

Erik Jonsson School of Engineering and Computer Science

Graduate Program in Telecommunications Engineering

Objectives

The Graduate Program in Telecommunications Engineering (TE) provides intensive preparation for professional practice in the design, programming, theory, and applications of telecommunications networks. It is designed to serve the needs of engineers who wish to continue their education. The Telecommunications Engineering Program offers courses of study leading to the MS and a PhD degree in Telecommunications Engineering. Education and training is provided to both academically oriented students and students with professional goals in industrial or governmental occupations requiring advanced knowledge of telecommunications and related technology. A comprehensive program of evening courses is also offered, which enables part-time students to earn the MS and PhD degree or to select individual courses of interest. Courses and research are both offered in a variety of subfields of telecommunications engineering, including, fault-tolerant networks, digital communications, modulation and coding, electromagnetic-wave propagation, fiber and integrated optics, lasers, wireless communications, mobile computing, wireless multimedia, DWDM networks, QoS assurance protocols, network design and optimization, telecommunications software, performance of systems, ad-hoc and PCS wireless networks, network security and high speed transmission protocols.

Facilities

The Erik Jonsson School of Engineering and Computer Science has developed a state-of-the-art computational facility consisting of a network of Sun servers and Sun Engineering Workstations. All systems are connected via an extensive fiber-optic Ethernet, and through the Texas Higher Education Network, have direct access to most major national and international networks. In addition, many personal computers are available for student use.

The Engineering and Computer Science Building provides extensive facilities for research in telecommunications, microelectronics, and computer science. The TARGET Laboratory has state-of-the-art telecommunications equipment, which includes a number of transport nodes, data packet routers, voice over IP gears, and a cluster of Linux workstations for protocols development and testing. The Wireless Information Systems (WISLAB) and Antenna Measurement Laboratories at UT Dallas have a wealth of experimental equipment with a unique reconfigurable multiple antenna testbed. Having this testbed allows wireless researchers to integrate and to demonstrate radio functions (i.e. WiFi and WiMAX) in geographically different regions under different frequency

usage characteristics. With the aid of the Antenna Measurement Lab located in the Waterview Science and Technology Center (WSTC), the researchers can design, build, and test many type of antennas. The Optical Communications Laboratory includes attenuators, optical power meters, lasers, APD/p-i-n photodetectors, optical tables, and couplers and is available to support system level research in optical communications.

The Center for Systems, Communications, and Signal Processing, with the purpose of promoting research and education in general communications, signal processing, control systems, medical and biological systems, circuits and systems and related software, is located in the Erik Jonsson School. The Photonic Technology and Engineering Center (PhoTEC) has produced more than thirty PhD graduates. The PhoTEC faculty carry out research in enabling technologies for microelectronics and telecommunications.

The Digital Systems Laboratory includes a network of workstations, personal computers, FPGA development systems, and a wide spectrum of state-of-the-art commercial and academic design tools to support graduate research in VLSI design and computer architecture. In the Digital Signal Processing Laboratory several multi-CPU workstations are available in a network configuration for simulation experiments. Hardware development facilities for real time experimental systems are available and include microphone arrays, active noise controllers, speech compressors and echo cancellers. The Nonlinear Optics Laboratory has a dedicated network of Sun workstations for the development of simulation methods and software for optical transmission and communication systems, optical routers and all-optical networks. The Broadband Communication Laboratory has design and modeling tools for fiber and wireless transmission systems and networks, and all-optical packet routing and switching. The Advanced Communications Technologies (ACT) Laboratory provides a design and evaluation environment for the study of telecommunication systems and wireless and optical networks. ACT has facilities for designing network hardware, software, components, and applications.

In addition to the facilities on campus, cooperative arrangements have been established with many local industries to make their facilities available to UT Dallas graduate engineering students.

