken at USU, a potential to succeed in the major of their choice.

3. Admission requirements for students desiring to major in Electrical Engineering or Computer Engineering are the same as those governing admission to the College of Engineering, *except* that students must also be "calculus ready." That is, they must: (1) achieve a score of 27 or higher on the Math ACT test; (2) complete MATH 1050 and 1060 *or* MATH 1210; or (3) achieve an AP score of at least 3 on the AB Calculus or BC Calculus test.

Pre-Engineering and Professional Engineering Requirements. Students interested in Engineering careers enter the University with a wide variety of educational backgrounds. Therefore, it is necessary for all students to demonstrate a satisfactory level of proficiency in basic engineering, mathematics, science, and English courses before they are admitted into a professional engineering program. Specific courses used to evaluate this proficiency are listed on the applications to the Professional Program available in the individual departments or in the College of Engineering Dean's Office. The professional engineering programs consist of the last two years of study listed in the departmental sections of the *General Catalog*. Students will not be admitted into engineering classes numbered 3000 or higher until they have been admitted into a professional engineering program.

Applications listing the required pre-professional courses and admission standards are available from the various departments and the office of the Dean of Engineering. The minimum requirements a student must satisfy in order to be eligible to apply for admission to a professional program are:

1. The student must achieve a grade of C- or better in every required pre-professional course. The *P-D-F* grading option may not be used except in freshman English composition.

2. The student must achieve an overall grade point average of 2.8 or better for all required pre-professional coursework completed at USU.

3. A student can repeat no more than three of the required pre-professional courses in order to satisfy the eligibility requirements. Multiple repeats of the same course are included in the total of three repeats. Audits count as a time taking a class unless prior written approval is obtained from the college academic advisor.

Satisfying minimum eligibility requirements does not ensure that a student will be admitted to a professional program in a specific department. The number of students accepted will be based upon the number of students that can be accommodated in upper-division classes. Applicants will be ranked and selected in order of their academic standing in the required pre-professional courses.

The Program

Within the Electrical and Computer Engineering Department, students may choose to major in either electrical or computer engineering. Each program helps to prepare students for careers as practicing engineers by offering a balanced curriculum of classwork, laboratory work, and design experiences.

For both major options, coursework covers many areas, including basic science (with an emphasis on physics), mathematics, computer programming, English, humanities, and social sciences. Building upon this foundation, core engineering courses help provide students with a solid foundation in circuit analysis, design and analysis of electronic circuits, and the design of digital circuits and microprocessor-based systems. Throughout these engineering courses, an emphasis is placed on computer-based tools, and experience is provided using modern laboratory equipment.

Both major options include a sequence of courses in senior design, in which students use the skills they are acquiring in the design, analysis, and implementation of a significant project. The design process also includes a significant writing component, in which students exercise technical writing and project documentation skills. Students frequently work in teams on these projects, both within the department, as well as with teams of students from other engineering departments. Senior projects are frequently done with industry sponsorship, or in conjunction with an internship at a company.

Many students obtain experience and earn summer income by taking internships at engineering companies. Several companies actively recruit USU students. These internships provide excellent experience for students, as well as potential employer contacts.

The **electrical engineering** degree option builds upon the core engineering concepts by providing greater depth in modern physics, with elective options for electromagnetics, controls, signal processing, electronics, and communications. These topics are important in most conventional engineering areas, including communications, transportation, and defense industries.

The **computer engineering** degree option builds upon the core engineering concepts by providing greater depth in programming, operating systems, and computer architectures. These topics help prepare students for positions in computer-related work.

In both majors, students also have the flexibility to choose from among a wide variety of technical electives, covering such engineering areas as communications, electromagnetics, antenna design, computer architecture, controls, optics, acoustics, microprocessor interfacing, real-time processing, electronics, and controls, as well as options in computer science, physics, mathematics, and other fundamental sciences.

In cooperation with other departments, all students are encouraged to complete one or more minors in mathematics, computer science, physics, or other appropriate fields of interest to the student. Dual majors are also available with many of these departments.

The electrical engineering major and the computer engineering major are each accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology (EAC/ABET).

The requirements for these majors, along with University and University Studies requirements, are summarized in this program sheet. Students are encouraged to keep this program guide and to use it in recording progress toward the completion of their degree requirements. Students are also urged to study this requirement sheet and the *General Catalog* frequently and to visit with their advisors on a regular basis about progress toward the completion of their degrees.

