

# Department of Electrical Engineering

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## Murali Varanasi, Chair

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## Introduction

The Department of Electrical Engineering at the University of North Texas commits to achieving excellence in research and graduate education in major electrical engineering areas. Our primary goals include: (1) to provide high quality innovative educational programs at the undergraduate and graduate levels to foster learning, ethical standards, and leadership qualities; (2) to pursue excellence in research at the frontiers of electrical engineering; (3) to facilitate access to our faculty expertise and our modern facilities, and (4) to serve the industry, the profession, and other constituents in North Texas, the state and the nation.

## Research Laboratories

The Department of Electrical Engineering has state-of-the-art instructional and research laboratories and software to provide practical and advanced hands-on experiences. Some laboratories and instrumentation from other departments are also available for interdisciplinary work.

The **Computer-Aided Design Laboratory** provides infrastructure for computer-aided design (CAD), including several workstations with the latest CAD software to enable designing, testing and simulation of a range of electronic chip designs.

The **Communication and Signal Processing Laboratory** is equipped with specialized digital waveform generators, logic analyzers, spectrum analyzers, a vector network analyzer and a wireless communication analyzer. Research areas include information

and communication theory, source and channel coding, encryption, and wireless communication and networking.

The **Computer Vision and Intelligent Signal Processing Research Laboratory** is dedicated to the design and development of advanced computer vision and signal processing algorithms for various applications. Research areas include computer vision and image processing, pattern recognition, target identification and tracking, signal detection and estimation, robust signal processing, and information fusion from various sensor sources.

The **Radio Frequency and Electromagnetic Scattering Laboratory** has high radio frequency (RF) bandwidth equipment, transmitter/receiver pairs for experiments over a wide range of frequencies, test equipment for high-frequency pulsed signals, RF sensing and identification systems, microwave scattering near-field measurement equipment and advanced scattering simulation software.

The **Wireless Systems and Sensor Networks Research Laboratory** focuses on system-level assurance and integration issues that are critical for the design of high-performance wireless networks and intelligent sensor networks. Current research topics include measurement and modeling of wireless channels, experimental and theoretical study of system performance, integrated communications and positioning, real-time signal processing, coding theory, and optimum network deployment and connectivity. Research areas also include challenging applications to environmental monitoring in collaboration with the Environmental Observatory.

The **Environmental Observatory** focuses on the integration of real-time monitoring and modeling of ecosystem dynamics and global changes. Current research includes real-time monitoring-modeling of soil moisture dynamics, use of wireless sensor networks (in collaboration with the Wireless Systems and Sensor Networks Research Laboratory), watershed predictive models, use of weather radar precipitation data, biosensors, and development of automated monitors for ozone and other atmospheric constituents.

## Degree Program

The department offers a graduate program leading to the following degree:

- Master of Science with a major in electrical engineering.

## Master of Science

### Program Objectives

1. Graduates will achieve master's-level proficiency in electrical engineering subjects that include digital integrated circuit design, analog design, adaptive and statistical signal processing, coding theory, control system design, and computer vision and image analysis.
2. Graduates will attain a broad background in electrical engineering that provides them with a number of choices for future specialization, if needed.
3. Graduates will attain proficiency in both oral and written communication that is needed for achieving success in their future careers.
4. Graduates will learn how to learn and thereby attain the ability to pursue life-long learning and continued professional development.
5. Graduates will have experience in project-based learning and hence will be ready to engage in high-tech careers upon their graduation.

### Admission Requirements

The student must satisfy all the general admission requirements of the Toulouse School of Graduate Studies as well as the admission requirements of the electrical engineering department as follows:

1. Competitive score on the Graduate Record Examination (GRE).
2. Acceptable scores on the TOEFL for applicants whose native language is not English.
3. A GPA of at least 3.0 on undergraduate electrical engineering course work.
4. Course work in mathematics.

An overall evaluation of credentials is used as a basis for admission to the program. Leveling courses will be required for applicants with degrees other than electrical engineering.

### Admission to Candidacy

After removal of all deficiencies and upon completion of all the leveling courses described below, the student is required to submit a formal degree plan to his or her advisor and the dean of the School of Graduate Studies. Failure to fulfill these requirements may prevent a student from enrolling the following term/semester. Admission to candidacy is granted by the Dean of Graduate Studies after the degree plan has been approved.

### Leveling Courses

- Mathematics through multivariable calculus
- Physics including mechanics, electricity and magnetism
- EENG 2620, Signals and Systems
- EENG 2710, Digital Logic Design

- EENG 3520, Electronics II
- EENG 3710, Computer Organization
- EENG 3810, Communications Systems

All entering students must demonstrate knowledge of the material covered in the leveling courses by:

- completing the courses at UNT,
- completing similar courses at another recognized institution, or
- evidence based on employment experience.

A student may be required to pass a placement examination to fulfill this requirement.

### Degree Requirements

**Option A:** Thesis option with 24 semester hours of organized course work excluding undergraduate prerequisites and leveling courses, in addition to 6 hours of EENG 5950, Master's Thesis.

**Option B:** Non-Thesis option with 30 semester hours of organized course work and 3 semester hours of EENG 5890, Directed Study.

### Course Selection

- At least 12 hours of graduate electrical engineering courses.
- No more than 6 semester hours of special problems or directed study courses.
- Leveling courses: Students whose undergraduate majors were not electrical engineering must take additional leveling courses that will be determined by the electrical engineering graduate advisor on an individual basis.

## Courses of Instruction

All Courses of Instruction are located in one section at the back of this catalog.

### Course and Subject Guide

The "Course and Subject Guide," found in the Courses of Instruction section of this book, serves as a table of contents and provides quick access to subject areas and prefixes.