ELECTRICAL ENGINEERING, BACHELOR OF SCIENCE

College of Engineering

The Electrical & Computer Engineering Undergraduate Programs

The department administers two undergraduate curricula in the College of Engineering: (1) the Electrical Engineering curriculum and (2) the Computer Engineering curriculum.

Integrated Degree Program (IDP)

The IDP leads to both the Bachelor of Science and the Master of Science degrees. The program provides a student the opportunity to obtain superior breadth and depth of technical material. The IDP program in the Department of Electrical & Computer Engineering is available only to UC Davis undergraduates with strong academic records enrolled in Electrical Engineering, Computer Engineering, Electronic Materials Engineering, or Applied Physics curricula. Applicants in their junior year must apply for the IDP indicated date on our website. For more information on IDP, see Electrical & Computer Engineering (http://www.ece.ucdavis.edu).

Mission

Under its land grant status, the University of California has a mission to provide the state with the trained workforce it needs and to advance knowledge and research in directions that contribute to the general welfare of the state and the nation. The Department of Electrical & Computer Engineering contributes to the mission of the University in three ways. First, its undergraduate and graduate education programs seek to provide students with an understanding of the fundamental principles of electrical and computer engineering, the skills needed to solve the complex technological problems of modern society and the ability to continue to learn and develop throughout their careers. Second, through its research programs, the department contributes to the development and progress of electronics, communications, and computer technology. Finally, the department helps to transfer research results to industry through publication, public service and professional activities.

Objectives

Teaching—To provide undergraduate students with sufficient breadth to allow them to participate in teams, continue their own education after graduation, and select a focus area intelligently; to provide undergraduate students with sufficient depth in a narrower discipline to allow them to develop the ability to solve complex engineering problems; to educate the students in the graduate program to be leaders in industry or to do meaningful research in industry, government or academia.
Research—To develop and maintain research programs that produce useful technological advances while simultaneously training the next generation of researchers and leaders; to update and/or shift the foci of these programs frequently in response to the needs of our constituency and the nation; to provide a stimulating environment that encourages our graduate students to develop their abilities as far as possible.

Electrical Engineering Undergraduate Program

The Electrical Engineering Bachelor of Science is accredited by the Engineering Accreditation Commission of ABET (http://www.abet.org) under the commission's General Criteria and Program Criteria for Electrical, Computer, Communications, Telecommunication(s), and Similarly Named Engineering Programs.

Electrical engineering involves the design, analysis, and effective use of electrical systems including electronic computers. Electrical systems and computers play a central role in nearly all aspects of modern life, including communication, medicine, education, environmental protection, space exploration, defense, and home entertainment.

Students who complete the Electrical Engineering curriculum will obtain a Bachelor of Science in Electrical Engineering, one of the engineering degrees recognized in all fifty states as eligible for registration as a Professional Engineer.

Objectives

The Electrical & Computer Engineering program educational objectives have been developed to address the needs of our constituencies. The objectives of the Electrical & Computer Engineering programs are as follow:

- Graduates create value for their employers, demonstrating knowledge and initiative and making beneficial contributions beyond the workplace. This can also result in patents, awards, publications and presentations.
- Graduates grow their capabilities through advanced education and professional development.
- Graduates provide leadership and be proactive in their profession and/or communities.

Students are encouraged to adhere carefully to all prerequisite requirements. The instructor is authorized to drop students from a course for which stated prerequisites have not been completed.

The major requirements below are in addition to meeting University Degree Requirements (https://catalog.ucdavis.edu/undergraduate-education/university-degree-requirements/) & College Degree Requirements (https://catalog.ucdavis.edu/undergraduate-education/college-degree-requirements/); unless otherwise noted. The minimum number of units required for the Electrical Engineering Bachelor of Science is 147.