Electrical and Computer Engineering Objectives

Electrical Engineering Objectives

The Electrical Engineering program is dedicated to producing engineers who:

1. Contribute to engineering practice, advance engineering knowledge, and contribute to the good of society;
2. Advance their education in engineering or other professions; and
3. Take a leadership role in engineering and society.

Computer Engineering Objectives

The Computer Engineering program is dedicated to producing engineers who:

1. Apply fundamental principles to solve practical engineering problems;
2. Continually engage in professional, personal, and community development;
3. Implement well-planned top-down designs of complex systems; and
4. Function well as team members and interact well with other professionals and nonengineers.

Career Opportunities

Electrical and computer engineers design, analyze, program, and supervise the production and manufacturing of electrical equipment, such as computers, computer peripherals, CD-players, televisions, radios, cell phones, radar, test equipment, and many other products used in modern society. They contribute in important ways to transportation industries (automotive and aeronautical), the computer industry, and national defense. Engineers are also employed in technical sales and support positions for business and scientific equipment. Many engineers work for private industry, or form their own companies. Others work for large corporations, such as Micron, IBM, Microsoft, Intel, Novell, Agilent, and Hewlett-Packard.

Engineering also forms a strong foundation for graduate studies in other areas, such as bioengineering, law, business, or (with additional courses in biology and chemistry) medicine.

The job placement rate for students graduating from USU's electrical and computer engineering programs is nearly 100 percent.

Recommended High School Courses

Students interested in any field of engineering should take two or three years of algebra, pre-calculus (including trigonometry), and calculus if possible. Four years of English and courses in computer programming, physics, and chemistry are also recommended. If the suggested mathematics courses are not taken in high school, they must be taken in college prior to starting calculus.

Degrees and Programs Offered Through This Department

Electrical Engineering: Bachelor of Science (BS), Master of Science (MS), Master of Engineering (ME), Electrical Engineer (EE), and Doctor of Philosophy (PhD)

Computer Engineering: Bachelor of Science (BS)

Academic Advisement

All students should contact their academic advisor for assistance with course selection, program planning, and meeting graduation requirements. If they do not know who their advisor is, students should contact their department, college, or University Advising and Transfer Services.

Academic Requirements

The Dean's Office of the College of Engineering maintains a handout sheet giving current details of all academic regulations of the college. **It is the responsibility of the student to know the current regulations and to follow these regulations.**

Pre-professional Program. Students must maintain a USU GPA of 2.0 to remain in good standing both in the college and the University. Students in a pre-professional program who are not making satisfactory progress toward acceptance into a professional program or who become ineligible to enter a professional program will be suspended from the college. Students in good standing in a pre-professional program must still meet the entrance requirements for admission into a professional program.

Professional Program. For all engineering majors in the professional program, the following academic regulations apply in addition to University regulations:

1. A GPA of 2.0 or higher must be maintained in all upper-division engineering/math/science courses required for, or used as technical electives in, the chosen major. Courses which were part of the pre-professional program requirements and University Studies courses are not included in this GPA calculation.

2. No more than 10 hours of *D* or *D+* credit may be applied toward meeting graduation requirements in engineering/math/science classes.

3. College of Engineering courses may be repeated only once. Audits count as a time taking a class unless prior written approval is obtained from the department head. A maximum of three required or elective courses completed as part of a professional program can be repeated in order to meet graduation requirements. (Courses completed as part of a pre-professional program are not included in this total of three repeats.)

4. The *P/D+*, *D*, *F* grading option may not be used in required or elective courses completed as part of a professional program. (The *P/D+*, *D*, *F* grading option is approved for University Studies Courses.)

5. The academic regulations listed above (1-4) apply to required coursework and any elective engineering/math/science course which could be used to satisfy graduation requirements for the chosen degree. That is, once a student completes a particular technical elective, it becomes a required course for that student.

