

Computer Engineering (BS)

Degree Requirements

General Education Requirements (54 Hours)

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 from: 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 hours from: HY 101, HY 102, HY 135, HY 136
- B. 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 (4 Courses, 14 Hours)

- A. 14 hours from: MA 126, MA 227, MA 238, MA 267

Major Requirements (75 Hours)

Computer Engineering Major Core (24 Courses, 62 Hours)

- A. 2 hours: EG 101 or EG 201
- B. 3 hours: EG 231
- C. 13 hours: CIS 210, CSC 231, CSC 311, CSC 322
- D. 14 hours: EE 220, EE 223, EE 227, EE 263, EE 264, EE 268
- E. 16 hours: EE 321, EE 322, EE 328, EE 331, EE 334, EE 368
- F. 14 hours: EE 401, EE 404, EE 431, EE 446, EE 454, EE 457

Computer Technical Electives For Hardware Track (4 Courses, 12 Hours)

- A. 6 hours from: EE 438, EE 439, *EE 440, *EE 441, *EE 443, EE 444, EE 465, EE 468, EE 469, EE 470, EE 471, EE 473, CSC 410, CSC 411, CSC 412, CSC 413, CSC 414, CSC 415, CSC 416, CSC 417, CSC 418, CSC 434, CSC 440
- B. 6 hours from: EE 438, EE 439, *EE 440, EE 441, *EE 443, EE 444, EE 465, EE 468, EE 469, EE 470, EE 471, EE 473
*Credit for both EE 440 & EE 443 not allowed OR

Computer Technical Electives For Software Track (4 Courses, 12 Hours)

- A. 9 hours from: CSC 331, CSC 332, CSC 333
- B. 3 hours from: EE 438, EE 439, *EE 440, EE 441, *EE 443, EE 444, EE 465, EE 468, EE 469, EE 470, EE 471, EE 473, CSC 410, CSC 411, CSC 412, CSC 413, CSC 414, CSC 415, CSC 416, CSC 417, CSC 418, CSC 434, CSC 440

Computer Senior Lab (1 Course, 1 Hour)

A. 1 hour from: EE 437, EE 447, EE 449

Minor Requirements (0 Hours)

A minor is not required for this degree program

Notes:

- Recommended Course
 - Hardware Track – Students will take 2 senior level EE or CSC Technical Elective courses along with 2 senior level EE Technical courses
 - Software Track – Students will take 1 senior level EE or CSC Technical Elective course along with CSC 331, CSC 332 and CSC 333.
 - Credit for both EE 440 & EE 443 not allowed
 - All undergraduates must complete two designated writing credit (W) courses, at least one of which must be in the student's major or minor
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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, CIS 210, 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

Computing Engineering (BS): (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 & Design	2
Gen Education	Area II or IV	3
Total Hours		16

First Year - Spring Semester

Course ID	Course Description	Hours
MA 126	Calculus II	4
PH 201/PH 201L	Calculus Based Physics I and Lab	4
EH 102	English Composition II	3
CIS 210	Intro to C++ Programming	3
Gen Education	Area II or IV	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 220	Circuit Analysis	3
EE 263	Digital Logic Design	3
MA 267	Discrete Math Structures	3
Total Hours		17

Second Year - Spring Semester

Course ID	Course Description	Hours
MA 238	Differential Equations	3
EE 223	Network Analysis	3
EE 264	Microprocessor Systems & Interfacing	3
EE 268	Digital Logic Lab	1
CSC 231	Intro to Data Structures & Algs	4
Gen Education	Area II or IV	3
Total Hours		17

Third Year - Fall Semester

Course ID	Course Description	Hours
EE 331	Physical Electronic	3
EE 321	Signals & Systems	3
EE 227	Circuits and Devices Lab	1
EG 231	Ethics & Engineering Economics	3

EE 368	Microprocessor Systems & Interfacing Lab	1
CSC 311	Networking and Communications	3
Gen Education	Area II or IV	3
Total Hours		17

Third Year - Spring Semester

Course ID	Course Description	Hours
EE 334	Digital Electronics	3
EE 328	Feedback Control Systems	3
EE 322	Probability	3
EE 457	Embedded Systems	3
EE 446**	Embedded Systems Lab	1
CSC 322	Operating Systems	3
Total Hours		16

Fourth Year - Fall Semester

Course ID	Course Description	Hours
EE 431	Analog Electronics	3
EE 401*	Intro to ECE Design	1
EE 454	Digital Computer Architecture	3
EE/CSC 4xx	Technical Elective	3
EE/CSC 4xx	Technical Elective	3
Gen Education	Area II or IV	3
Total Hours		16

