

ELECTRICAL ENGINEERING, BS

The Bachelor of Science in Electrical Engineering program at the University of Alabama is accredited by the Engineering Accreditation Commission of ABET, <https://www.abet.org>, under the General Criteria and Program Criteria for Electrical, Computer, Communications, Telecommunication(s) and Similarly Named Engineering Programs.

The Electrical Engineering program gives students a broad knowledge of the math, physics, electronics, and power concepts necessary for a career in the discipline. Students will become familiar with topics such as electronics, electromechanical systems, embedded systems, power electronics, micro and nanoelectronics, microwave engineering, optoelectronics, semiconductor devices, photonics, photovoltaics, solar power, biomedical devices, microelectromechanical systems, internet of things, laser, RF/analog/digital circuit design, radar, robotics, sensors, signal processing, control, software development, machine learning, cyber-physical security, artificial intelligence, and vehicle technology. Students develop critical-thinking and problem-solving skills throughout their studies. In addition, they develop an ability to apply their knowledge of mathematics, science, and general engineering to address technical issues.

Graduates with an Electrical Engineering BS degree commonly begin their careers in a variety of functions including: power generation, management, and distribution engineers; analog electronics designers; digital hardware designers; printed circuit board designers; and embedded hardware and software developers. Graduates often work in a wide range of industries including aerospace, defense/military, automotive, medical, software, semiconductors, and consumer electronics. These graduates also pursue post-graduate degrees in Electrical Engineering, Computer Engineering, Computer Science, Business & Commerce, and even professional areas such as Law and Medicine.

The information contained here describes the undergraduate curriculum in Electrical Engineering. Graduate students and students participating in the Accelerated Masters Program (AMP) should consult the graduate catalog for information on all cross-listed and graduate-only courses. More information about various programs within the department is available in the Electrical and Computer Engineering departmental office located in 3027 SERC.

Program Educational Objectives

The Program Educational Objectives for the B.S. in Electrical Engineering are:

- Graduates will excel in engineering careers and/or postgraduate education utilizing knowledge of Electrical Engineering disciplines and underlying fundamental principles of science and mathematics, engineering analysis, problem solving, and design;
- Graduates will expand their knowledge of current and emerging issues in Electrical Engineering and continue career-long professional development through engagement in lifelong learning;
- Graduates will grow professionally and advance throughout their engineering careers utilizing skills in effective communication; responsible, multidisciplinary teamwork, and adherence to principles of professional accountability and ethics.

Student Outcomes

Graduates of the Electrical Engineering program will have:

1. An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics;
2. An ability to apply engineering design to produce solutions that meet specific needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors;
3. An Ability to communicate effectively with a range of audiences;
4. An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts;
5. An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives;
6. An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions;
7. An ability to acquire and apply new knowledge as needed, using appropriate learning strategies;
8. An ability to solve mathematics problems in probability, statistics, differential equations, linear algebra, complex variables, and discrete mathematics as they relate to problems in Electrical Engineering.

The overall goal of the Electrical Engineering program is to prepare students for engineering careers within the discipline. The first year and a half of the Electrical Engineering curriculum includes basic courses in mathematics and physical science, broadening courses in humanities and social science, and foundation courses in engineering. The next three semesters provide the core education in Electrical Engineering, with courses in computers, electronics, circuits, power, and systems. The last year of study includes two semesters of Capstone Design as well as technical electives to allow students to concentrate in selected areas of the discipline. For seniors, the department offers advanced courses in computers, communications, controls, electromagnetics, microelectronics, materials, and power.

To complete the senior-level electives, students must select two Electrical Engineering electives with associated labs (lecture/lab combinations). These lecture/lab combinations must be completed as a pair. Additional materials that describe the curriculum are available in the Electrical and Computer Engineering departmental office and on the Electrical Engineering website.

[Click here for details regarding the College of Engineering policy for repeating courses.](#)

[Click here for details regarding the College of Engineering Residency policy.](#)

ECE 4xx-level lecture/lab combos must be taken as a pair (either both lecture and lab taken off-campus at the same institution as a pair and transferred in, or both taken at UA).

Credit hour substitutions for a course must come from a course within the same discipline (for example, a CS hour must be used to substitute for a missing CS hour). The course used as substitution cannot be used for any other Electrical Engineering program requirement. This is accomplished through a petition to the ECE Department.