6. Students in violation of departmental or college academic regulations, no longer eligible for graduation, or not making satisfactory progress toward a degree, will be placed on probation.

a. Students will be placed on probation if they (i) earn an *F* in an engineering/math/science course which could be used to satisfy graduation requirements for the chosen degree (see No. 5 above); (ii) have more than 10 hours of *D* credit (see No. 2 above); or (iii) have a GPA of less than 2.0 (see No. 1 above).

b. Students remain on probation until they improve their standing by repeating and passing all failed classes, repeating classes to reduce the number of *D* credits to 10 or less, and/or by raising their GPA above 2.0.

c. While on probation, a student must earn a semester GPA of 2.0 or higher in engineering/math/science classes and must not earn any grade of *D* or *F*.

While on probation, a student may not preregister. The student's major code will be changed to a pre-professional code. The student must meet at least once per semester with the college academic advisor to work out a schedule having the primary goal of correcting the existing academic problems.

Graduation Requirements: BS Degree in Electrical or Computer Engineering

Minimum University Requirements*

Total credits	120
Grade point average (most majors require higher GPA)	2.00 GPA
Credits of C- or better	100
Credits of upper-division courses (#3000 or above)	40
USU credits	30
(20 of which must be upper division, including 10 required by major)	
Completion of approved major program of study	See department
Credits in minor (if required by department)	12
Credits in American Institutions (ECON 1500; HIST 1700, 2700, or 2710; POLS 1100; or USU 1300)	3
University Studies requirements	See below

*Colleges and departments may require more credits or a higher GPA. See requirements on this sheet.

University Studies Requirements for Electrical or Computer Engineering Major

Note: Approved University Studies courses and requirements are listed in the back section of each semester's *Schedule of Classes*.

General Education Requirements (27-31 credits)

Competency Requirements (9-13 credits)

Communications Literacy (CL1 and CL2) (6 credits)

ENGL 1010 (CL1) (3 credits) or satisfactory AP, CLEP, or ACT score

AND

ENGL 2010 (CL2) (3 credits)

Quantitative Literacy (QL) (3-4 credits)

MATH 1030 or 1050 or STAT 1040 (3-4 credits)

OR

One MATH or STAT course requiring MATH 1050 as a prerequisite

OR

AP Math score of 3 or higher

Computer and Information Literacy (0-3 credits)

Passing grade on six computer and information literacy related examinations. Although no specific course is required, USU 1000 and OSS 1400 teach the required skills.

Breadth Requirements (18 credits minimum)

Select at least one approved course from each of the following six categories: **American Institutions (BAI)**, **Creative Arts (BCA)**, **Humanities (BHU)**, **Life Sciences (BLS)**, **Physical Sciences (BPS)**, and **Social Sciences (BSS)**. At least two of the six breadth courses must be University Studies courses with a **USU prefix** (excluding USU 1000, 1010, 1100, and 3330). (CLEP or AP credit may be used.) PHYS 2220 will fulfill the Physical Sciences requirement for students in the Electrical or Computer Engineering major.

Depth Education Requirements

Communications Intensive (CI) (2 courses)

ECE 4840 and 4850 will meet this requirement for students in the Electrical or Computer Engineering major.

Quantitative Intensive (QI) (1 course)

MATH 2250 will meet this requirement for students in the Electrical or Computer Engineering major.

Depth Course Requirements (2 courses)

Select at least one approved 3000-level or above course from each of the following two categories: **Humanities and Creative Arts (DHA)** and **Social Sciences (DSS)**. Students must earn two or three credits in each depth area.

Transfer Students

Transfer students coming to USU with an associate degree from a Utah college or university, or from another institution with which USU has an articulation agreement, will have met the General Education portion of the USU University Studies Requirements, but not necessarily the College of Engineering requirements. Students with transfer credits in University Studies areas will need to have their transfer credit evaluated by the College of Engineering to determine which of the University Studies requirements it will satisfy. In general, transfer students will still need to satisfy the Depth Education portion of University Studies. Also, since not all associate degrees granted by institutions outside of Utah include an American Institutions course (a State of Utah requirement), students may need to complete such a course while at USU.

Electrical Engineering Required Coursework

Lower-Division “Pre-professional” Program

Note: Effective Summer Semester 2006, some course numbers changed, due to House Bill 320 (Common Course Numbering). Course numbers used *prior to* Summer Semester 2006 are shown in parentheses, following *formerly*.

