Electrical and Computer Engineering, Communications, Signal Processing, Networks, and Systems (BSECE)

Communications, Signal Processing, Networks, and Systems

Communications, signal processing, networks, and systems broadly encompasses the principles underlying the design and implementation of systems for information transmission. The field considers how information is represented, compressed, and transmitted on wired and wireless links and how communication networks can be, and are, designed and operated. A student who chooses this technical concentration should recognize that communications and networking is a broad application domain where many engineering tools come into play: from circuit design for wireless phones to embedded network processors to system and application software for networked systems.

Bachelor of Science in Electrical and Computer Engineering

The curriculum in electrical engineering and computer engineering is designed to educate students in the fundamentals of engineering, which are built upon a foundation of mathematics, science, communication, and the liberal arts. Graduates should be equipped to advance their knowledge while contributing professionally to a rapidly changing technology. Areas in which electrical and computer engineers contribute significantly are: communications, signal processing, networks and systems, electronics and integrated circuits, energy systems and renewable energy, fields, waves and electromagnetic systems, nanoelectronics and nanotechnology, computer architecture and embedded systems, and software engineering and design. Typical career paths of graduates include design, development, management, consulting, teaching, and research. Many graduates seek further education in law, medicine, business, or engineering.

The core requirements of the Bachelor of Science in Electrical and Computer Engineering provide a foundation of engineering fundamentals. Students then build on the core requirements by choosing an advanced technical component and a set of free electives from within or outside of the department. Once the technical core area is chosen, the student is assigned a faculty advisor with expertise in that area to help the student select technical core courses that are appropriate to his or her career and educational goals. The curriculum thus ensures breadth through the core courses and the choice of a technical elective; technical core area coursework provides additional depth.

Program Educational Objectives

Electrical and computer engineering graduates should:

- Be highly skilled, trained, and educated for the ethical practice of electrical and computer engineering in industry and public service
- Exhibit leadership in technical or business activity through engineering ability, communication skills, and knowledge of contemporary and global issues
- Continuously educate themselves through professional study and personal research to expand and apply knowledge within and outside the discipline
- Use their engineering ability and creative potential to create technology solutions that consider environmental and social impacts to improve the quality of life in society
- Be able to develop and design systems, artifacts, and methods either individually or in teams
- Be prepared for admission to, and to excel in, the best graduate programs in the world

Portable Computing Devices

Students enrolled in a degree program in electrical and computer engineering will be expected to own a portable computing device capable of compiling and running a program suitable for use in the classroom and on the University wireless network. Use of these devices in the classroom and as a general part of the learning experience within our programs is at the discretion of faculty and not all classes or courses of instruction will require the use of these devices. Once admitted, students will be informed by the Electrical and Computer Engineering Department (ECE) office about specific device requirements.

Student Outcomes

Electrical and computer engineering graduates should demonstrate:

- An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
- An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors
- An ability to communicate effectively with a range of audiences
- 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
- 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
- An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions
- An ability to acquire and apply new knowledge as needed, using appropriate learning strategies

Total Hours Required: 125

Plan of Study

The Plan of Study is a suggested four-year course sequence to support academic planning and serves as a helpful guide. Currently enrolled students should meet with their academic advisor to tailor their course selections and timelines to their individual goals and circumstances.

Course	Title	Hours
Year 1		
Semester 1		
ECE 302	Introduction to Electrical Engineering	3
ECE 306	Introduction to Computing	3
RHE 306	Rhetoric and Writing	3
M 408C	Differential and Integral Calculus	4

