Electrical Engineering - Undergraduate Programs

Accreditation

Accreditation is an assurance that the professionals that serve us have a solid educational foundation and are capable of leading the way in innovation, emerging technologies, and in anticipating the welfare and safety needs of the public. The Electrical Engineering Department at the University of Texas at Arlington has been continuously accredited since 1965 by the Engineering Accreditation Commission of ABET, http://www.abet.org.

Overview of Electrical Engineering

Electrical Engineering is a cross-cutting field that includes power systems, control systems, microelectronics and nanoelectronics, embedded systems and computer networks, communications (wireless, including cellular and satellite, and wired/fiber optic), remote sensing, signal and data processing, optics (electro-optics, optoelectronics and photonics) and other emerging technologies. Modern applications include renewable energy sources and microgrids, 4G and 5G cellular phones and base stations, Internet of Things (IoT), machine learning, deep learning (such as neural networks), medical devices and instruments, electric vehicles, vehicular networking, and assisted/autonomous vehicles (including drones and robots), and many others.

Electrical engineers must be prepared to apply fundamental concepts in the applications of new technologies and to contribute to the growth of these technologies. They must also have the skills to communicate their ideas and to manage projects within a schedule and budget. Because of the broad nature of the field, electrical engineers are involved in a wide range of engineering design projects and they must be able to employ knowledge from other disciplines in electrical engineering designs. They must also be prepared to support engineers in other disciplines.

Engineering designs are a team effort and require good communication skills, both oral and written. Therefore it is important that each student develops these necessary communication skills.

The benefit of having an education in electrical engineering is that the student is prepared for a career not only in technical areas but also for further training in other disciplines that require strong organizational and analytical skills such as medicine, law, public policy, business, economics, management, and teaching.

Educational Objectives of the Undergraduate Program

The Program Educational Objectives are to produce graduates who:

- Advance the mission of their organization by significantly contributing to any of the following disciplines: component and/or system design, R&D, manufacturing, customer support, technical training, sales and marketing.
- Demonstrate leadership in one or more significant roles since graduation, as evidenced for example by successful entrepreneurship in a start-up, significant promotions and awards in a company or engineering firm.
- Successfully build on the BSEE degree from UTA by: completing a graduate degree; or taking professional course(s); or earning professional certificate(s).

Student Outcomes of the Undergraduate Program

From these Program Educational Objectives, the department designed its baccalaureate program to offer its graduates the following student learning outcomes:

- 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

The program has been continuously accredited since 1965 by the Engineering Accreditation Commission (EAC) of ABET, http://www.abet.org.

Admission Requirements

Requirements for admission as an EE major are governed by the requirements as stated in the College of Engineering section of this catalog. EE majors are only allowed to enroll in pre-professional courses until they meet the requirements for the professional program as outlined below.

Undergraduate Advising

General academic advising for new students (excluding transfer course evaluation) is done during the scheduled orientation period prior to registration. Academic advising for continuing students will be done during each semester prior to registration. The dates for advising new and continuing students will be listed in the appropriate schedule of classes. Personal academic advising is available in the office of the Undergraduate Advisor during the semester by appointment. To graduate, the student must have an approved degree plan on file in the Registrar's Office.

The students can use the course sequences described above to plan their studies. Recommended electives are listed in the advising office and on the Web site at https://www.uta.edu/academics/schools-colleges/engineering/academics/departments/electrical (https://www.uta.edu/academics/schools-colleges/engineering/academics/departments/electrical/). A supplemental EE Undergraduate Program Guide is available in the Advising Office; it provides more details of the different areas of specialization in Electrical Engineering as well as on other matters relevant to completing the BSEE degree.

Admission to the Professional Program

Requirements for admission to the professional program in Electrical Engineering are in accordance with those of the College of Engineering with the following added stipulations:

- Application to the professional program is to be made to the Undergraduate Advisor during the semester that the advancement requirements are being completed.
- No professional electrical engineering courses may be taken until the student is admitted into the professional program or obtains the written consent of the Undergraduate Advisor.
- Each student must complete all pre-professional courses stipulated under "Requirements for a Bachelor of Science Degree in Electrical Engineering" with a minimum grade of C in each course and a minimum GPA of 2.25 in:
  i. all courses,
  ii. in all math, science, and engineering courses, and
  iii. in all EE courses.