Freshman Year (30 credits)

Fall Semester (15 credits)

Credits

- MATH 1210 (QL)**** Calculus I 4
- CS 1400** Introduction to Computer Science—CS 1 3
(formerly CS 1700)
- ECE 1000**** Introduction to Electrical and Computer Engineering 2
(formerly ECE 1010)
- University Studies Breadth courses 6

Spring Semester (15 credits)

- MATH 1220 (QL)**** Calculus II 4
- CS 1410 (QI)**** Introduction to Computer Science—CS 2 3
(formerly CS 1720)
- PHYS 2210 (QI)**** General Physics—Science and Engineering I 4
- ECE 2700**** Digital Circuits 4
(formerly ECE 2530)

Sophomore Year (33 credits)

Fall Semester (16 credits)

- MATH 2210 (QI)**** Multivariable Calculus 3
- PHYS 2220 (BPS/QI)**** General Physics—
Science and Engineering II 4
- University Studies Breadth courses 9

Spring Semester (17 credits)

- MATH 2250 (QI)**** Linear Algebra and Differential Equations 4
- ECE 2270**** Electrical Circuits 4
(formerly ECE 2410)
- ENGL 2010 (CL2)**** Intermediate Writing: Research Writing in
a Persuasive Mode 3
- Technical Elective course 3
- University Studies Depth Social Sciences (DSS) course 3

**These classes are required for admission to the Professional Engineering Program (PEP). Courses are listed under the semesters in which they best fit.

Professional Program in Electrical Engineering

Upper-Division “Professional” Program

Because of the variations in schedules, it is recommended that students meet with an advisor to work out a schedule for their junior and senior years. The following courses are required for students selecting the **Professional Program in Electrical Engineering**.

Junior Year (31 credits)¹

Fall Semester (16 credits)

Credits

- ECE 3620** Circuits and Signals 3
- ECE 3710** Microcomputer Hardware and Software 4
- ECE 5530** Digital System Design 3
- MATH 5710** Introduction to Probability 3
- Technical Elective course 3

Spring Semester (15 credits)

- ECE 3410** Microelectronics I 4
- ECE 3640** Signals and Systems 3
- ECE 3820 (CI)** Design I 2
- ECE 3870** Electromagnetics I 3
- Math/Science elective course 3

Senior Year (31-32 credits)

Fall Semester (15 credits)

- ECE 4840 (CI)** Design II 3
- PHYS 2710** Introductory Modern Physics 3
- ECE elective courses 9

Spring Semester (16-17 credits)

- ECE 4850 (CI)** Design III 2
- ECE elective courses 12
- University Studies Depth Humanities and
Creative Arts (DHA) course 2-3

¹Some of the junior classes can be delayed until the senior year, but this may limit a student's choice of electives during his or her senior year.

Technical Elective Courses (select 30 or more credits)

Credits

Electrical Engineering Electives (select 21-27 credits) Credits

- ECE 3720 Microcomputer Systems Programming (Sp) 3
- ECE 4650⁴ Optics I (F) 3
- ECE 4680⁴ Optics II (Sp) 3
- ECE 4740 Computer and Data Communications (F) 3

Also, any ECE 5000-level course (including ECE 5930 when topic relates to electrical engineering) may be counted as an Electrical Engineering Elective.

Math and Science Electives (select 3-9 credits)

