# Electrical Engineering, BS

Natural Sciences, Mathematics, and Engineering (nsme) (https://catalog.csusb.edu/general-information/ csusb-information/school-natural-sciences-mathematics-engineering/)

Department of Computer and Electrical Engineering and Computer Science (https://catalog.csusb.edu/general-information/ csusb-information/school-natural-sciences-mathematics-engineering/ department-computer-electrical-engineering-computer-science/)

Department Chair: Saeed Jafarzadeh

Office: Science Building III, 317
Phone: (661) 654-3082
Email: ceeecs@cs.csusb.edu
www.cs.csusb.edu (http://www.cs.csusb.edu)

Program Maps for Natural Sciences, Mathematics, and Engineering (https://programmap.csusb.edu/academics/interest-clusters/4e942a6e-b8e4-4b60-a1ae-334235acc581/)

### Program Description

The Electrical Engineering (B.S.) program is accredited by the Engineering Accreditation Commission of ABET, https://www.abet.org [abet.org] /, under the General Criteria and the Program Criteria for Electrical, Computer, Communications, Telecommunication(s) and Similarly Named Engineering Programs.

Electrical Engineering is a large and expanding field which is concerned with the following fundamental areas: digital signal processing, semiconductor electronics, microprocessors and embedded systems, VLSI design, cyber-physical systems, data communications, energy systems and power electronics, transmission and distribution, RF and microwave, robotics and control system design, electromechanics and mechatronics, computer networks, digital design, image processing, computer vision. If computer science can be regarded to be on the information processing side of computer engineering, then electrical engineering can be regarded to be on the side which builds upon the fundamental physical properties of electricity and magnetism. Electrical engineers often work with other engineers, physical scientists, and computer scientists.

The Computer and Electrical Engineering and Computer Science Department moved into a new building in Fall 2008. The department administers its own local area network which includes multiple Unix/Linux servers, two software programming labs, a walk in lab/tutoring center, one advanced workstation lab, an isolated network lab, an AI/visualization lab, a DSP/communications lab, one digital electronics hardware lab, a power systems/electronics lab, and a robotics/control systems lab. There is also a department library/major study room with computers available to students.

An important goal of the department is to enable students to work much more closely with faculty than they would be able to at larger universities.

A detailed description of student learning goals and objectives can be found at https://www.cs.csusb.edu/abet/.

### Program Requirements

#### General Education Requirements

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>ECE/ENGR 1618</td>
<td>Introduction to Engineering I</td>
<td>2</td>
</tr>
<tr>
<td>ECE/ENGR 1628</td>
<td>Introduction to Engineering II</td>
<td>2</td>
</tr>
<tr>
<td>ENGR/ECE/PHYS</td>
<td>Electric Circuits</td>
<td>4</td>
</tr>
<tr>
<td>CMPS 2010</td>
<td>Programming I: Programming Fundamentals</td>
<td>4</td>
</tr>
<tr>
<td>CMPS 3040</td>
<td>Signals and Systems</td>
<td>4</td>
</tr>
<tr>
<td>CMPS 3070</td>
<td>Analog Circuits</td>
<td>4</td>
</tr>
<tr>
<td>CMPS 3200</td>
<td>Digital Circuits</td>
<td>4</td>
</tr>
<tr>
<td>CMPS 3230</td>
<td>Digital Communications</td>
<td>4</td>
</tr>
<tr>
<td>CMPS 3320</td>
<td>Fields and Waves</td>
<td>4</td>
</tr>
<tr>
<td>CMPS 3370</td>
<td>Power Systems Fundamentals</td>
<td>4</td>
</tr>
<tr>
<td>CMPS 3340</td>
<td>Control Systems</td>
<td>4</td>
</tr>
<tr>
<td>ECE 4910</td>
<td>Senior Project I</td>
<td>2</td>
</tr>
<tr>
<td>ECE 4928</td>
<td>Senior Project II</td>
<td>2</td>
</tr>
</tbody>
</table>

#### Upper Division Elective Courses OR Emphasis Courses

Students with a declared emphasis must complete the upper division elective courses required for the emphasis (14 units see below). Students without a declared emphasis (Traditional students) must select 12 units of upper division elective courses.