To graduate, the student must be admitted to the professional program and have an approved degree plan on file in the Registrar's office. The degree plan is generated upon entry to the professional program. Graduating seniors should apply to graduate during the next-to-last semester. Each student must complete all professional level electrical engineering courses stipulated under "Requirements for a Bachelor of Science Degree in Electrical Engineering" with a minimum grade of C in each course. All engineering courses used on the BSEE degree plan must be C or better.

Program Features

The pre-professional program reflects a concentration of preliminary science, mathematics, and engineering courses to prepare the student for the professional engineering program. EE students are admitted to the professional program as described above. The pre-professional program consists of core courses in electronics; digital systems, microprocessors, and computer programming. The professional program consists of core courses in electromagnetics; power systems and energy conversion; continuous and discrete time systems; controls; and communications. The core curriculum provides the needed foundation for a variety of technical areas in electrical engineering. The design experience is emphasized throughout the program, with particular emphasis on the team concept in the engineering design courses. Through careful selection of technical electives, the student may specialize in certain fields of electrical engineering. Information on these areas is available in the Electrical Engineering Department Advising Office. In addition, there are opportunities to participate in ongoing research projects of the faculty in Electrical Engineering. Independent study credit can be obtained through EE 4391 ADVANCED PROBLEMS IN ELECTRICAL ENGINEERING.

Cooperative Education Program

Cooperative education opportunities are plentiful for EE students. Interested students should contact the Cooperative Education Office in the College of Engineering.

Master's Degree Path

The electrical engineering field is continually evolving in all areas. To stay current in technical areas requires a commitment to lifelong learning. Completing a master's degree certainly gives the student a head start on this.

Students graduating with a GPA of 3.0 or higher and GRE scores of 146 verbal or higher, 156 quantitative or higher, and 3.0 writing can be admitted to the EE master's program upon application. Interested students should contact the graduate advisor. Students can take a project course, EE 4391, as one of their technical electives to begin their studies on a topic that they may use for their MS research and thesis. Also, students that require less than 12 hours to graduate can dual enroll in the graduate program in the last semester of their BS program.

Fast Track Program for Master of Science in Electrical Engineering

Students within 30 credit hours of completing their bachelor's degree with a GPA of at least 3.5 may be eligible for admission into the Fast Track Program for Master of Science in Electrical Engineering. Once admitted, students will be allowed to take select graduate courses that may be used to satisfy both bachelor's and master's degree requirements. Interested students should contact the graduate advisor.

Competence in Oral Communication and Computer Use Certificate

Electrical Engineering students will satisfy the University Competence in Oral Presentations requirement by completing the course COMS 2302. They will satisfy the University Competence in Computer Use requirement by completing EE 1311 and EE1201

Requirements for a Bachelor of Science Degree in Electrical Engineering

The program is divided into a pre-professional program and a professional engineering program, with the division essentially occurring between the sophomore and junior years.

Pre Professional Requirements that may also satisfy Core requirements [1]		**26**
UNIV 1131	STUDENT SUCCESS [5]	
ENGL 1301	RHETORIC AND COMPOSITION I	
ENGL 1302	RHETORIC AND COMPOSITION II	
MATH 1426	CALCULUS I [2]	
MATH 2425	CALCULUS II	
MATH 2326	CALCULUS III	
PHYS 1443	GENERAL TECHNICAL PHYSICS I	
PHYS 1444	GENERAL TECHNICAL PHYSICS II	
General Education		**24**
History Electives: 6 hours of history courses that satisfy University Core Curriculum requirements		
POLS 2311	GOVERNMENT OF THE UNITED STATES	
POLS 2312	STATE AND LOCAL GOVERNMENT	
English literature elective: Any English or modern and classical languages literature that meets the 3 University Core Curriculum requirement for Language, Philosophy and Culture is accepted.		
Communication: COMS 2302		
Creative arts elective: any course which satisfies the University Core Curriculum requirements for Creative Arts is accepted. [3]		
Social/behavioral elective: ECON 2305		
Program Requirements		
MATH 3319	DIFFERENTIAL EQUATIONS & LINEAR ALGEBRA	3
CHEM 1465	CHEMISTRY FOR ENGINEERS [4]	4
EE 1201	INTRODUCTION TO ELECTRICAL ENGINEERING	2
EE 1106	ELECTRICAL ENGINEERING FRESHMAN PRACTICUM	1
EE 1311	COMPUTING SYSTEM AND ALGORITHMIC SOLUTIONS	3
EE 2315	CIRCUIT ANALYSIS I	3
EE 2240	SOPHOMORE PROJECT LABORATORY	2
EE 2347	MATHEMATICAL FOUNDATIONS OF ELECTRICAL ENGINEERING	3
EE 2302	PRINCIPLES OF ACTIVE AND PASSIVE DEVICES	3
EE 2303	ELECTRONICS I	3
EE 2341	DIGITAL CIRCUITS AND SYSTEMS	3
Professional Courses		
EE 3316	CONTINUOUS AND DISCRETE SIGNALS AND SYSTEMS	3
EE 3330	PROBABILITY AND STATISTICAL METHODS	3
EE 3346	CIRCUIT ANALYSIS II	3
EE 3407	ELECTROMAGNETICS	4
EE 3318	ANALOG AND DIGITAL SIGNAL PROCESSING	3
EE 3314	FUNDAMENTALS OF EMBEDDED CONTROL SYSTEMS	3
EE 3240	JUNIOR PROJECT LABORATORY	2
EE 4240	CONCEPTS & EXERCISES IN ENGINEERING PRACTICE	2
EE 4149	ENGINEERING DESIGN PROJECT	1