Requirements

Code	Title	Units
Lower Division Required Courses		
CMN 001	Introduction to Public Speaking	4
or CMN 001V	Introduction to Public Speaking	
or ENG 003	Introduction to Engineering Design	
or ENG 003Y	Introduction to Engineering Design	
Mathematics		
MAT 021A	Calculus	4
MAT 021B	Calculus	4
MAT 021C	Calculus	4
MAT 021D	Vector Analysis	4
MAT 022A	Linear Algebra	3
MAT 022B	Differential Equations	3
Physics		
PHY 009A	Classical Physics	5
PHY 009B	Classical Physics	5

PHY 009C	Classical Physics	5
PHY 009D	Modern Physics	4
Chemistry		
CHE 002A	General Chemistry	5
Engineering		
ENG 006	Engineering Problem Solving	4
ENG 017	Circuits I	4
or ENG 017V	Circuits I	
Electrical & Computer Engineering		
EEC 001	Introduction to Electrical & Computer Engineering [1]	2
EEC 007	Introduction to Programming & Microcontrollers	4
EEC 010	Introduction to Digital & Analog Systems [2]	4
EEC 018	Digital Systems I	5
Lower Division Composition/Writing; choose one; a grade of a C- or better is required:		4
COM 001	Major Works of the Ancient World	
COM 002	Major Works of the Medieval & Early Modern World	
COM 003	Major Works of the Modern World	
COM 004	Major Works of the Contemporary World	
ENL 003	Introduction to Literature	
or ENL 003V	Introduction to Literature	
NAS 005	Introduction to Native American Literature	
or NAS 005V	Introduction to Native American Literature	
UWP 001	Introduction to Academic Literacies (Recommended)	
or UWP 001V	Introduction to Academic Literacies: Online	
or UWP 001Y	Introduction to Academic Literacies	
Lower Division Required Courses Subtotal		77
Upper Division Required Courses		
Electrical & Computer Engineering		
Take all courses, below:		26
EEC 100	Circuits II	
EEC 110A	Electronic Circuits I	
EEC 130A	Electromagnetics I	
EEC 140A	Principles of Device Physics I	
or EEC 140AV	Principles of Device Physics I	
EEC 150	Introduction to Signals & Systems	
EEC 161	Applied Probability for Electrical & Computer Engineers	
EEC 196	Issues in Engineering Design	
Choose one:		3
ENG 160/ PHY 160 DISCONTINUED FOR WINTER 2026 (DISCONTINUED FOR WINTER 2026) **	Environmental Physics & Society	
ENG 190	Professional Responsibilities of Engineers	
Upper Division Electives		
Choose at least eight courses for a minimum of 32 units:		32
After completion of the upper division elective requirement (at least 8 courses, 2 core, 2 with labs, 1 project) any units in excess of 32 will count toward the Technical Elective requirement.		
Two Core Electives (p. 2)		
Design Laboratory Electives (p. 3)		

Technical Electives		
Choose 9 units (p. 3)		9
Upper Division Composition Requirement		
Choose one; a grade of C- or better is required:		0-4
UWP 101	Advanced Composition	
or UWP 101V	Advanced Composition	
or UWP 101Y	Advanced Composition	
UWP 102A	Writing in the Disciplines: Special Topics	
UWP 102B	Writing in the Disciplines: Biology	
UWP 102C	Writing in the Disciplines: History	
UWP 102D	Writing in the Disciplines: International Relations	
UWP 102E	Writing in the Disciplines: Engineering	
UWP 102F	Writing in the Disciplines: Food Science & Technology	
UWP 102G	Writing in the Disciplines: Environmental Writing	
UWP 102H	Writing in the Disciplines: Human Development & Psychology	
UWP 102I	Writing in the Disciplines: Ethnic Studies	
UWP 102J	Writing in the Disciplines: Fine Arts	
UWP 102K	Writing in the Disciplines: Sociology	
UWP 102L	Writing in the Disciplines: Film Studies	
UWP 104A	Writing in the Professions: Business Writing	
or UWP 104AV	Writing in the Professions: Business Writing	
or UWP 104AY	Writing in the Professions: Business Writing	
UWP 104B	Writing in the Professions: Law	
UWP 104C	Writing in the Professions: Journalism	
UWP 104D	Writing in the Professions: Elementary & Secondary Education	
UWP 104E	Writing in the Professions: Science	
UWP 104F	Writing in the Professions: Health	
or UWP 104FV	Writing in the Professions: Health	
or UWP 104FY	Writing in the Professions: Health	
UWP 104I	Writing in the Professions: Internships	
UWP 104J	Writing in the Professions: Writing for Social Justice	
UWP 104T	Writing in the Professions: Technical Writing	
Passing the Upper Division Composition Exam.		
Upper Division Required Courses Subtotal		70-74
Total Units		**147-151**

