

# ELECTRICAL ENGINEERING, BS

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

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

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Program Maps for Natural Sciences, Mathematics, and Engineering (<https://programmmap.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] ([https://urldefense.com/v3/\\_https://www.abet.org\\_/!!LNEL6vXnN3x8o9c!loKhoaJJBANZtSCfQzMuPruH8X9\\_esnkGaNvJBPrxHQiHcCIPp0LdsnWV\\_LPaeZWs93n4UyW0eF\\_A](https://urldefense.com/v3/_https://www.abet.org_/!!LNEL6vXnN3x8o9c!loKhoaJJBANZtSCfQzMuPruH8X9_esnkGaNvJBPrxHQiHcCIPp0LdsnWV_LPaeZWs93n4UyW0eF_A)), 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

Code	Title	Units
<b>General Education Requirements</b>		
First-Year Seminar (FYS) <sup>4</sup>		0
Lower Division Area A: Foundational Skills <sup>4</sup>		6
Lower Division Area B: Natural Sciences <sup>4</sup>		0
Lower Division Area C: Arts and Humanities		6
Lower Division Area D: Social and Behavioral Sciences <sup>4</sup>		0
Lower Division Area E: Student Enrichment and Lifelong Learning (SELF) <sup>5</sup>		0
Lower Division Area F: Ethnic Studies		3
American Institutions: Government and History		6
Junior Year Diversity & Reflection (JYDR)		3
Graduation Writing Assessment Requirement (GWAR) <sup>4</sup>		0
Upper Division Thematic Area C and D <sup>4</sup>		0
General Education Capstone <sup>4</sup>		0
<i>General Education Subtotal</i> <sup>4</sup>		24
<b>Major Requirements</b>		
<i>Lower Division</i>		
ECE/ENGR 1618	Introduction to Engineering I	2
ECE/ENGR 1628	Introduction to Engineering II	2
ENGR/ECE/PHYS 2070	Electric Circuits	4
CMPS 2010	Programming I: Programming Fundamentals	4
<i>Upper Division</i>		
ECE 3040	Signals and Systems	4
ECE 3070	Analog Circuits	4
ECE 3200	Digital Circuits	4
ECE 3230	Digital Communications	4
ECE 3320	Fields and Waves	4
ECE 3370	Power Systems Fundamentals	4
ECE 3340	Control Systems	4
ECE 4910	Senior Project I	2
ECE 4928	Senior Project II	2
<i>Upper Division Elective courses OR Emphasis courses</i>		
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. <sup>1</sup>		
Select 12 or 14 units of the following:		12-14
<b>Digital Design and Embedded Systems:</b>		
ECE 3220	Digital Design with VHDL	
ECE 3250	Embedded Systems	
ECE 4240	Microprocessor System Design	
<b>Digital Communication and Digital Signal Processing:</b>		
ECE 3280	Instrumentation, Control, and Data Acquisition	
ECE 4570	Robotics	
CMPS/ECE 4550	Applied Machine Learning	
<b>Power Systems and Power Electronics:</b>		

ECE 4370	Power Systems Analysis	
ECE 4380 & ECE 4381	Power System Operation with Renewable Energy Resources and Power System Operation with Renewable Energy Resources Laboratory <sup>2</sup>	
Image Processing and Computer Vision:		
ECE 4460	Image Processing	
ECE 4470	Computer Vision	
Special Topics and Independent Study: <sup>3</sup>		
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	
<i>Required Cognate Courses</i>		
MATH 2510	Single Variable Calculus I	4
	or MATH 2310 Single Variable Calculus I for Engineers	
MATH 2520	Single Variable Calculus II	4
	or MATH 2320 Single Variable Calculus II for Engineers	
Select one of the following:		
MATH 2530		
MATH 2533	Multivariable and Vector Calculus	
MATH 2330	Multivariable and Vector Calculus for Engineers	
MATH 2531 & MATH 2532	Multivariable Calculus 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
<i>Major Subtotal</i>		<i>86-88</i>
<b>Additional Units Needed Towards Graduation<sup>6</sup></b>		<b>2-6</b>
<b>Total Units</b>		<b>112-118</b>

<sup>1</sup> At least one course must be at the 4000-level

<sup>2</sup> 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.

<sup>3</sup> Only a combined total of 4 units of ECE 377x, 477x, 48xx may be used for elective credit.

<sup>4</sup> 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 D is met through EAC/ABET outcomes 2 and 4

<sup>5</sup> 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.

<sup>6</sup> 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<sup>1</sup>

<sup>1</sup> 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.