

# Electrical Engineering (BS) - General Track

## Degree Requirements

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### General Education Requirements (54 Hours)

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#### Area I – Written Composition (2 Courses, 6 Hours)

- A. 3 hours: EH 101
- B. 3 hours: EH 102

#### Area II – Humanities & Fine Arts (3 Courses, 9 Hours)

- A. 3 hours from: EH 215, EH 216, EH 225, EH 226, EH 235, EH 236
- B. 3 hours from: ARH 100, ARH 103, ARH 123, ARS 101, DRA 110, MUL 101
- C. 3 hours: CA 110

#### Area III – Natural Sciences & Mathematics (4 Courses & Labs, 16 Hours)

- A. 4 hours: MA 125
- B. 12 hours from: CH 131 & CH 131L, PH 201 & PH 201L, PH 202 & PH 202L

#### Area IV – History, Social & Behavioral Sciences (3 Courses, 9 Hours)

- A. 3-6 hours from: HY 101, HY 102, HY 135, HY 136
- B. 3--6 hours from: AN 100, AN 101, CA 100, CA 211, ECO 215, ECO 216, GEO 114, GEO 115, GS 101, HY 101, HY 102, HY 135, HY 136, IS 100, IST 201, PSC 130, PSY 120, PSY 250, SY 109, SY 112

#### Area V Pre-Professional, Major, Elective Courses (4 Courses, 14 Hours)

- A. 14 hours from: MA 126, MA 227, MA 237, MA 238

### Major Requirements (75 Hours)

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#### Electrical Engineering Major Core (26 Courses & Labs, 65 Hours)

- A. 2 hours: EG 101 or EG 201
- B. 3 hours: CPE 260
- C. 6 hours: EG 231, EG 270
- D. 14 hours: EE 220, EE 223, EE 227, EE 263, EE 264, EE 268
- E. 29 hours: EE 321, EE 322, EE 328, EE 331, EE 334, EE 354, EE 355, EE 368, EE 372, EE 381, EE 385
- F. 11 hours: EE 401, EE 404, EE 431, EE 437, EE 465

#### Technical Electives (3 Courses, 9 Hours)

- A. 6 hours: Control Systems: EE 422, EE 423, EE 424, EE 427, EE 438, EE 468
- B. 6 hours: Communications and Networks: EE 441, EE 444, EE 453, EE 456, EE 471, EE 473
- C. 6 hours: Digital Systems: EE 438, EE 440\*, EE 441, EE 443\*, EE 454, EE 457, EE 468, EE 469
- D. 6 hours: Electromagnetics and Optics: EE 450, EE 452, EE 453, EE 455, EE 456, EE 458, EE 488
- E. 6 hours: Electronics: EE 430, EE 432, EE 438, EE 439, EE 455, EE 470, EE 482, EE 486
- F. 6 hours: Power Systems: EE 430, EE 481, EE 482, EE 483, EE 484, EE 485, EE 486, EE 488, EE 489
- G. 3 hours: EE 422, EE 423, EE 424, EE 427, EE 430, EE 432, EE 438, EE 439, EE 440\*, EE 441, EE 443\*, EE 444, EE 450, EE 452, EE 453, EE 454, EE 455, EE 456, EE 457, EE 458, EE 465, EE 468, EE 469, EE 470, EE 471, EE 473, EE 481, EE 482, EE 483, EE 484, EE 485, EE 486, EE 488, EE 489

## Senior Lab Elective (1 Course, 1 Hour)

A. 1 hour: EE 446, EE 447, EE 449

## Minor Requirements (0 Hours)

A minor is not required for this degree program

### Notes:

\* Recommended Course

1. EE Technical electives must be selected from Electrical Engineering courses carrying a 400 number and must include a two-course concentration from approved list with permission of the student's advisor.
2. Credit for both EE 440 & EE 443 not allowed
3. All undergraduates must complete two designated writing credit (W) courses, at least one of which must be in the student's major or minor.
4. Appropriate software tools will be utilized in almost all EE courses.

## Additional Information

### Professional Component Standing (PCS)

PCS is required to be eligible to take EE 300-level and EE 400-level courses. PCS is awarded when the students meet the following requirements.