- MATH 3310 Discrete Mathematics (F,Sp,Su) 3
- MATH 4200 (CI) Foundations of Analysis (F,Sp) 3
- MATH 4310 (CI) Introduction to Algebraic Structures (F,Sp) 3
- MATH 5210 Introduction to Analysis I (F) 3
- MATH 5220 Introduction to Analysis II (Sp) 3
- MATH 5270 Complex Variables (Sp) 3
- MATH 5310 Introduction to Modern Algebra (Sp) 3
- MATH 5340 Theory of Linear Algebra (Sp) 3
- MATH 5420 Partial Differential Equations (Sp) 3
- MATH 5460 Introduction to the Theory and Application of Nonlinear Dynamical Systems (Sp) 3
- MATH 5510 Introduction to Topology (F) 3
- MATH 5610 Computational Linear Algebra and Solution of Systems of Equations (F) 3
- MATH 5620 Numerical Solution of Differential Equations (Sp) 3
- MATH 5720 Introduction to Mathematical Statistics (Sp) 3
- MATH 5760 Stochastic Processes (F) 3
- AP Biology 4
- BIOL 1610 Biology I (F) 4
(formerly BIOL 1210)
- BIOL 2420 Human Physiology (F,Sp,Su) 4
(formerly BIOL 2000)
- BIOL 3300 General Microbiology (F,Sp) 4
- AP Chemistry 8
- CHEM 1210 Principles of Chemistry I (F,Sp) 4
- CHEM 1215 Chemical Principles Laboratory I (F,Sp) 1
(formerly CHEM 1230)
- CHEM 1220 (BPS) Principles of Chemistry II (F,Sp,Su) 4
- CHEM 2310 Organic Chemistry I (F) 4
- CHEM 3700 Introductory Biochemistry (Sp) 3
- CHEM 3710 Introductory Biochemistry Laboratory (Sp) 1
- FRWS 2200 (BLS) Ecology of Our Changing World (F,Sp) 3
- PHYS 3550² Intermediate Classical Mechanics 3
- PHYS 3600 Intermediate Electromagnetism 3
- PHYS 3700³ Thermal Physics 3
- PHYS 3750 Foundations of Wave Phenomena 3
- PHYS 4550 Advanced Classical Mechanics 3
- PHYS 4600 Advanced Electromagnetism 3
- PHYS 4650⁴ Optics I 3
- PHYS 4680⁴ Optics II 3
- PHYS 4700 Quantum Mechanics I 3
- PHYS 4710 Quantum Mechanics II 3

Technical Electives (select 0-6 credits)

- CS 2420 (QI) Algorithms and Data Structures—CS 3 (F,Sp,Su) 3
(formerly CS 2200)
- CS 2450 (CI) Software Engineering (F,Sp) 3
(formerly CS 2370)
- CS 3100 Operating Systems and Concurrency (F,Sp) 3
- CS 2810 Computer Organization and Architecture (F,Sp) 3
(formerly CS 3550)
- CS 4700 Programming Languages (F,Sp) 3
- CS 5000 Theory of Computability (Sp) 3
- CS 5050 Advanced Algorithms (F,Sp) 3
- CS 5100 Graphical User Interfaces and Windows Programming (Sp) 4
- CS 5200 Distributed and Network Programming (F) 4
- CS 5300 Compiler Construction (F) 4
- CS 5370 Advanced Software Engineering (F) 3
- CS 5400 Computer Graphics I (F) 4
- CS 5450 Multimedia Systems (Sp) 4
- CS 5500 Parallel Algorithms (Sp) 3
- CS 5600 AI: Problem Solving and Expert Systems (F) 3

- CS 5650 CVPRIP I: Computer Vision, Pattern Recognition, and Image Processing (F) 3
- CS 5700 Object-Oriented Software Development (F) 3
- CS 5800 Introduction to Database Systems (F) 3
- CS 5850 Systems Analysis (Sp) 3
- CEE 4200 Engineering Economics (F) 2
- ECE 3260 (QI) Science of Sound (F) 3
- ECE 4250 Internship/Co-op (F,Sp,Su) 3
- ENGR 2010² Engineering Mechanics Statics (F,Sp) 2
(formerly ENGR 2000)
- ENGR 2030 Engineering Mechanics Dynamics (F,Sp) 3
(formerly ENGR 2020)
- ENGR 2140 Strength of Materials (F,Sp) 2
(formerly ENGR 2040)
- ENGR 5500 High Performance Computing for Engineers (F) 3
- MAE 2160 Material Science (F,Sp) 3
(formerly MAE 2060)
- MAE 2300³ Thermodynamics I (Sp,Su) 3
(formerly MAE 2400)

²Students cannot receive credit for both Engineering Mechanics and Analytical Mechanics.

³Students cannot receive credit for both Engineering Thermodynamics and Thermal Physics.

⁴Students cannot receive credit for both ECE Optics and PHYS Optics.

Computer Engineering Required Coursework

Lower-Division “Pre-Professional” Program

Note: Effective Summer Semester 2006, some course numbers changed, due to House Bill 320 (Common Course Numbering). Course numbers used *prior to* Summer Semester 2006 are shown in parentheses, following *formerly*.