Click here for details regarding The University of Alabama's policy on auditing courses.

Freshman

Fall	Hours	Spring	Hours
CH 101	4	PH 105	4
MATH 125	4	MATH 126	4
ECE 121 or ENGR 111 (Or other ENG intro courses)	1	ENGR 103 or 123	3
EN 101	3	EN 102	3
Humanities (HU), Literature (L), or Fine Arts (FA) Elective ^{1,2}	3		
		15	14

Sophomore

Fall	Hours	Spring	Hours
PH 106	4	PH 253	3
MATH 227	4	MATH 237	3
MATH 238	3	ECE 225	4
CS 100	4	ECE 380	4
		Humanities (HU), Literature (L), or Fine Arts (FA) Elective ^{1,2}	3
		15	17

Junior

Fall	Hours	Spring	Hours
MATH 355	3	ECE 326	3
ECE 370	3	ECE 350	3
ECE 332	4	ECE 333	4
ECE 383	4	ECE 330, 455, or PH 301	3
Humanities (HU), Literature (L), or Fine Arts (FA) Elective ^{1,2}	3	History (HI) or Social and Behavioral Sciences (SB) Elective ^{1,2}	3
		17	16

Senior

Fall	Hours	Spring	Hours
ECE 340	4	ECE Elective or Professional Elective ⁴	3
ECE Restricted Area Elective ³	3	ECE Elective	3
ECE 492	2	ECE 494	2
ECE Elective with Laboratory	4	ECE Elective with Laboratory	4
History (HI) or Social and Behavioral Sciences (SB) Elective ^{1,2}	3	History (HI) or Social and Behavioral Sciences (SB) Elective ^{1,2}	3
		16	15

Total Hours: 125**Footnotes**

¹ Students must satisfy the College of Engineering in-depth requirement (minimum of six hours in one discipline).

² The College of Engineering core curriculum requires a minimum of: nine hours of HU, L, or FA courses; nine hours of HI or SB courses; six hours of FC courses; six hours of W courses (300- and 400-level ECE courses); 12 hours of N courses (eight hours of calculus-based physics); 12 hours of MA courses (MATH 125 or higher); and six hours of C or FL courses.

³ The ECE Restricted Area Elective must be chosen from the list approved by the Department of Electrical and Computer Engineering below.

⁴ The Professional Elective must be chosen from the list approved by the Department of Electrical and Computer Engineering below.

The table below lists approved **Restricted Area Electives**. The electives are grouped by suggested areas of study within Electrical and Computer Engineering. However, a student is free to choose any elective listed that does not duplicate other program requirements. Special topics courses such as ECE 491 and ECE 493 may also be approved by petition. Note that some transfer courses are not eligible as Restricted Area Electives.

Code and Title	Hours
Area 1: Software and Embedded Systems	
AEM 249 Algorithm Devl Implementation	3
CS 101 CS II for Majors	4
CS 200 Software Design & Engineering	4
CS 201 Data Structures and Algorithms	4
CS 202 Web Foundations	3
CS 300 Operating Systems	3
CS 301 Database Management Systems	3
CS 403 Programming Languages	3
CS 407 Software Interface Desgn	3
CS 434 Compiler Construction	3
CS 435 Computer Graphics	3
CS 451 Data Science	3
CS 460 Intro to Autonomous Robotics	3
CS 465 Artificial Intelligence	3
CS 470 Computer Algorithms	3
CS 480 Computer Simulation	3
ECE 408 Communications	3
ECE 409 Communications Lab	1
ECE 480 Digital Systems Design	3
ECE 481 Digital Systems Design Lab	1
ECE 482 Comp Visn Dig Image Proc	3
ECE 483 Intro to Machine Learning	3
ECE 484 Computer Architecture	3
ECE 486 Embedded Systems	3
ECE 487 Embedded Systems Laboratory	1
ECE 488 Computational Intelligence	3
ME 456 Mechatronics	3
Area 2: Electromechanical Systems	
ECE 451 Power Electronics	3
ECE 452 Power Electronics Laboratory	1
ECE 453 Power Systems	3
ECE 454 Power Systems Laboratory	1
ECE 455 Electromechanical Systems	3
ECE 475 Control Systems Analysis	3