- Courses: MA 125, MA 126, CH 131, CH 131L, PH 201, CPE 260, EE 220, EE 263, EH 101, EH 102,
- C-grade or higher required in PCS courses
- Minimum Grade Point Average: 2.00 USA GPA

Students who fail to maintain at least a 2.00 GPA overall at the University of South Alabama will lose PCS and may be required to take or repeat appropriate courses as specified by the department chair to correct their deficiencies and may not be permitted to continue in 300- and 400-level engineering courses.

## Graduation Plan

### Electrical Engineering (BS): General Track (129 Total Hours)

#### First Year - Fall Semester

Course ID	Course Description	Hours
MA 125	Calculus I	4
CH 131/CH 131L	General Chemistry I and Lab	4
EH 101	English Composition I	3
EG 101	Intro to Engineering and Design	2
General Education	Area I, II or IV	3
Total Hours		16

**First Year - Spring Semester**

Course ID	Course Description	Hours
MA 126	Calculus II	4
CA 110	Public Speaking	3
PH 201/PH 201L	Calculus-Based Physics I and Lab	4
CPE 260	Intro to C++ Programming	3
EH 102	English Composition II	3
Total Hours		17

**Second Year - Fall Semester**

Course ID	Course Description	Hours
MA 227	Calculus III	4
PH 202/PH 202L	Calculus-Based Physics II and Lab	4
EE 263	Digital Logic Design	3
EE 220	Circuit Analysis	3
General Education	Area I, II or IV	3
Total Hours		17

**Second Year - Spring Semester**

Course ID	Course Description	Hours
EE 223	Network Analysis	3
EE 264	Microprocessor Sys-Interfacing	3
EE 268	Digital Logic Lab	1
MA 237	Linear Algebra i	3
MA 238	App Diff Equations	3
EG 270	Thermodynamics	3
Total Hours		16

**Third Year - Fall Semester**

Course ID	Course Description	Hours
EE 227	Circuits/Devices Lab	1
EE 321	Signals, Systems & Transforms	3

EE 331	Physical Electronics	3
EE 354	Electromagnetics I	3
EE 368	Microprocessor Interface lab	1
EE 381	Elec Energy Conversion	3
General Education	Area I, II or IV	3
Total Hours		17

### Third Year - Spring Semester

Course ID	Course Description	Hours
EE 328	Feedback Control	3
EE 334	Digital Electronics	3
EE 355**	Electromagnetics II	3
EE 372	Intro Communications	3
EE 385	Energy Conversion Lab	1
EE 322	Prob, Rand Sigs & Stat Anlys	3
Total Hours		16

### Fourth Year - Fall Semester

Course ID	Course Description	Hours
EG 231	Intro to Ethics & Processing	3
EE 401*	Intro to Electrical and Computer Design	1
EE 431	Analog Electronics	3
EE 465	Digital Signal Processing	3
EE 4XX-L***	Electrical Engineering Technical Senior Lab	1
EE 4XX***	Electrical Engineering Technical Elective	3
General Education	Area I, II or IV	3
Total Hours		17

### Fourth Year - Spring Semester

Course ID	Course Description	Hours
EE 404**	Electrical and Computer Engineering Design	3
EE 437	Electronics Lab	1
EE 4XX***	Electrical Engineering Technical Electives	3
EE 4XX***	Electrical Engineering Technical Electives	3
General Education	Area I, II or IV	3
Total Hours		13

**Notes**

\* EE Courses only taught in the fall semester

\*\* EE Courses only taught in the spring

\*\*\* EE Technical electives must be selected from Electrical Engineering courses carrying a 400 number and must include a two-course concentration from approved list with permission of the student's advisor"

Students with an adequate ACT/SAT score in English Composition will not be required to take EH 101 as a prerequisite to EH 102

**BOLD** courses are required for Professional Component Standing (PCS). "C" grade or better in each course is required to obtain PCS in the Electrical Engineering Program

Appropriate software tools will be utilized in almost all EE courses.