Master of Science in Telecommunications Engineering

30 semester credit hours minimum

Program Faculty

FACG> ecs-telecommunications-engineering-mste

Professors: Naofal Al-Dhahir, Farokh B. Bastani, Andrea Fumagalli, Zygmunt Haas, John H. L. Hansen, Jason Jue, Latifur Khan, Kamran Kiasaleh, Hlaing Minn, Neeraj Mittal, Aria Nosratinia, Mehrdad Nourani, Balakrishnan Prabhakaran, Ravi Prakash, Mohammad Saquib, Kamil Sarac, Lakshman Tamil, Murat Torlak, Subbarayan Venkatesan, W. Eric Wong, I-Ling Yen

Associate Professors: Jorge A. Cobb, Cong Liu

Assistant Professor: Shuang Hao

Professors Emeriti: William J. Pervin, Balaji Raghavachari

Professors of Instructions: Miguel Razo-Razo, Marco Tacca

Associate Professor of Instruction: Neeraj Gupta

NOTE> Please be advised, the admissions section below feeds in from a separate page. Any changes made to the admissions section below will not be retained. Please contact catalog@utdallas.edu with any questions.

Admission Requirements

The University's general admission requirements are discussed on the [Graduate Admission](#) page.

A student lacking undergraduate prerequisites for graduate courses in electrical engineering must complete these prerequisites or receive approval from the graduate advisor and the course instructor. A diagnostic examination may be required. Specific admission requirements follow.

A student entering the MS TE program should meet the following guidelines:

- An undergraduate preparation equivalent to a baccalaureate in electrical engineering from an accredited engineering program.
- A grade point average (GPA) in upper-division quantitative coursework of 3.0 or better on a 4.0 point scale.
- GRE revised scores of 154, 156, and 4 for the verbal, quantitative and analytical writing components, respectively, are advisable based on our experience with student success in the program.

Applicants must submit three letters of recommendation from individuals who are able to judge the candidate's probability of success in pursuing a program of study leading to the master's degree. Applicants must also submit an essay outlining the candidate's background, education, and professional goals.

Students from other engineering disciplines or from other science and math areas may be considered for admission to the program on a case-by-case basis; however, some additional coursework may be necessary before starting the master's program.

Degree Requirements

The University's general degree requirements are discussed on the [Graduate Policies and Procedures](#) page.

The MS TE degree requires a minimum of 30 semester credit hours.

All students must have an academic advisor and an approved degree plan. Courses taken without advisor approval will not count toward the 30 semester credit hour requirement. Successful completion of the approved course of studies leads to the MS TE degree.

The MS TE program has both a thesis and a non-thesis option. All part-time MS TE students will be assigned initially to the non-thesis option. Those wishing to elect the thesis option may do so by obtaining the approval of a faculty thesis supervisor. With the prior approval of an academic advisor, non-thesis students may count no more than 3 semester credit hours of research or individual instruction courses towards the 30 semester credit hour degree requirement.

All full-time, supported students are required to participate in the thesis option. The thesis option requires nine semester credit hours of research (of which three must be thesis semester credit hours), a written thesis submitted to the graduate school, and a formal public defense of the thesis. The supervising committee administers this defense and is chosen in consultation with the student's thesis advisor prior to enrolling for thesis credit. Research and thesis semester credit hours cannot be counted in an MS TE degree plan unless a thesis is written and successfully defended.

Department of Electrical and Computer Engineering will not accept any course that does not count towards degrees in the offering department.

Course Requirements

Each student must complete a total of 30 semester credit hours from three categories:

I. Required Concentration Core Courses: 15 semester credit hours

Each student must complete the following five (5) Concentration Core courses making a B- or better in each course and an overall GPA of 3.0 or better in the Concentration Core courses:

[TE 6385](#) Algorithmic Aspects of Telecommunication Networks

[EEESC 6349](#) Probability, Random Variables, and Statistics

[EEESC 6352](#) Digital Communication Systems

[CS 6352](#) Performance of Computer Systems and Networks

[CS 6390](#) Advanced Computer Networks

II. Recommended Elective Courses: 12 semester credit hours

Each student must complete four (4) recommended elective courses; two (2) from each of the following groups:

Recommended Electrical Engineering Electives

Choose two courses from the following:

[EEGR 6316](#) Fields and Waves

[EEOP 6310](#) Optical Communication Systems

[EEOP 7340](#) Optical Network Architectures and Protocols

[EERF 6311](#) RF and Microwave Circuits

[EERF 6394](#) Antenna Engineering and Wave Propagation

[EERF 6395](#) RF and Microwave Systems Engineering

[EESC 6340](#) Introduction to Telecommunications Networks

[EESC 6341](#) Information Theory

[EESC 6343](#) Detection and Estimation Theory

[EESC 6344](#) Coding Theory

[EESC 6353](#) Broadband Digital Communication

[EESC 6360](#) Digital Signal Processing I

[EESC 6361](#) Digital Signal Processing II

[EESC 6362](#) Introduction to Speech Processing

[EESC 6390](#) Introduction to Wireless Communication Systems

Recommended Computer Science Electives

Choose two courses from the following:

