

# Erik Jonsson School of Engineering and Computer Science

## Department of Electrical Engineering

### Electrical Engineering (B.S.E.E.)

#### Faculty

**Professors:** Naofal Al-Dhahir, Poras T. Balsara, Dinesh Bhatia, Andrew J. Blanchard, Cyrus D. Cantrell III, David Daniel, Babak Fahimi, John P. Fonseka, William R. Frensley, Andrea F. Fumagalli, John H.L. Hansen, C.R. Helms, Louis R. Hunt (Emeritus), Nasser Kehtarnavaz, Kamran Kiasaleh, Jeong-Bong Lee, Gil S. Lee, Duncan L. MacFarlane, Aria Nosratinia, Mehrdad Nourani, Kenneth O. Raimund J. Ober, Lawrence J. Overzet, William J. Pervin (Emeritus), Carl Sechen, Don W. Shaw (Emeritus), Mark W. Spong, Lakshman S. Tamil, Dian Zhou

**Associate Professors:** Gerald O. Burnham, Yun Chiu, Walter Hu, Hoi Lee, Jin Liu, Dongsheng Ma, Yiorgos Makris, Hlaing Minn, Won Namgoong, Issa Panahi, Robert Rennaker, Mohammad Saquib, Murat Torlak

**Assistant Professors:** Bhaskar Banerjee, Carlos Busso, Nickolas Gans, Rashaunda Henderson, Roozbeh Jafari

**Research Professors:** Walter Duncan, Sam Schichijo

**Research Assistant Professor:** Wooil Kim

**Senior Lecturers:** Charles P. Bernardin, Nathan B. Dodge, Edward J. Esposito, Jung Lee, Randall E. Lehmann, P. K. Rajasekaran, Ricardo Saad, Marco Tacca

**Affiliated Faculty:** Larry P. Ammann (Math Sciences), Leonidas Bleris (Bioengineering), Yves J. Chabal (Materials Science and Engineering), Matthew Goeckner (Math Sciences), Bruce E. Gnade (Materials Science and Engineering), Jiyoung Kim (Materials Science and Engineering), Moon J. Kim (Materials Science and Engineering), Yang Liu (Computer Science), Mario A. Rotea (Mechanical Engineering), Mathukumalli Vidyasagar (Bioengineering), Robert M. Wallace (Materials Science and Engineering), Stephen Yurkovich (Systems Engineering)

The Electrical Engineering Department offers a bachelor's degree in Electrical Engineering. The Electrical Engineering program offers students an opportunity to acquire a solid foundation in the broad areas of electrical engineering and emphasizes advanced study in digital systems, digital signal processing, communications, analog systems, RF/microwave, and microelectronics.

The Electrical Engineering program offers students a solid educational foundation in the areas of electrical networks, electronics, electromagnetics, computers, digital systems, and communications and is accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology (ABET). Mastery of these areas provides students with the ability to

adapt and maintain leadership roles in their post-baccalaureate pursuits through the application of fundamental principles to a rapidly changing and growing discipline.

Students in the Electrical Engineering program a broad general program in electrical engineering and can then take advanced courses in computer hardware and software; the analysis and design of analog and digital communication systems; analog and digital signal processing; the analysis, design, and fabrication of microelectronic components and systems; and guided and unguided wave propagation. A broad choice of electives (within and external to electrical engineering) allows students to broaden their education as well as develop expertise in areas of particular interest. In keeping with the role of a professional, students are expected to develop communication skills and an awareness of the relationship between technology and society.

The Electrical Engineering program is based on a solid foundation of science and mathematics coursework. Students in this program are given an opportunity to learn and extend their abilities to analyze and solve complex problems and to design new uses of technology to serve today's society. The engineering programs at UT Dallas provide an integrated educational experience directed toward the development of the ability to apply pertinent knowledge to the identification and solution of practical problems in Electrical and other related engineering fields. These programs ensure that the design experience, which includes both analytical and experimental studies, is integrated throughout the curriculum in a sequential development leading to advanced work. Design problems are frequently assigned in both lecture and laboratory courses. Each student is required to complete a major design project during the senior year. In addition, established cooperative education programs with area industry serve to further supplement design experiences.

## Mission of the Electrical Engineering Program

The focus of the Electrical Engineering degree is to provide excellent education in modern electrical engineering practice. Our graduates are uniquely qualified for rewarding and successful careers in materials, devices, circuits, digital systems, signal processing, and communications. In the spring of 2005 the EE faculty adopted a new set of Program Educational Objectives that refined the prior objectives and established measurements and benchmarks to monitor progress. A feedback mechanism using Alumni Surveys (by the ECS Office of Assessment) and other tools are used to measure progress toward these objectives.

## Program Educational Objectives for Electrical Engineering

One broad goal for the Erik Jonsson School is an excellent education for our students.