## Major Milestones

### ELECTRICAL ENGINEERING SAMPLE 4-YEAR PLAN WITH MILESTONES

Term 1	Course Description	Pre-req	Cr Hrs	Milestone Notes
EH 101	English Composition I		3	Must complete at least 12 hours with a 2.0 or higher GPA
MA 125	Calculus I	ACT Math 27	4	
CH 131/CH 131L	General Chemistry I	ACT Math 24	4	
EG 101	Freshman Seminar	ACT Math 24	2	
<b>Fine Arts Elective</b>			3	
			<b>16</b>	
Term 2	Course Description	Pre-req	Cr Hrs	Milestone Notes
EH 102	English Composition II	EH 101 or test score	3	MA 125
MA 126	Calculus II	MA 125	4	CH 131/CH 131L
PH 201/PH 201L	Physics I	MA 125, MA 126 (cc) and EH 101	4	EH 101 or EH 105*
CPE 260	Introduction to C++ Programming	MA 125 (cc)	3	
CA 110	<b>Public Speaking</b>		3	
			<b>17</b>	Grade of "C" or better required in all Milestones for PCS

Term 3	Course Description	Pre-req	Cr Hrs	Milestone Notes
MA 227	Calculus III	MA 126	4	PH 201/PH 201L
PH 202/PH 202L	Physics II	PH 201, MA 126 and EH 101	4	MA 126
EE 220	Circuit Analysis	MA 125 and PH 201	3	CPE 260
EE 263	Digital Logic Design	CPE 260	3	
<b>History/ English Literature</b>		EH 102	3	
			<b>17</b>	Grade of "C" or better required in all Milestones for PCS

Term 4	Course Description	Pre-req	Cr Hrs	Milestone Notes
MA 238	Differential Equations	MA 227 (cc)	3	EE 220
EE 223	Network Analysis	EE 220, PH 202, MA 227 (cc) and MA 238 (cc)	3	EE 263 or CSC 228
EE 268	Digital Logic Design Lab	EE 263 or CSC 228	1	Obtain PCS
EE 264	Microprocess Systems and Interfacing	EE 263 or CSC 228	3	
MA 237	Linear Algebra	MA 126	3	
EG 270	Thermodynamics	MA 126 and PH 201	3	
			<b>16</b>	Grade of "C" or better required in all Milestones for PCS

Term 5	Course Description	Pre-req	Cr Hrs	Milestone Notes
EE 227	Circuits and Devices Lab	EE 223 (cc) and EH 102	1	EH 102
EE 321	Signals, Systems, and Digital	MA 238 and EE 223	3	
EE 331	Physical Electronics	CH 131, MA 238 and PH 202	3	
EE 354	Electromagnetics I	MA 237, MA 238, and PH 202	3	

EE 381	Electromechanical Energy Conversion	EE 223	3	
EE 368	Microprocess Systems and Interfacing Lab	EE 268 and EE 264 (cc)	1	
HY/Social/Behavioral Elective			3	
			<b>17</b>	

Term 6	Course Description	Pre-req	Cr Hrs	Milestone Notes
EE 322	Probability, Random Signals, and Statistical Analysis	MA 238 and EE 321 (cc)	3	
EE 328	Feedback Control Systems	EE 321	3	
EE 372	Introduction to Communications	EE 321 and EE 322 (cc)	3	
EE 355	Electromagnetics II	EE 354	3	
EE 385	Energy Conversion Lab	EE 381 and EE 227	1	
EE 334	Digital Electronics	EE 331	3	
			<b>16</b>	

Term 7	Course Description	Pre-req	Cr Hrs	Milestone Notes
Technical Elective	EE 400 level or higher		3	
EE 431	Analog Electronics	EE 334	3	
EE 465	Digital Signal Processing	EE 321 and EE 322	3	Apply for Graduation
Senior Technical Elective Lab	EE 400 level or higher		1	
EE 401 (W)	Introduction to ECE Design	EE 321, CA 110, EE 334 (cc), and EE 368 (cc)	1	
EG 231	Engineering Economics and Ethics	MA 126	3	
History/Social/Behavioral Elective			3	
			<b>17</b>	

Term 8	Course Description	Pre-req	Cr Hrs	Milestone Notes
Technical Elective	EE 400 level or higher		3	
Technical Elective	EE 400 level or higher		3	
EE 404 (W)	ECE Design	EE 401, EE 328, EE 334 and EE 368	3	
EE 437	Electronic Lab	EE 334 and EE 431 (cc)	1	
<b>History/ Social/ Behavioral Elective</b>			3	
			13	
		<b>**TOTAL</b>	<b>129</b>	

All bolded courses meet general education requirements. See the departmental flow chart for the current listing of courses.

Courses listed as Milestones are required to obtain Professional Component Standing (PCS). All Milestone courses require a grade of "C" or better. Prerequisite courses denoted (cc) may be taken concurrently.

\*Students who earn an English ACT score of 27, or a written SAT score of 610, can opt out of EH 101.