Select 12 or 14 units of the following:

**Digital Design and Embedded Systems:**
- ECE 3220 Digital Design with VHDL
- ECE 3250 Embedded Systems
- ECE 4240 Microprocessor System Design

**Digital Communication and Digital Signal Processing:**
- ECE 3280 Instrumentation, Control, and Data Acquisition
- ECE 4570 Robotics

**CMPS/ECE 4550** Applied Machine Learning

**Power Systems and Power Electronics:**
ECE 4370  Power Systems Analysis
ECE 4380  Power System Operation with Renewable Energy Resources
& ECE 4381  Power System Operation with Renewable Energy Resources Laboratory

Image Processing and Computer Vision:
ECE 4460  Image Processing
ECE 4470  Computer Vision

Special Topics and Independent Study:
ECE 3770  Special Topics in Engineering
ECE 3771  Special Topics Laboratory
ECE 4770  Special Topics in Engineering
ECE 4771  Special Topics Laboratory
ECE 4800  Undergraduate Research
ECE 4860  Internship
ECE 4870  Cooperative Education
ECE 4890  Experiential Prior Learning

Required Cognate Courses
MATH 2510  Single Variable Calculus I
or MATH 2310  Single Variable Calculus I for Engineers
4

MATH 2520  Single Variable Calculus II
or MATH 2320  Single Variable Calculus II for Engineers
4

Select one of the following:
MATH 2530
MATH 2533  Multivariable and Vector Calculus
MATH 2330  Multivariable and Vector Calculus for Engineers
MATH 2531  Multivariable Calculus
& MATH 2532  and Vector Calculus
MATH 2610  Linear Algebra I
4
MATH 3200  Probability Theory
4
CHEM 1000  Foundations of Chemistry
3
PHYS 2210  Physics for Scientists and Engineers I
4
PHYS 2220  Physics for Scientists and Engineers II
4
PHIL 3318  Professional Ethics
3

Major Subtotal 86-88

Additional Units Needed Towards Graduation 6 2-6

Total Units 112-118

1 At least one course must be at the 4000-level
2 Students must take both ECE 4380 Power System Operation with Renewable Energy Resources and ECE 4381 Power System Operation with Renewable Energy Resources Laboratory to receive elective credit for the Electrical Engineering degree.
3 Only a combined total of 4 units of ECE 377x, 477x, 48xx may be used for elective credit.
4 Some of the courses required for the Electrical Engineering major also satisfy General Education requirements. Students who complete each of these courses with the appropriate grade will also satisfy the GE requirement, even if they were to change majors:
   • ECE 1618 Introduction to Engineering I/ENGR 1618 Introduction to Engineering I and ECE 1628 Introduction to Engineering II/ENGR 1628 Introduction to Engineering II satisfy the First-Year Seminar requirement.
   • ECE 4928 Senior Project II satisfies the Capstone requirement.
   • PHIL 3318 Professional Ethics satisfies UD Thematic Area C and the Electrical Engineering Ethics requirement.
   • PHYS 2210 Physics for Scientists and Engineers I satisfies LD Area B1.
   • MATH 2510 Single Variable Calculus I or MATH 2310 Single Variable Calculus I for Engineers with a grade of C- or better satisfies Foundational Skills B4
   • PHIL 3318 Professional Ethics satisfies GWAR

Electrical Engineering majors have the following General Education Modifications (GEMs), which means they do not have to take courses to satisfy these GE requirements. These GEMs are specific to the three engineering majors (Computer Engineering, Electrical Engineering and Engineering Sciences). Students who change to another major will not keep the modifications:
• Foundational Skill A3 is embedded in PHYS 2210 Physics for Scientists and Engineers I, PHYS 2220 Physics for Scientists and Engineers II[B1] and ECE 2070 Electric Circuits/ENGR 2070 Electric Circuits/PHYS 2070 Electric Circuits[A3].
• LD Area B2 is embedded throughout the curriculum.
• 3 units of LD Area D is met through EAC/ABET outcomes 2 and 4.
• UD Thematic Area A is met through EAC/ABET outcomes 2 and 4.

5 The SELF requirement can be met by selecting another General Education course with a SELF overlay or by taking a stand-alone course. The GWAR may be satisfied by taking the GWAR exam, by taking another General Education course with a GWAR overlay, or by taking a stand-alone course. If a student opts to take a stand-alone course for either or both of these requirements, the course(s) will add additional units to that student's general education pathway.

6 Additional Units are required to meet the 120-unit requirement for graduation. Any accepted university units may be used to meet this requirement, including stand-alone courses for SELF.

SB1440 units required – 58-60 units

1 Units required for graduation after completion of the Engineering (Electrical Engineering focus) model curriculum and lower-division general education at a California community college.

Note: One (1) semester unit of credit normally represents one hour of in-class work and 2-3 hours of outside study per week.