Select four Electrical Engineering Junior/Senior Elective courses		12
Select one Engineering Elective course (also includes Electrical Engineering) [3]		3
Select one 3000/4000 courses in Mathematics or Science Elective [3]		3
MAE 3309	THERMAL ENGINEERING	3
Total Hours		**125**

1 All pre-professional courses must be completed before enrolling in professional program courses
2 The Mathematics Department requires passing a placement test provided by the Mathematics Department before enrolling.
3 A list of acceptable electives is available in the EE Dept. advising office.
4 Chem 1465 can be substituted with Chem 1441 and Chem 1442 (8 hours).
5 For transfer students, UNIV 1131 can be substituted with ENGR 1101.
6 Total hours will depend upon prior preparation and academic qualifications. Also, students who do not have two units of high school foreign language will be required to take two courses of foreign language in addition to the previously listed requirements.

Recommended Core Curriculum

Electrical Engineering students will satisfy the university core curriculum requirement by completing all General Education courses specified under "Requirements for a Bachelor of Science Degree in Electrical Engineering" along with ENGL 1301, ENGL 1302, MATH 1426, MATH 2425, MATH 2326, MATH 3319, PHYS 1443 and PHYS 1444, which are also part of the Pre-Professional Program. For more information, see University Core Curriculum (http://catalog.uta.edu/archives/2023-2024/academicregulations/degreerequirements/generalcorerequirements/).

Refer to the College of Engineering section of this catalog for information concerning the following topics: Admission into Engineering, Admission into Pre-Engineering, Admission into the Professional Program, Counseling or Advising, Transfer and Change of Major Policies, Honors Program, Academic Regulations, Professional Engineering Registration, Cooperative Education, Academic Probation, Repeating Course Policy, and Academic Dishonesty.

Refer to the Electrical Engineering Department website for the suggested course sequence or contact the Undergraduate Advisor.

Requirements for a Minor in Electrical Engineering

To receive a minor in Electrical Engineering, a student must complete the following five courses in the boxed Course List below and, one elective from the following EE courses: EE 3302, EE 3314, EE 3318, EE 3346 or EE 3444 with a grade of C or better in each.

EE 2303	ELECTRONICS I	3
EE 2315	CIRCUIT ANALYSIS I	3
EE 2341	DIGITAL CIRCUITS AND SYSTEMS	3
EE 3407	ELECTROMAGNETICS	4
EE 3316	CONTINUOUS AND DISCRETE SIGNALS AND SYSTEMS	3

UNDERGRADUATE CERTIFICATE IN Electric propulsion

PROGRAM OBJECTIVE

The certificate program will emphasize the common aspects of Electric Propulsion including power electronics, electric machines and drives, or energy distribution systems. This program aims to employment opportunities of the participants, including UTA's students. Upon completion, students will be able to

- Model, analyze, or control power electronics circuits and systems
- Model, analyze, or control electric machines and drives
- Understand the impact of power quality

ADMISSION REQUIREMENTS

- A current enrollment at Junior level in an engineering undergraduate's program at UTA.
- If English is not the applicant's native language, he/she should meet the EE admission requirement on TOEFL iBT, or IELTS.