Two Core Electives

Code	Title	Units
A maximum of one course appearing on both the Core Elective list and the Design Laboratory Elective list may be counted in both categories.		
EEC 110B	Electronic Circuits II	4
EEC 130B	Introductory Electromagnetics II	4
EEC 140B	Principles of Device Physics II	4
EEC 180	Digital Systems II	5
Only one of the following may be used:		4

EEC 151	Digital Signals & Systems	
EEC 157A	Control Systems	
or EEC 157AV	Control Systems	

Design Electives with Laboratory

Code	Title	Units

A maximum of one course appearing on both the Core Elective list and the Design Electives with Laboratory list may be counted in both categories.

Choose at least two Design Electives with Laboratory:		
EEC 110B	Electronic Circuits II	4
EEC 112	Communication Electronics	4
EEC 113	Power Electronic Circuits	4
EEC 116	VLSI Design	4
EEC 118	Digital Integrated Circuits	4
EEC 132A	RF & Microwaves in Wireless Communication	5
EEC 132B	RF & Microwaves in Wireless Communication	5
EEC 132C	RF & Microwaves in Wireless Communications	5
EEC 133	Electromagnetic Radiation & Antenna Analysis	4
EEC 135	Optoelectronics for High-Speed Data Networking & Computing Systems	4
EEC 140B	Principles of Device Physics II	4
EEC 145	Electronic Materials	4
EEC 146A	Integrated Circuits Fabrication	4
EEC 146B	Advanced Integrated Circuits Fabrication	3
EEC 157A	Control Systems	4
or EEC 157AV	Control Systems	
EEC 157B	Control Systems II	4
or EEC 157BY	Control Systems II	
EEC 160	Signal Analysis & Communications	4
EEC 165	Statistical & Digital Communication	4
EEC 170	Introduction to Computer Architecture	4
EEC 172	Embedded Systems	4
EEC 179	Applied Machine Learning for Electrical & Computer Engineers	4
EEC 180	Digital Systems II	5

Choose at least one Senior Design Project course:		

All Senior Design Project courses are also considered Design Electives with Laboratory may be counted in both categories simultaneously. Both A & B need to be taken to receive credit for the Senior Design Project.

EEC 119A	Integrated Circuit Design Project	3
EEC 119B	Integrated Circuit Design Project	3
EEC 134A	RF/Microwave Systems Design	3
EEC 134B	RF/Microwave Systems Design	3
EEC 136A	Electronic Design Project	3
EEC 136B	Electronic Design Project	3
EEC 174AY	Applied Machine Learning	3
EEC 174BY	Applied Machine Learning Senior Design Projects	3

EEC 175A	Internet of Things	3
EEC 175B	Internet of Things Senior Design Project	3
EEC 181A	Digital Systems Design Project	3
EEC 181B	Digital Systems Design Project	3
EEC 193A	Senior Design Project	3
EEC 193B	Senior Design Project	3
EEC 195A	Autonomous Vehicle Design Project	3
EEC 195B	Autonomous Vehicle Design Project	3

The remaining electives may be any letter-graded upper division Electrical & Computer Engineering course not used to satisfy another major requirement or the following ECS courses:

ECS 036B	Software Development & Object-Oriented Programming in C++	4
ECS 150	Operating Systems & System Programming	4
ECS 152B	Computer Networks	4
ECS 163	Information Visualization	4
ECS 175	Computer Graphics	4
ECS 177	Scientific Visualization	4
ECS 178	Geometric Modeling	4

Technical Electives

Code	Title	Units

After completion of the upper division elective requirement (at least 8 courses, 2 core, 2 with labs, 1 project) any units in excess of 32 will count toward the technical elective requirement.