Freshman Year (30-31 credits)

- Fall Semester (15-16 credits) Credits**
- MATH 1210 (QL)*** Calculus I 4
 - CS 1400*** Introduction to Computer Science—CS 1 3
(formerly CS 1700)
 - CS 1405⁵ Introduction to Computer Science—CS 1 Lab (1)
(formerly CS 1710)
 - ECE 1000*** Introduction to Electrical and Computer Engineering . 2
(formerly ECE 1010)
 - University Studies Breadth courses 6

Spring Semester (15 credits)

- MATH 1220 (QL)*** Calculus II 4
- CS 1410 (QI)*** Introduction to Computer Science—CS 2 3
(formerly CS 1720)
- PHYS 2210 (QI)*** General Physics—
Science and Engineering I 4
- ECE 2700*** Digital Circuits 4
(formerly ECE 2530)

Sophomore Year (34-35 credits)

- Fall Semester (17 credits)**
- ENGL 2010 (CL2)*** Intermediate Writing: Research Writing in a Persuasive Mode 3
 - CS 2420 (QI)*** Algorithms and Data Structures—CS 3 3
(formerly CS 2200)
 - MATH 2250 (QI)*** Linear Algebra and Differential Equations 4
 - PHYS 2220 (BPS/QI)*** General Physics—
Science and Engineering II 4
 - University Studies Breadth course 3

Spring Semester (17-18 credits)	Credits
<input type="checkbox"/> MATH 3310 Discrete Mathematics	3
<input type="checkbox"/> ECE 2270*** Electrical Circuits	4
(formerly ECE 2410)	
<input type="checkbox"/> CS 2450 (CI) Software Engineering	3
(formerly CS 2370)	
<input type="checkbox"/> Technical Elective course	4-5
<input type="checkbox"/> University Studies Breadth course	3

⁵Students desiring a Computer Science minor must take CS 1405 as a freshman. The rest of the minor is built into the curriculum. This lab is *not required* for the Computer Engineering major.

***These classes are required for admission to the Professional Engineering Program (PEP). Courses are listed under the semesters in which they best fit.

Professional Program in Computer Engineering

Upper-Division “Professional” Program

Because of the variation in schedules, it is recommended that students meet with an advisor to work out a schedule for their junior and senior years. The following courses are required for students selecting the **Professional Program in Computer Engineering**.

Junior Year (31 credits)⁶

Fall Semester (16 credits)	Credits
<input type="checkbox"/> CS 3100 Operating Systems and Concurrency	3
<input type="checkbox"/> ECE 3620 Circuits and Signals	3
<input type="checkbox"/> ECE 3710 Microcomputer Hardware and Software	4
<input type="checkbox"/> ECE 5530 Digital System Design	3
<input type="checkbox"/> University Studies Breadth course	3
Spring Semester (15 credits)	
<input type="checkbox"/> ECE 3410 Microelectronics I	4
<input type="checkbox"/> ECE 3640 Signals and Systems	3
<input type="checkbox"/> ECE 3720 Microcomputer Systems Programming	3
<input type="checkbox"/> ECE 3820 (CI) Design I	2
<input type="checkbox"/> MATH 5710 Introduction to Probability	3

Senior Year (30-31 credits)

Fall Semester (15-16 credits)	
<input type="checkbox"/> ECE 4740 Computer and Data Communications	3
<input type="checkbox"/> ECE 4840 (CI) Design II	3
<input type="checkbox"/> Computer Science elective course	4
<input type="checkbox"/> Computer Engineering elective course	3
<input type="checkbox"/> University Studies Depth Humanities and Creative Arts (DHA) course	2-3
Spring Semester (15 credits)	
<input type="checkbox"/> ECE 4850 (CI) Design III	2
<input type="checkbox"/> High-Level Technical Elective courses	7
<input type="checkbox"/> Math/Science elective course	3
<input type="checkbox"/> University Studies Depth Social Sciences (DSS) course	3

⁶Some of the junior classes can be delayed until the senior year, but this may limit a student’s choice of electives during his or her senior year.

High-Level Technical Elective Courses (select 14-19 credits)

Students must complete a total of *at least* 14 credits within high-level technical electives. Courses listed on this sheet as Computer Engineering Electives or Computer Science Electives may be used to fulfill this requirement. Also, courses having an ECE or CS prefix, which are numbered at the 5000 level, may be used as high-level technical electives.