**\*\*Students not Term 1-Calculus I ready will exceed the 129 hours required for this degree. If math is not started prior to Fall of Year 1, you are likely extending your four-year graduation timetable. Students with ACT Math scores 21 and below should begin math courses in the summer before Fall of Year 1.**

#### **No 300 level courses can be taken without PCS**

Two designated writing (W) courses are required with at least one course chosen from offerings in the student's major or minor. Courses carrying this required credit are identified in the University Bulletin by a (W) after the course title.

The Sample 4-year plan is designed as a guide for students preparing for their course selections. This information provides only a suggested schedule. Actual course selections should be made in consultation with an advisor.

## Department Information

Department of Electrical and Computer Engineering Administrative Staff		(251) 460-6117
Chair	Hulya Kirkici	
Professors	Kirkici, Steadman, Woods	
Associate Professors	El-Sharkh, Gong, Khan, Latif, Russ, Spencer, Thomas, Wang	
Assistant Professors	Shaban, Touma	
Emeritus Professors	Bosarge, Gungor, Sakla	
Part-time Instructor	Gholson, Sakla	

Department of Electrical and Computer Engineering website  
<https://www.southalabama.edu/colleges/engineering/ece/index.html>



The Department of Electrical and Computer Engineering offers the degrees of Bachelor of Science in Electrical Engineering (BSEE) and Bachelor of Science in Computer Engineering (BSCpE), both granted by the College of Engineering. The BSCpE program is administered by the ECE Department in collaboration with the School of Computing. The ECE Department also offers the degree of Master of Science in Electrical Engineering.

## **BSEE Program Educational Objectives**

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The program educational objectives (PEOs) of the Electrical Engineering Degree Program are to produce graduates who, during their first few years after graduation, will:

1. Achieve professional advancement with increasing responsibility, leadership, and mentorship.
2. Function effectively on multidisciplinary teams, and individually, to develop and apply electrical engineering solutions within a global, societal, and environmental context.
3. Communicate effectively and manage resources skillfully as members and leaders of their profession.
4. Advance professional competence through continuous learning such as studying for advanced degrees, professional registration, and leadership through ethical standards and professionalism.

## **BSEE Student Outcomes**

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By the time of graduation from the Electrical Engineering Program, students should attain the following outcomes:

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 specified 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.

The BSEE curriculum is designed to ensure the attainment of the student outcomes.

The Bachelor of Science in Electrical Engineering program is accredited by the Engineering Accreditation Commission of ABET, <http://www.abet.org>

Electrical Engineering is among the fastest evolving disciplines in our technological society. Engineering developments in electrical technology have provided, in a substantial way, improvement in the standard of living of humanity. The domain of the electrical engineer reaches from massive electrical energy systems to microscopic integrated circuits; from life studies in bioengineering to satellite communications systems; and from the control of electromagnetic radiation to the control of information flow in this field.

The highly diverse and rapidly evolving characteristics of this field requires a thorough understanding of fundamentals as well as flexibility in the design of individualized programs of study.

Therefore, emphasis is placed on mathematics, physics, humanities, social sciences, basic sciences and engineering sciences during the first two years. Sufficient flexibility is provided at the senior level to allow a student, in consultation with an advisor, to prepare a specialized course of study in six main concentration areas from the broad field of electrical engineering: 1 – Control Systems, 2 – Communications and Networks, 3 – Digital Systems, 4 – Electromagnetics and Optics, 5 – Electronics, and 6 – Power Systems. In addition, means are provided, through the Electrical and Computer Engineering Design Laboratory, for a student to pursue a design topic outside of, but related to, the formal coursework.

Students are required to take general education (GenEd) elective courses in four broad areas: (i) Literature, (ii) Humanities and Fine Arts, (iii) Natural Science and Mathematics and (iv) History, Social, and Behavioral Sciences. These courses provide breadth to the educational experience of Electrical Engineering and Computer Engineering students. They must be planned, in consultation with an academic advisor, to reflect a rationale appropriate to the educational objectives of the Departmental Programs, while conforming strictly to the requirements of the Articulation and General Studies Committee of the State of Alabama.

All students are required to successfully complete EH 101 and EH 102, English Composition I and II from area (i), plus a minimum of 18 semester hours of general education courses from areas (ii) and (iv). In area (ii), Public Speaking (CA110) is required for all Electrical and Computer Engineering students. Of the two remaining courses, one course must be in literature and one course must be in the fine arts. In area (iv), at least one course must be in history and at least one course must be from disciplines in the social and behavioral sciences.