CHE 002B	General Chemistry [3]	5
ENG 035	Statics [4]	4

A maximum of 6 units for any combination of engineering courses numbered 190C, 192, 198, and 199 may be used.

Mathematics
Any upper division course. [5]		

Physics
Any upper division course. [6]		

Statistics
Any upper division course. [7]		

Biological Sciences
BIS 101	Genes & Gene Expression	4
or BIS 101V	Genes & Gene Expression	
BIS 101D	Genes & Gene Expression Discussion	1
BIS 102	Structure & Function of Biomolecules	3
BIS 103	Bioenergetics & Metabolism	3
BIS 104	Cell Biology	3
BIS 122	Population Biology & Ecology	3
BIS 122P	Population Biology & Ecology/Advanced Laboratory Topics	5

Economics
ECN 100A	Intermediate Micro Theory: Consumer & Producer Theory	4
or ECN 100AV	Intermediate Micro Theory: Consumer & Producer Theory	
ECN 100B	Intermediate Micro Theory: Imperfect Competition & Market Failure	4
ECN 101	Intermediate Macro Theory	4
ECN 102	Analysis of Economic Data	4

ECN 103	Economics of Uncertainty & Information	4
ECN 122	Theory of Games & Strategic Behavior	4
ECN 140	Econometrics	4
Management		
MGT 011A	Elementary Accounting	4
or MGT 011AV	Elementary Accounting	
or MGT 011AY	Elementary Accounting	
MGT 011B	Elementary Accounting	4
MGT 100	(Discontinued for summer 2025) **	
MGT 120	Managing & Using Information Technology	4
MGT 140	Marketing for the Technology-Based Enterprise	4
MGT 150	Technology Management	4
MGT 160	Financing New Business Ventures	4
MGT 170	Management Accounting & Control	4
MGT 180	Supply Chain Planning & Management	4

1

Transfer and change of major students will need 2 additional units of upper division electives instead of EEC 001.

2

Transfer and change of major students who do not take EEC 010 will substitute 4 additional units of upper-division electives.

3

CHE 002C and any upper division course; except CHE 195, CHE 197.

4

ENG 045, and any upper division engineering course not used in satisfaction of core degree requirements, excluding ENG 100, ENG 160 (restricted to 1 unit of technical elective; same as PHY 160), PHY 190 (restricted to 1 unit of technical elective), PHY 198, ECS 111, ECS 113, ECS 115, ECS 116, ECS 117, ECS 132, ECS 154A, ECS 154B, ECS 171, ECS 188 (ECS 154A & ECS 154B courses may be used by EEEL majors who did not take EEC 170).

5

Except MAT 135A & MAT 197TC.

6

Except PHY 116A, PHY 116B, PHY 116C, PHY 160 (restricted to 1 unit of technical elective), PHY 195, PHY 197T.

7

Except STA 100, STA 101, STA 103, STA 104, STA 106, STA 108, STA 130A.

**

Course(s) discontinued; see your advisor for course options.

Areas of Specialization

Students are encouraged to focus on one of the following five specialty areas: Physical Electronics; Electromagnets, RF, Microwave, Wireless; Analog Electronics; Digital Electronics: and Communication Controls & Signal Processing. For updated recommended courses, see Electrical & Computer Engineering (https://www.ece.ucdavis.edu/undergraduate/majors-and-minor/).

Physical Electronics

Solid-state devices, circuits and fabrication and the theory courses supporting those subjects.