Technical Elective Courses (select 23 or more credits)

Computer Engineering Electives (select 3-16 credits)	Credits
<input type="checkbox"/> ECE 5320 Mechatronics (Sp)	4
<input type="checkbox"/> ECE 5640 Real-Time Processors (Sp)	4
<input type="checkbox"/> ECE 5740 Concurrent Programming (F)	3
<input type="checkbox"/> ECE 5750 High-Performance Microprocessor Architecture (Sp)	3
<input type="checkbox"/> ECE 5770 Microcomputer Interfacing (Sp)	4
<input type="checkbox"/> ECE 5780 Real-Time Systems (F)	4

Computer Science Electives (select 4-13 credits)	Credits
<input type="checkbox"/> CS 5100 Graphical User Interfaces and Windows Programming (Sp)	4
<input type="checkbox"/> CS 5200 Distributed and Network Programming (F)	4
<input type="checkbox"/> CS 5400 Computer Graphics I (F)	4

Math and Science Electives (select 3-9 credits)

<input type="checkbox"/> MATH 2210 (QI) Multivariable Calculus (F,Sp,Su)	3
<input type="checkbox"/> MATH 4200 (CI) Foundations of Analysis (F,Sp)	3
<input type="checkbox"/> MATH 4310 (CI) Introduction to Algebraic Structures (F,Sp)	3
<input type="checkbox"/> MATH 5210 Introduction to Analysis I (F)	3
<input type="checkbox"/> MATH 5220 Introduction to Analysis II (Sp)	3
<input type="checkbox"/> MATH 5270 Complex Variables (Sp)	3
<input type="checkbox"/> MATH 5310 Introduction to Modern Algebra (Sp)	3
<input type="checkbox"/> MATH 5340 Theory of Linear Algebra (Sp)	3
<input type="checkbox"/> MATH 5420 Partial Differential Equations (Sp)	3
<input type="checkbox"/> MATH 5460 Introduction to the Theory and Application of Nonlinear Dynamical Systems (Sp)	3
<input type="checkbox"/> MATH 5510 Introduction to Topology (F)	3
<input type="checkbox"/> MATH 5610 Computational Linear Algebra and Solution of Systems of Equations (F)	3
<input type="checkbox"/> MATH 5620 Numerical Solution of Differential Equations (Sp)	3
<input type="checkbox"/> MATH 5720 Introduction to Mathematical Statistics (Sp)	3
<input type="checkbox"/> MATH 5760 Stochastic Processes (F)	3
<input type="checkbox"/> AP Biology	4
<input type="checkbox"/> BIOL 1610 Biology I (F)	4
(formerly BIOL 1210)	
<input type="checkbox"/> BIOL 2420 Human Physiology (F,Sp,Su)	4
(formerly BIOL 2000)	
<input type="checkbox"/> BIOL 3300 General Microbiology (F,Sp)	4
<input type="checkbox"/> AP Chemistry	8
<input type="checkbox"/> CHEM 1210 Principles of Chemistry I (F,Sp)	4
<input type="checkbox"/> CHEM 1215 Chemical Principles Laboratory I (F,Sp)	1
(formerly CHEM 1230)	
<input type="checkbox"/> CHEM 1220 (BPS) Principles of Chemistry II (F,Sp,Su)	4
<input type="checkbox"/> CHEM 2310 Organic Chemistry I (F)	4
<input type="checkbox"/> CHEM 3700 Introductory Biochemistry (Sp)	3
<input type="checkbox"/> CHEM 3710 Introductory Biochemistry Laboratory (Sp)	1
<input type="checkbox"/> FRWS 2200 (BLS) Ecology of Our Changing World (F,Sp)	3
<input type="checkbox"/> PHYS 2710 Introductory Modern Physics	3
<input type="checkbox"/> PHYS 3550 ⁷ Intermediate Classical Mechanics	3
<input type="checkbox"/> PHYS 3600 Intermediate Electromagnetism	3
<input type="checkbox"/> PHYS 3700 ⁸ Thermal Physics	3
<input type="checkbox"/> PHYS 3750 Foundations of Wave Phenomena	3
<input type="checkbox"/> PHYS 4550 Advanced Classical Mechanics	3
<input type="checkbox"/> PHYS 4600 Advanced Electromagnetism	3
<input type="checkbox"/> PHYS 4650 ⁹ Optics I	3
<input type="checkbox"/> PHYS 4680 ⁹ Optics II	3
<input type="checkbox"/> PHYS 4700 Quantum Mechanics I	3
<input type="checkbox"/> PHYS 4710 Quantum Mechanics II	3