Students in Electrical Engineering are required to become Student Members of the Institute of Electrical and Electronics Engineers (IEEE) when they enroll in EE 401 and EE 404. Through participation in the activities of such technical organizations the student becomes aware of the activities of electrical and computer engineers in society. An excellent opportunity is provided to students for contact with practicing professionals as well as fellow students.

Any Electrical Engineering student interested in pursuing a career in medicine or bioengineering should consult with an advisor for an appropriate sequence of courses which will meet the minimum requirements for entry into a medical school or the necessary life sciences background to enter a graduate program in bioengineering.

The award of the BSEE degree will allow the graduate to enter the professions of electrical engineering directly, or to continue his/her education at the graduate level.

### **BSCpE Program Educational Objectives**

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The program educational objectives (PEOs) of the Computer Engineering Degree Program are to produce graduates who, during their first few years after graduation, will:

1. Achieve professional advancement with increasing responsibility, leadership and mentorship.
2. Function effectively on multidisciplinary teams, and individually, to develop and apply computer engineering solutions within a global, societal, and environmental context.
3. Communicate effectively and manage resources skillfully as members and leaders of their profession.
4. Advance professional competence through continuous learning such studying for advanced degrees, professional registration, and leadership through ethical standards and professionalism.

### **BSCpE Student Outcomes**

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By the time of graduation from the BSCpE program, a student will have demonstrated attainment of the following outcomes:

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 specified 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

The BSCpE curriculum is designed to ensure the attainment of the student outcomes.

The Bachelor of Science in Computer Engineering program is accredited by the Engineering Accreditation Commission of ABET, <http://www.abet.org>

The Computer Engineering program is geared to students who are interested in the design of digital computing systems, integrating both hardware and software design components.

In the Computer Engineering Degree Program, sequences of courses are chosen from Electrical and Computer Engineering and from Computer Science that produce an in-depth treatment of digital logic and systems theory. In addition, means are provided through the Electrical and Computer Engineering Design Laboratory, for a student to pursue a design topic outside of, but related to, the formal coursework.

Students are required to take general education (GenEd) elective courses in four broad areas: (i) Literature, (ii) Humanities and Fine Arts, (iii) Natural Science and Mathematics and (iv) History, Social, and Behavioral Sciences. These courses provide breadth to the educational experience of Electrical Engineering and Computer Engineering students. They must be planned,

in consultation with an academic advisor, to reflect a rationale appropriate to the educational objectives of the Departmental Programs, while conforming strictly to the requirements of the Articulation and General Studies Committee of the State of Alabama.

All students are required to successfully complete EH 101 and EH 102, English Composition I and II from area (i), plus a minimum of 18 semester hours of general education courses from areas (ii) and (iv). In area (ii), Public Speaking (CA 110) is required for all Electrical and Computer Engineering students. Of the two remaining courses, one course must be in literature and one course must be in the fine arts. In area (iv), at least one course must be in history and at least one course must be from disciplines in the social and behavioral sciences.

Students in Computer Engineering are required to become members of either the Institute of Electrical and Electronics Engineers (IEEE) or the Association for Computing Machinery (ACM) when they enroll in EE 401 and EE 404. Through participation in the activities of such technical organizations the student becomes aware of the activities of electrical and computer engineers in society. An excellent opportunity is provided to students for contact with practicing professionals as well as fellow students.

Any Computer Engineering student interested in pursuing a career in medicine or bioengineering should consult with an advisor for an appropriate sequence of courses which will meet the minimum requirements for entry into a medical school or the necessary life sciences background to enter a graduate program in bioengineering.

The award of the BSCpE degree will allow the graduate to enter the professions of electrical engineering or computer engineering directly, or to continue his/her education at the graduate level.

### **BSEE And BSCpE Accelerated Bachelor's To Master's (ABM) Degree Option**

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The Department of Electrical and Computer Engineering allows well-qualified EE and CpE undergraduates to follow an "Accelerated Bachelor's to Master's" study plan. This plan permits up to six credit hours of graduate coursework to count towards both the Bachelor's (as Technical Electives) and the Master's degrees, so that the Master's degree is earned faster than usual. (The coursework concerned must individually satisfy the requirements of both degrees.) See a departmental advisor for specific details.

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