ECE 476	Control Systems Lab	1
ECE 479	Digital Control Systems	3
ME 454	Auto. Elec. and Electron. Sys.	3
Areas 3 and 4: Materials and Devices; Electromagnetics		
ECE 430	Solid State Devices	3
ECE 438	Intgr Circuit Fabr Prin	3
ECE 439	Thin Film Technology	3
ECE 440	Electromagnetic Waves	3
ECE 462	Semiconductor Optoelectronics	3
ECE 463	Magnetic Materials & Devices	3
ECE 466	Fund of Nanotechnology	3
MTE 271	Engr Matls: Struc Prop	3
MTE 450	Plasma Proc of Thin Films	3
MTE 481	Analy Methods For Matls	4

Area 5: General Courses

Aerospace Engineering and Mechanics – AEM 201, AEM 349

Mechanical Engineering – ME 215, ME 305, ME 349, ME 372

General Engineering Studies – GES 400

Mathematics (MATH) – All courses above MATH 238 not duplicating other courses required in the curriculum. Exceptions to this include courses with math education as the primary emphasis (e.g. MATH 403, MATH 405, MATH 409).

Music (MUS) – MUS 308, MUS 340, MUS 341, MUS 414

Physics (PH) – All courses 300 and above not duplicating other courses required in the curriculum.

The table below lists approved **Professional Electives**. A minimum of three credit hours of professional elective courses are required. Note that some transfer courses are not eligible as Professional Electives.

Code and Title	Hours
Culverhouse School of Accountancy (AC) – All courses.	
Aerospace Engineering and Mechanics (AEM) – All courses 200 and above.	
Air Force Studies (AFS) – All courses 300 and above.	
Astronomy (AY) – All courses 200 and above.	
Biological Sciences (BSC) – All courses.	
Chemical and Biological Engineering (CHE) – All courses 200 and above.	
Chemistry (CH) – All courses except CH 100, CH 101, and CH 117.	
Civil, Construction, and Environmental Engineering (CE) – All courses 200 and above.	
Randall Research Scholar (RRS) – All courses 200 and above.	
Computer Science (CS) – All courses 300 and above not duplicating other courses required in the curriculum.	
Economics (EC) – All courses 300 and above.	
English (EN) – EN 319.	
Finance (FI) – All courses.	
Foreign languages – All courses 300 and above not duplicating other program requirements.	
General Business Administration (GBA) – All courses.	
General Engineering Studies – All GES courses 200 and above not duplicating other courses required in the curriculum. ENGR 161 and ENGR 171.	
Geological Sciences (GEO) – All courses.	

International Honors Program (IHP) – All courses.

Legal Studies (LGS) – All courses.

Management (MGT) – All courses.

Marine Science (MS) – All courses.

Marketing (MKT) – All courses.

Mathematics (MATH) – All courses above MATH 238 not duplicating other courses required in the curriculum. Exceptions to this include courses with math education as the primary emphasis (e.g. MATH 403, MATH 405, MATH 409).

Mechanical Engineering (ME) – All courses 200 and above.

Metallurgical Engineering (MTE) – All courses 200 and above.

Military Science (MIL) – All courses 300 and above.

Music (MUS) – MUS 308, MUS 340, MUS 341, MUS 414

Physics (PH) – All courses 300 and above not duplicating other courses required in the curriculum.

Statistics (ST) – All courses.

Electrical Engineering graduates have career opportunities in a number of industries and fields including, but not limited to, computing, communications, manufacturing, maintenance, utilities, aerospace, automotive, defense/military, medical, robotics and automation, semiconductors, and consumer electronics. The degree also provides an excellent background for graduate study in Electrical Engineering or Computer Engineering as well as Law and Medicine.

Types of Jobs Accepted

Electrical Engineering graduates often gain entry-level positions as utility engineers, facilities engineers, programmers, or design engineers with various engineering firms, consulting firms, and companies across a wide range of industries.

Jobs of Experienced Alumni

Alumni of the Department of Electrical and Computer Engineering currently hold positions such as distribution manager, Alabama Power; vice president, ADTRAN; and senior design engineer, Radiance Technologies; senior engineer, TSC.

Learn more about opportunities in this field at the Career Center