ACADEMIC REQUIREMENTS

Students must complete two (2) required/Core course and one (1) elective course as outlined. All courses used to satisfy the certificate requirements must be passed with a grade of B or better. The time limit for completion of the Certificate Program is 2 years.

Required/Core Courses		
EE 4375	INTRODUCTION TO POWER ELECTRONICS	3
EE 4370	ELECTRIC MOTOR DRIVES	3

Elective Courses		
EE 4371	POWER SYSTEM PROTECTIVE RELAYING	3
EE 4372	POWER SYSTEM DISTRIBUTION	3
EE 4373	POWER QUALITY	3

Undergraduate Certificate in Embedded Systems

PROGRAM OBJECTIVE

The Undergraduate Certificate in Embedded Systems educates undergraduate students in the knowledge and skills required to design, develop, and deploy Embedded Systems including Industrial, Security, Entertainment and Automation Systems. This program aims at the dual goal of providing the UVS industry with a knowledgeable, locally available workforce and developing career opportunities for its participants.

Through this program the students will learn hardware/software development techniques for microprocessors and their programmable peripherals, perform DMA/SDRAM controller design, and real-world interfacing, gain proficiency in C programming, HDL, design of digital systems using programmable logic devices and high-level techniques.

ADMISSION REQUIREMENTS

- A current enrollment in an engineering undergraduate’s program at UTA with a minimum GPA of 3.0.
- If English is not the applicant's native language, he/she should meet the EE admission requirement on TOEFL iBT, or IELTS.

ACADEMIC REQUIREMENTS

Students must complete one (1) required/Core course and two (2) elective courses as outlined above. The average GPA of all courses used to satisfy the certificate requirements must be 3.0 or better. The time limit for completion of the Certificate Program is 6 years.

Required/Core Courses		
EE 4311	EMBEDDED MICROCONTROLLER SYSTEMS	3
Elective Courses		
EE 4310	MICROPROCESSOR SYSTEMS	3
EE 4312	ADVANCED MICROPROCESSOR SYSTEMS	3
EE 4334	PROGRAMMABLE LOGIC DESIGN	3

Undergraduate Certificate in Unmanned Vehicle Systems (UVS)

PROGRAM OBJECTIVE

The Certificate in Unmanned Vehicle Systems (UVS), offered through the Department of Electrical Engineering (EE), will educate undergraduate students in the knowledge and skills required for design, development and operation of UVS including Unmanned Aircraft Systems (UAS), Unmanned Ground Systems (UGS), and Unmanned Maritime Systems (UMS). The certificate program will emphasize common aspects of UVS such as sensors, actuators, communications, and more importantly, decision-making capabilities (autonomy), while also covering development of domain-specific mobile platforms such as airplane and rotorcraft. This program aims at the dual goal of providing the UVS industry with a knowledgeable, locally available workforce and developing career opportunities for its participants. To this end, the Certificate in UVS will be awarded concurrently with the BSEE degree.

ADMISSION REQUIREMENTS

- A Bachelor#s degree in an engineering discipline with a minimum GPA of 3.0 or a current enrollment in an engineering Master#s program at UTA with a minimum GPA of 3.0.
- Those who desire to complete the certificate program without enrolling in
- Graduate degree program must be admitted to UTA as a non#degree seeking student.
- An essay detailing the applicant's background and skills as pertaining to UVS, his/her interest in a specific domain and his/her expected benefit from completing this program.

ACADEMIC REQUIREMENTS

Students must complete 15 hours of coursework as outlined below that include 9 hours of a core curriculum that is interdisciplinary and forms the basis of a common core in UVS Certificate and 6 hours of discipline specific curriculum. All courses used to satisfy the certificate requirements must be passed with a grade of B or better.

Required/Core Courses		
EE 5307	LINEAR SYSTEMS ENGINEERING	3
EE 6321	INTRODUCTION TO UNMANNED VEHICLE SYSTEMS	3
EE 6322	UNMANNED VEHICLE SYSTEM DEVELOPMENT	3

Elective Courses

EE 5321	OPTIMAL CONTROL	3
EE 5322	INTELLIGENT CONTROL SYSTEMS	3
EE 5325	ROBOTICS	3
EE 5327	SYSTEM IDENTIFICATION AND ESTIMATION	3
AE 5301	ADVANCED TOPICS IN AEROSPACE ENGINEERING	3
CSE 5369	SPECIAL TOPICS IN INTELLIGENT SYSTEMS	3
EE 5323	NONLINEAR SYSTEMS	3