First-Year Signature Course (090)		3
	Hours	**16**
Semester 2		
ECE 319K	Introduction to Embedded Systems	3
M 408D	Sequences, Series, and Multivariable Calculus	4
PHY 303K	Engineering Physics I	3
PHY 105M	Laboratory For Physics 302K, 303K, and 317K	1
Social and Behavioral Sciences (080)		3
	Hours	**14**
Year 2		
Semester 1		
ECE 411	Circuit Theory	4
M 427J	Differential Equations with Linear Algebra	4
PHY 303L	Engineering Physics II	3
PHY 105N	Laboratory For Physics 302L, 303L, and 317L	1
Visual and Performing Arts (050)		3
	Hours	**15**
Semester 2		
ECE 312	Software Design and Implementation I	3
ECE 313	Linear Systems and Signals	3
M 340L	Matrices and Matrix Calculations	3
Humanities (040)		3
American and Texas Government (070)		3
	Hours	**15**
Year 3		
Semester 1		
ECE 333T	Engineering Communication	3
ECE 351K	Probability and Random Processes	3
Advanced technical component		4
Advanced technical component laboratory		4
Advanced technical component requirement		3
	Hours	**17**
Semester 2		
Advanced technical elective		3
Free elective (mathematics or basic science)		4
Free Elective		4
Advanced technical component requirement		3
Advanced technical component elective		3
	Hours	**17**
Year 4		
Semester 1		
ECE 364D or ECE 364E	Introduction to Engineering Design or Interdisciplinary Entrepreneurship	3
U.S. History (060)		3
Free Elective		3
Advanced technical component electives		6
	Hours	**15**
Semester 2		
Hours chosen from:		4
ECE 464C	Corporate Senior Design Project	
ECE 464G	Multidisciplinary Senior Design Project	
ECE 464H	Honors Senior Design Project	
ECE 464K	Senior Design Project	
ECE 464R	Research Senior Design Project	
ECE 464S	Start-Up Senior Design Project	
Advanced technical component elective		3
Free Elective		3
U.S. History (060)		3
American and Texas Government (070)		3
	Hours	**16**
	Total Hours	**125**

Requirements

All requirements are listed below, starting with the most specialized moving to the most general. Additional requirements may follow the table, so be sure to read the entire page. Some required courses listed below may also satisfy General Education requirements, including Core Curriculum.

Code	Title	Hours
Concentration		
ECE 325	Electromagnetic Engineering	3
or ECE 351M	Digital Signal Processing	
Hours chosen from:		3
ECE 362K	Introduction to Automatic Control	
ECE 371Q	Digital Image Processing	
ECE 360K	Introduction to Digital Communications	
ECE 445S	Real-Time Digital Signal Processing Laboratory	4
or ECE 471C	Wireless Communications Laboratory	
M 427L	Advanced Calculus for Applications II	4
Hours chosen from:		12
ECE 325	Electromagnetic Engineering	
ECE 325K	Antennas and Wireless Propagation	
ECE 445S	Real-Time Digital Signal Processing Laboratory	
ECE 351M	Digital Signal Processing	
ECE 360C	Algorithms	
ECE 460J	Data Science Laboratory	
ECE 360K	Introduction to Digital Communications	
ECE 461P	Data Science Principles	
ECE 362K	Introduction to Automatic Control	
ECE 363M	Microwave and Radio Frequency Engineering	
ECE 471C	Wireless Communications Laboratory	
ECE 371Q	Digital Image Processing	
M 325K	Discrete Mathematics	
M 362M	Introduction to Stochastic Processes	
M 365C	Real Analysis I	
Subtotal		*26*
Degree (see details below)		**61**
Free electives: Additional coursework to reach total hours required.		14
Subtotal		*75*
General Education		
Remaining Core Curriculum (42 hours total)		24
Foreign Language other than English, Beginning Proficiency		
Subtotal		*24*
College Requirements - Engineering		
General University Requirements		
Total Hours		**125**

Degree-Bachelor of Science in Electrical and Computer Engineering

Code	Title	Hours
Electrical and Computer Engineering Courses		
ECE 302	Introduction to Electrical Engineering (part II science and technology)	3
or ECE 302H	Introduction to Electrical Engineering: Honors	
ECE 306	Introduction to Computing	3
ECE 411	Circuit Theory	4