Within a few years of graduation, graduates of the Electrical Engineering program should:

- Have a successful, long-lived engineering based career path
- Meet the needs of industry
- Contribute to, and/or lead engineering based teams
- Actively pursue continuing (lifelong) learning

## High School Preparation

Engineering education requires a strong high school preparation. Pre-engineering students should have high school preparation of at least one-half year in trigonometry and at least one year each in elementary algebra, intermediate and advanced algebra, plane geometry, chemistry, and physics, thus developing their competencies to the highest possible levels and preparing to move immediately into demanding college courses in calculus, calculus-based physics, and chemistry for science majors. It is also essential that pre-engineering students have the competence to read rapidly and with comprehension, and to write clearly and correctly.

## Lower-Division Study

All lower-division students in Electrical Engineering concentrate on mathematics, science and introductory engineering courses, building competence in these cornerstone areas for future application in upper-division engineering courses. The following requirements apply both to students seeking to transfer to UT Dallas from other institutions as well as to those currently enrolled at UT Dallas, whether in another school or in the Erik Jonsson School of Engineering and Computer Science.

## ABET Accreditation

The B.S. program in Electrical Engineering is accredited by the Engineering Accreditation Commission of ABET, [www.abet.org](http://www.abet.org).

## Academic Progress in Electrical Engineering

In order to make satisfactory academic progress as an Electrical Engineering major, a student must meet all University requirements for academic progress, and must earn a grade of C- or better in each of the major core courses. No "Major Requirement" course (as listed under Section II of the B.S.E.E. degree requirement) may be taken until the student has obtained a grade of C- or better in each of the prerequisites (if a higher grade requirement is stated for a specific class, the higher requirement applies).

## Bachelor of Science in Electrical Engineering

### Degree Requirements (128 hours)

I. Core Curriculum Requirements<sup>1</sup>: 42 hours

#### Communication (6 hours)

3 hours Communication ([RHET 1302](#))

3 hours Professional and Technical Communication ([ECS 3390](#))<sup>2</sup>

#### Social and Behavioral Sciences (15 hours)

6 hours Government ([GOVT 2301](#) and [GOVT 2302](#))

6 hours American History

3 hours Social and Behavioral Science elective ([ECS 3361](#))

**Humanities and Fine Arts (6 hours)**

3 hours Fine Arts ([ARTS 1301](#))

3 hours Humanities ([HUMA 1301](#))

**Mathematics and Quantitative Reasoning (6 hours)**

6 hours Calculus ([MATH 2417](#) and [MATH 2419](#))<sup>3</sup>

**Science (9 hours)**

8 hours Physics ([PHYS 2325](#), [PHYS 2125](#), [PHYS 2326](#) and [PHYS 2126](#))

4 hours Chemistry ([CHEM 1311](#) and [CHEM 1111](#))<sup>4</sup>

II. Major Requirements: 76 hours<sup>5</sup>

**Major Preparatory Courses (22 hours beyond Core Curriculum)**

[CHEM 1111](#) General Chemistry Laboratory I<sup>4, 5</sup>

[CHEM 1311](#) General Chemistry I<sup>4, 5</sup>

[CS 1325](#) Introduction to Programming

[ECS 1200](#) Introduction to Engineering and Computer Science<sup>6</sup>

[EE 1202](#) Introduction to Electrical Engineering<sup>6</sup>

[ENGR 2300](#) Linear Algebra for Engineers

[EE 2310](#) Introduction to Digital Systems

[MATH 2417](#) Calculus I<sup>3</sup>

[MATH 2419](#) Calculus II<sup>3</sup>

[MATH 2420](#) Differential Equations with Applications

[PHYS 2125](#) Physics Laboratory I

[PHYS 2126](#) Physics Laboratory II

[PHYS 2325](#) Mechanics

[PHYS 2326](#) Electromagnetism and Waves

**Major Core Courses (45 hours beyond Core Curriculum)**

[ECS 3361](#) Social Issues and Ethics in Computer Science and Engineering<sup>7</sup>

[ECS 3390](#) Professional and Technical Communication<sup>2</sup>

[EE 3101](#) Electrical Network Analysis Laboratory

[EE 3102](#) Signals and Systems Laboratory

[EE 3110](#) Electronic Devices Laboratory  
[EE 3111](#) Electronic Circuits Laboratory  
[EE 3120](#) Digital Circuits Laboratory  
[EE 3150](#) Communications Systems Laboratory  
[ENGR 3300](#) Advanced Engineering Mathematics  
[EE 3301](#) Electrical Network Analysis  
[EE 3302](#) Signals and Systems  
[EE 3310](#) Electronic Devices  
[EE 3311](#) Electronic Circuits  
[EE 3320](#) Digital Circuits  
[ENGR 3341](#) Probability Theory and Statistics  
[EE 3350](#) Communications Systems  
[EE 4301](#) Electromagnetic Engineering I  
[EE 4310](#) Systems and Controls  
[EE 4368](#) RF Circuit Design Principles  
[EE 4388](#) Senior Design Project I  
[EE 4389](#) Senior Design Project II

