Electrical Engineering (MS)

Degree Requirements

With the ever-increasing pace of technological development in society, new and challenging opportunities are becoming available that require engineering graduates with increased levels of specialization. To provide for this, the Electrical and Computer Engineering Department offers electrical engineering and computer engineering graduates a cutting-edge program in graduate studies leading to the Master of Science in Electrical Engineering (MSEE) degree.

The program offers advanced level courses and areas of specialization in computer engineering, digital controls, laser-assisted fabrication, microelectronics, networks, image processing, pattern recognition, wireless communications, optical information processing and power systems. Graduate students have wide opportunities to undertake front-line engineering research alongside faculty for both thesis and project work. In addition, a course work-only program is also offered by the department for those in industry who intend to further their professional development while pursuing a graduate degree.

Admission To The MSEE Program

The following criteria supplement the College of Engineering admission criteria (see ADMISSION TO GRADUATE PROGRAMS):

1. Regular Admission
   a. A B.S. degree in electrical or computer engineering.
   b. A grade-point average of 3.0 or greater (A=4.0) on all undergraduate work.
   c. A minimum GRE score of 151 and a minimum GRE Verbal score of 141. GRE scores are not required from applicants who received their undergraduate degrees in electrical or computer engineering from ABET-accredited institutions.
   d. For International students, a minimum score of 550 on the written Test of English as a Foreign Language (TOEFL) or a 79 score on the Internet-based TOEFL exam, or a minimum score of Band 6.5 on the International English Language Testing System (IELTS) test.

2. Provisional Admission
   a. A B.S. degree in electrical or computer engineering, or in a field acceptable to the departmental Graduate Admissions Committee. Depending on the student's background, additional undergraduate preparatory courses may be required. These courses will not count toward the Masters degree.
   b. A minimum grade-point average of 2.5 (A=4.0) on all undergraduate work, including a minimum grade-point average of 2.5 over the last 64 course hours of undergraduate work. Alternatively, a minimum grade-point average of 2.75 over the last 64 course hours of undergraduate work is required.
   c. A minimum GRE combined score greater than or equal to 283 (Verbal + Quantitative). GRE scores are not required from applicants who received their undergraduate degrees in electrical or computer engineering from ABET-accredited institutions.
   d. For International students, a minimum score of 525 on the written Test of English as a Foreign Language (TOEFL) or a 71 score on the Internet-based TOEFL exam, or a minimum score of Band 6.0 on the International English Language Testing System (IELTS) test.

The minimum credit hour requirements for the different options pertaining to the MSEE degree are:

- Thesis Option: 30 credit hours
- Project Option: 30 credit hours
- Course Option: 30 credit hours

The details of each option are contained in the Electrical and Computer Engineering Department Guidelines for the MSEE program.

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

### 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 and 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 advanced degrees, professional registration, 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. The engineering developments in electrical technology have provided, in a substantial way, for 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 as advanced degrees, professional registration, leadership through ethical standards and professionalism.

**BSCpE Student Outcomes**

The student outcomes (SOs) of the Computer Engineering degree program are to produce graduates who at the time of graduation will have:

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.