ECE 312	Software Design and Implementation I	3
or ECE 312H	Software Design and Implementation I: Honors	
ECE 313	Linear Systems and Signals	3
ECE 319K	Introduction to Embedded Systems	3
or ECE 319H	Introduction to Embedded Systems: Honors	
ECE 333T	Engineering Communication	3
ECE 351K	Probability and Random Processes	3
ECE 364D	Introduction to Engineering Design	3
or ECE 364E	Interdisciplinary Entrepreneurship	
Hours chosen from: senior design project		4
ECE 464G	Multidisciplinary Senior Design Project	
ECE 464H	Honors Senior Design Project	
ECE 464K	Senior Design Project	
ECE 464R	Research Senior Design Project	
ECE 464S	Start-Up Senior Design Project	
Advanced Technical Elective: Within Any Core of Electrical Engineering		
Within any core of Electrical Engineering, Hours chosen from:		3
One upper-division electrical engineering course		
ECE 316	Digital Logic Design	
Mathematics		
Choose a sequence below:		8
Sequence 1:		
M 408C	Differential and Integral Calculus	
M 408D	Sequences, Series, and Multivariable Calculus	
Sequence 2:		
M 408K	Differential Calculus	
M 408L	Integral Calculus	
M 408M	Multivariable Calculus	
M 427J	Differential Equations with Linear Algebra	4
M 340L	Matrices and Matrix Calculations	3
Physics		
PHY 303K	Engineering Physics I	3
PHY 105M	Laboratory For Physics 302K, 303K, and 317K	1
PHY 303L	Engineering Physics II	3
PHY 105N	Laboratory For Physics 302L, 303L, and 317L	1
Rhetoric and Writing		
RHE 306	Rhetoric and Writing	3
Total Hours		**61**

Additional Requirements and Policies

Enrollment in ECE 333T, ECE 160, ECE 260, ECE 360, ECE 460, and ECE 379K requires completion of ECE 312 or ECE 313 with a grade of at least *C-*.

Pre-approved courses are used to fulfill technical core, advanced math and/or science and core technical electives; other elective courses must be approved by the electrical and computer engineering faculty before the student enrolls in them.

Transfer Coursework: No more than 25 semester credit hours of transfer electrical and computer engineering coursework may be counted for credit toward the electrical and computer engineering degree.

Free Electives Policy

Must include at least one advanced mathematics or basic science course (three hours); no more than three hours of lower-division coursework; all coursework must count for a major in the offering department; all coursework must be taken in residence, except that up to three credit hours can be transferred with approval; no course can duplicate a course the student has taken or is required to take as part of the other Electrical and Computer Engineering coursework requirements.

Upper-Division Technical Component Areas

Electrical and computer engineering students must choose an advanced technical component area from the electrical engineering or computer engineering concentrations. Concentrations give students the flexibility to tailor their upper- division academic program to meet a variety of career goals, while ensuring that they graduate with a robust grounding in one or more selected technical or specialty areas.

For all concentrations, the student must complete all courses in the area on the letter-grade basis. Detailed guidelines for choosing areas and elective courses within each area are published on the electrical and computer engineering department website. Approved electives for each area may be subject to periodic change as needs arise.

Electrical Engineering Option

Advanced Technical Component (mathematics) is four hours and one Advanced Technical Component Requirement is three hours.

Computer Engineering Option

Advanced Technical Component (mathematics) is three hours and one Advanced Technical Component Elective is four hours.

Alternate Mathematics Courses

For students who choose an advanced technical component area in computer engineering:

Code	Title	Hours
M 427L	Advanced Calculus for Applications II	4
M 328K	Introduction to Number Theory	3
M 343K	Introduction to Algebraic Structures	3
M 344K	Intermediate Symbolic Logic	3
M 348	Scientific Computation in Numerical Analysis	3
M 358K	Applied Statistics	3
M 374M	Mathematical Modeling in Science and Engineering	3
C S 341	Automata Theory	3
C S 346	Cryptography	3

For students who choose an advanced technical component area in electrical engineering:

Code	Title	Hours
M 325K	Discrete Mathematics	3
M 328K	Introduction to Number Theory	3
M 346	Applied Linear Algebra	3
M 348	Scientific Computation in Numerical Analysis	3
M 358K	Applied Statistics	3
M 361	Theory of Functions of a Complex Variable	3
M 362M	Introduction to Stochastic Processes	3
M 372K	Partial Differential Equations and Applications	3
M 374	Fourier and Laplace Transforms	3
M 374M	Mathematical Modeling in Science and Engineering	3