#### **Major Guided Electives (9 hours)**

Students pursuing the general program take 9 semester hours from any other 4000 level Electrical Engineering courses. Students pursuing a concentration in Microelectronics take 3 of the following courses:

[EE 4302](#) Electromagnetic Engineering II  
[EE 4304](#) Computer Architecture  
[EE 4325](#) Introduction to VLSI Design  
[EE 4330](#) Integrated Circuit Technology  
[EE 4340](#) Analog Integrated Circuit Analysis and Design  
[EE 4341](#) Digital Integrated Circuit Analysis and Design  
[EE 4391](#) Technology of Plasma

Students pursuing a concentration in Telecommunications take 3 of the following courses:

[EE 4360](#) Digital Communications  
[EE 4361](#) Introduction to Digital Signal Processing  
[EE 4365](#) Introduction to Wireless Communication

[EE 4367](#) Telecommunications Networks

[EE 4390](#) Computer Networks

[EE 4392](#) Introduction to Optical Systems

### III. Elective Requirements: 10 hours

#### Advanced Electives (6 hours)

All students are required to take at least six hours of advanced electives outside their major field of study. These must be either upper-division classes or lower-division classes that have prerequisites. Four of these hours may be satisfied with [MATH 2420](#) counted under Major Preparatory courses.

#### Free Electives (8 hours)

Both lower- and upper-division courses may count as free electives but students must complete at least 51 hours of upper-division credit to qualify for graduation.

Degree programs in the Erik Jonsson School of Engineering and Computer Science are governed by various accreditation boards that place restrictions on classes used to meet the curricular requirements of degrees they certify. For this reason, not all classes offered by the University can be used to meet elective requirements. Please check with your academic advisor before enrolling in classes you hope to use as free electives.

## Fast Track Baccalaureate/Master's Degrees

In response to the need for advanced education in electrical engineering, a Fast Track program is available to exceptionally well-qualified UT Dallas undergraduate students who meet the requirements for admission to the graduate school. The Fast Track program is designed to accelerate a student's education so that both a B.S.E.E. and an M.S.E.E. degree can be earned in five years of full-time study. This is accomplished by (1) taking courses (typically electives) during one or more summer semesters, and (2) beginning graduate course work during the senior year. Details of the requirements for admission to this program are available from the Associate Dean for Undergraduate Education.

## Honors Program

The Department of Electrical Engineering offers upper-division Honors for outstanding students in the B.S. Electrical Engineering degree program. This program offers special sections of designated classes and other activities designed to enhance the educational experience of exceptional students. Admission to the Honors programs requires a 3.500 or better GPA in at least 30 hours of coursework. Graduation with Honors requires a 3.500 or better GPA and completion of at least 6 honors classes. These honors classes must include either Senior Honors in Electrical Engineering ([EE 4399](#)) or Undergraduate Research in Electrical Engineering ([EE 4V98](#)) and a Senior Honors Thesis must be completed within one of those two classes. (While the topics may be related, the Senior Thesis does not replace the need for the student to complete a regular Senior Design Project). The other 5 honors classes can come from a mixture of Graduate level (up to a count of 4) classes and special honor sections of regular undergraduate EE classes (up to a count of 2). Current

undergraduate honors courses include but are not limited to [EE 2310\(H\)](#), [EE 3350\(H\)](#), [EE 4302](#), [EE 4399](#), and [EE 4V98](#). Course grades in the 6 honors classes used to determine Honors status must be B- or higher to qualify.

Departmental Honors with Distinction may be awarded to students whose Senior Honors Thesis is judged by a faculty committee to be of exemplary quality. Only students graduating with Departmental Honors are eligible. Thesis/projects must be submitted by the deadline that applies to M.S. Theses in the graduating semester to allow for proper evaluation. Students interested in Honors with Distinction are encouraged to start working on their thesis/project a year prior to graduation.

## Minors

The Department of Electrical Engineering does not offer minors at this time.

1. Curriculum Requirements can be fulfilled by other approved courses from accredited institutions of higher education. The courses listed in parentheses are recommended as the most efficient way to satisfy both Core Curriculum and Major Requirements at UT Dallas.
2. Hours fulfill the communication component of the Core Curriculum.
3. Six hours of Calculus are counted under Mathematics Core, and two hours of Calculus are counted as Major Preparatory Courses.
4. One hour of Chemistry is counted under Science core, and three hours are counted as Major Preparatory Courses.
5. Students must pass each of the EE, CS, Math and Science courses listed in this degree plan and each of their prerequisites, with a grade of C- or better.
6. Transfer students with sufficient background may petition to substitute upper level hours in the major for this class.
7. Hours contribute to the Social and Behavioral Sciences component of the Core Curriculum.

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