Technical Electives (select 0-7 credits)

<input type="checkbox"/> CS 2810 Computer Organization and Architecture (F,Sp)	3
(formerly CS 3550)	
<input type="checkbox"/> CS 4700 Programming Languages (F,Sp)	3
<input type="checkbox"/> CEE 4200 Engineering Economics (F)	2
<input type="checkbox"/> ECE 4250 Internship/Co-op (F,Sp,Su)	3
<input type="checkbox"/> ENGR 2010 Engineering Mechanics Statics (F,Sp)	2
(formerly ENGR 2000)	
<input type="checkbox"/> ENGR 2030 Engineering Mechanics Dynamics (F,Sp)	3
(formerly ENGR 2020)	
<input type="checkbox"/> ENGR 2140 Strength of Materials (F,Sp)	2
(formerly ENGR 2040)	
<input type="checkbox"/> MAE 2160 Material Science (F,Sp)	3
(formerly MAE 2060)	
<input type="checkbox"/> MAE 2300 Thermodynamics I (Sp,Su)	3
(formerly MAE 2400)	
<input type="checkbox"/> ENGR 5500 High Performance Computing for Engineers (F)	3

Any upper-division (3000, 4000, or 5000 level) ECE class not required by the major may also be used as a Technical Elective course. However, specific courses must be approved in writing before the student registers for the course.

⁷Students cannot receive credit for both Engineering Mechanics *and* Physics Mechanics.

⁸Students cannot receive credit for both Engineering Thermodynamics *and* Physics Thermodynamics.

⁹Students cannot receive credit for both ECE Optics *and* PHYS Optics.

Minors

Students should have all minors approved by the minor department. Minors may be filled by using the Technical Electives credits for courses in the chosen minor area. All courses required for the minors must be completed with grades of C- or better.

Mathematics Minor: Required courses include MATH 1210, 1220, 2210, 2270, 2280, and two additional courses (6 credits) numbered above 4000, excluding MATH 4300, 4400, 4500, 4620, 5570, and 5580. MATH 2250 may substitute for MATH 2270 and 2280.

Physics Minor: PHYS 2210 and 2220 (8 credits), plus 10 credits selected from courses in Physics numbered 2710 or above.

Computer Science Minor: A minimum of 16 credits (with a cumulative GPA of 2.5 or higher and a C- or better in each class) is required. Students must complete CS 1400, 1405, 1410, 2420, and two additional computer science classes. One of the two classes must be numbered at the 3000 level or above. Students should contact the Computer Science Department for information about classes that may not be used toward the Computer Science Minor.

Other minors should be approved by the minor department.

Electrical and Computer Engineering Mentors

The following list of faculty interests is provided to help students select the appropriate faculty member to contact for career and elective selection counseling.

D. J. Baker, electronics, space, electromagnetics

R. Baktur, electromagnetics

T. Bose, signal processing, communications

S. E. Budge, image processing, signal processing

Y. Chen, controls, robotics

A. Dasu, computer engineering

B. Eames, software engineering

J. H. Gunther, digital communication, signal processing

H. S. Hinton, optics

P. Israelsen, computer engineering

R. J. Jost, electromagnetics, remote sensing, electronics

T. K. Moon, digital communication, information theory, signal processing

L. S. Powers, biophysics, instrumentation

W. Ren, controls

A. W. Shaw, digital design, VLSI

K. Shenai, VLSI, solid state electronics

E. Spencer, space systems

G. S. Stiles, computer architecture, parallel processing

C. M. Swenson, space systems

R. Thurgood, computer engineering

P. A. Wheeler, microprocessor design, digital design

C. Winstead, analog VLSI, information theory

Requirement Changes

Graduation requirements shown on this sheet are subject to change. Students should check with their assigned advisor concerning possible changes.

Materials for Persons with Disabilities

This requirement sheet is available in large print, audio, and braille format upon request to the USU Disability Resource Center.

For information contact

Electrical and Computer Engineering Department;

Engineering Laboratory 149; Utah State University; 4120 Old Main Hill;

Logan UT 84322-4120; tel. (435) 797-2840; e-mail info@ece.usu.edu;

<http://www.ece.usu.edu>

Prepared by University Advising and Transfer Services, Utah State University