Code	Title	Units
Recommended Elective Courses		
Core Electives		
EEC 130B	Introductory Electromagnetics II	
EEC 140B	Principles of Device Physics II	
Design Electives with Laboratory (select two or more courses)		
EEC 110B	Electronic Circuits II	
EEC 112	Communication Electronics	
EEC 118	Digital Integrated Circuits	
EEC 132A	RF & Microwaves in Wireless Communication	
EEC 132B	RF & Microwaves in Wireless Communication	
EEC 132C	RF & Microwaves in Wireless Communications	
EEC 146A	Integrated Circuits Fabrication	
Additional Technical Electives		
EEC 135	Optoelectronics for High-Speed Data Networking & Computing Systems	
EEC 145	Electronic Materials	

Electromagnetics, RF, Microwave, Wireless

Microwave circuits and systems, and fiber optical systems.

Code	Title	Units
Recommended Elective Courses		
Core Electives		
EEC 130B	Introductory Electromagnetics II	
EEC 140B	Principles of Device Physics II	
Design Electives with Laboratory (select two or more courses)		
EEC 110B	Electronic Circuits II	
EEC 112	Communication Electronics	
EEC 132A	RF & Microwaves in Wireless Communication	
EEC 132B	RF & Microwaves in Wireless Communication	
EEC 132C	RF & Microwaves in Wireless Communications	
EEC 133	Electromagnetic Radiation & Antenna Analysis	
EEC 146A	Integrated Circuits Fabrication	
EEC 165	Statistical & Digital Communication	
Additional Technical Electives		
EEC 135	Optoelectronics for High-Speed Data Networking & Computing Systems	
EEC 160	Signal Analysis & Communications	

Analog Electronics

Transistor- and system-level analog circuit design.

Code	Title	Units
Recommended Elective Courses		
Core Electives		
EEC 110B	Electronic Circuits II	
EEC 157A	Control Systems	

or EEC 157AV	Control Systems	
Design Electives with Laboratory (select two or more courses)		
EEC 112	Communication Electronics	
EEC 113	Power Electronic Circuits	
EEC 116	VLSI Design	
EEC 118	Digital Integrated Circuits	
EEC 146A	Integrated Circuits Fabrication	
EEC 157B	Control Systems II	
or EEC 157BY	Control Systems II	
Additional Technical Electives		
EEC 140B	Principles of Device Physics II	
EEC 160	Signal Analysis & Communications	

EEC 135	Optoelectronics for High-Speed Data Networking & Computing Systems	
EEC 157A	Control Systems	4
or EEC 157AV	Control Systems	
EEC 160	Signal Analysis & Communications	
EEC 179	Applied Machine Learning for Electrical & Computer Engineers	

Digital Electronics

Transistor- and system-level digital circuit design.

Code	Title	Units
Recommended Elective Courses		
Core Electives		
EEC 151	Digital Signals & Systems	
EEC 180	Digital Systems II	
Design Electives with Laboratory (select two or more courses)		
EEC 110B	Electronic Circuits II	
EEC 116	VLSI Design	
EEC 118	Digital Integrated Circuits	
EEC 146A	Integrated Circuits Fabrication	
EEC 157B	Control Systems II	
or EEC 157BY	Control Systems II	
EEC 165	Statistical & Digital Communication	
EEC 172	Embedded Systems	
Additional Technical Electives		
EEC 140B	Principles of Device Physics II	
EEC 157A	Control Systems	
or EEC 157AV	Control Systems	
EEC 160	Signal Analysis & Communications	
EEC 170	Introduction to Computer Architecture	

Communication Controls & Signal Processing

Digital communications, signals and systems, digital signal processing, control systems, robotics, and machine learning.

Code	Title	Units
Recommended Elective Courses		
Core Electives		5
EEC 151	Digital Signals & Systems	
EEC 180	Digital Systems II	
Design Electives with Laboratory (select two or more courses)		8
EEC 110B	Electronic Circuits II	
EEC 112	Communication Electronics	
EEC 157B	Control Systems II	
or EEC 157BY	Control Systems II	
EEC 165	Statistical & Digital Communication	
Additional Technical Electives		