Fourth Year - Spring Semester

Course ID	Course Description	Hours
EE 4xx	Technical Service Lab	1
EE 404**	ECE Design	3
EE/CSC 4xx	Technical Elective	3
EE/CSC 4xx	Technical Elective	3
Gen Education	Area II or IV	3
Total Hours		13

Notes

* EE Courses only taught in the fall semester

** EE Courses only taught in the spring semester

Major Milestones

COMPUTER 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	
Fine Arts Elective			3	
			16	
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 and EH 101 MA 126 (cc)	4	EH 101 or EH 105*
CIS 210	Introduction to C++ Programming	MA 125 (cc)	3	
CA 110	Public Speaking		3	
			17	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 201/201L
MA 267	Discrete Math	ACT Math 23	3	MA 126

PH 202/PH 202L	Physics II	PH 201 and MA 126 and EH 101	4	CIS 210
EE 220	Circuit Analysis	MA 125 and PH 201	3	
EE 263	Digital Logic Design	CIS 210	3	
			17	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	
CSC 231	Introduction to Data Structures and Algorithms	CIS 210 and MA 267 (cc)	4	
History/English Literature		EH 102	3	
			17	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	EE 223 (cc) and EH 102 (cc)	1	EH 102
EE 331	Physical Electronics	CH 131, MA 238 and PH 202	3	
EE 321	Signals, Systems, and Digital	MA 238 and EE 223	3	
EE 368	Microprocess Systems and Interfacing Lab	EE 268 and EE 264 (cc)	1	
EG 231	Engineering Economics and Ethics	MA 126	3	

CSC 311 (Fall only)	Networking and Communications	CSC 231	3	
History/ English Literature			3	
			17	

Term 6	Course Description	Pre-req	Cr Hrs	Milestone Notes
EE 334	Digital Electronics	EE 331	3	Apply for Graduation
EE 328	Feedback Control Systems	EE 321	3	
EE 322	Probability, Random Signals, and Statistical Analysis	MA 238 and EE 321 (cc)	3	
EE 446	Embedded Systems Design Lab	EE 457 (cc)	1	
EE 457	Embedded System Design	EE 264 and EE 368	3	
CSC 322 (Spring only)	Operating Systems	CSC 231	3	
			16	

Term 7	Course Description	Pre-req	Cr Hrs	Milestone Notes
Technical Elective	EE/CSC 400 level or higher		3	
Technical Elective	EE/CSC 400 level or higher		3	
EE 431	Analog Electronics	EE 334	3	
EE 401 (W)	Introduction to ECE Design	EE 321, CA 110, EE 334 (cc) and EE 368 (cc)	1	
EE 454	Digital Computer Architecture	EE 264 and EE 268	3	
Social/ Behavioral Elective			3	
			16	

Term 8	Course Description	Pre-req	Cr Hrs	Milestone Notes
Technical Elective	EE/CSC 400 level or higher		3	
Technical Elective	EE/CSC 400 level or higher		3	

Senior Technical Elective Lab	EE 400 level or higher		1
EE 404 (Spring only)	ECE Design	EE 401, EE 328, EE 334 and EE 368	3
Social/ Behavioral Elective			3
			13
**TOTAL			129

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 -Year 1, you are likely extending your four-year graduation time table. Students with ACT Math scores 21 and below should begin math courses in the summer before Fall - Year 1.****

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, Russ, Spencer, Thomas, Wang	
Assistant Professors	Latif, Lazarou, 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 consultation with the School of Computing. The ECE Department also offers the degree of Master of Science in Electrical Engineering.

BSEE Program Educational Objectives

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

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 a computer. 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.

The highly diverse and rapidly evolving characteristics of these fields require 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 while 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 two areas from the broad field of electrical and computer engineering.

BSCpE Program Educational Objectives

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

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>

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 in both degree programs, through the Electrical and Computer Engineering Design Laboratory, for a student to pursue a design topic outside of, but related to, the formal course work.

Students are required to take general education (GenEd) elective courses in two broad areas: (i) Literature, Humanities and Fine Arts, and (ii) 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.

A minimum of 18 semester hours from areas (i) and (ii) above must be successfully completed. In area (i), 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 (ii), 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 and Computing 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. 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 Electrical and 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 attainment of the BSEE or 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 Accelerated Bachelor's – Master's (ABM) Degree Option

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.