[CS 6349](#) Network Security

[CS 6360](#) Database Design

[CS 6363](#) Design and Analysis of Computer Algorithms

[CS 6368](#) Telecommunication Network Management

[CS 6378](#) Advanced Operating Systems

[CS 6381](#) Combinatorics and Graph Algorithms

[CS 6386](#) Telecommunication Software Design

[CS 6392](#) Mobile Computing Systems

[CS 6396](#) Real-Time Systems

- One pre-approved TE independent study is allowed in this group.
- Must be 6000 or above level courses.
- Thesis Option: Up to six (6) semester credit hours of research may be allowed in this group. Pre-approval by MS Thesis advisor is required.

III. ECS Free Electives: 3 semester credit hours

Each student must complete one (1) ECS Free Electives courses that satisfy the following:

- Must be a course in ECS School.
- Only one 5000 level course is allowed if: (a) is a pre-requisite to a course in the list above, and (b) it precedes the 6000 level course.

Doctor of Philosophy in Telecommunications Engineering

75 semester credit hours minimum beyond the baccalaureate degree

Each doctoral degree program is tailored to the student. The student must arrange a course program with the guidance and approval of a faculty member chosen as his/her graduate advisor. Adjustments can be made as the student's interests develop and a specific dissertation topic is chosen.

Program Faculty

FACG> ecs-telecommunications-engineering-phd

Professors: Naofal Al-Dhahir, Farokh B. Bastani, Andrea Fumagalli, Zygmunt Haas, John H. L. Hansen, Jason Jue, Latifur Khan, Kamran Kiasaleh, Hlaing Minn, Neeraj Mittal, Aria Nosratinia, Mehrdad Nourani, Balakrishnan Prabhakaran, Ravi Prakash, Mohammad Saquib, Kamil Sarac, Lakshman Tamil, Murat Torlak, Subbarayan Venkatesan, W. Eric Wong, I-Ling Yen

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catalog@utdallas.edu with any questions.

Admission Requirements

The University's general admission requirements are discussed on the [Graduate Admission](#) page.

The admission requirements will be basically the same as the existing ones for admission to the PhD programs in Electrical Engineering and Computer Science. The entrance requirements are:

- A master's degree in Telecommunications Engineering, Electrical Engineering, Computer Science or a closely associated discipline from an institution of higher education in the U.S. or from an acceptable foreign university. Consideration will be given to highly qualified students wishing to pursue the doctorate without satisfying all of the requirements for a master's degree.
- A grade point average (GPA) in graduate coursework of 3.5 or better on a 4.0 point scale.
- GRE revised scores of 154, 156, and 4 for the verbal, quantitative and analytical writing components, respectively, are advisable based on our experience with student success in the program.

Applicants must submit three letters of recommendation on official school or business letterhead or the UT Dallas Letter of Recommendation form from individuals who are familiar with the student record and able to judge the candidate's probability of success in purchasing doctoral study in Telecommunications Engineering.

Applicants must also submit a narrative describing their motivation for doctoral study and how it relates to their professional goals.

For students who are interested in a PhD but are unable to attend school full-time, there is a part-time option. The guidelines for admission to the program and the degree requirements are the same as for full-time PhD, students. All students must have an academic advisor and an approved plan of study.

Degree Requirements

The University's general degree requirements are discussed on the [Graduate Policies and Procedures](#) page.

The TE program for doctoral study is individually tailored to the student's background and research objectives by the student's supervisory committee. The program will require a minimum of 75 semester credit hours beyond the baccalaureate degree. These credits must include at least 30 semester credit hours of graduate level courses beyond the baccalaureate level in the major concentration. The core requirements for the PhD degree in Telecommunications Engineering are the same as the ones for the MS in Telecommunications Engineering. All PhD students must demonstrate competence in the master's level core courses in their research area. However, a student's supervising committee may impose course requirements that are necessary and

appropriate for the student's research program. It is expected that MS degree students planning to enter the proposed doctoral program will take most of the courses as part of their MS degree requirements. All students must have an academic advisor and an approved plan of study.

Also required are:

- A qualifying examination (QE), as approved by the TE graduate committee, demonstrating competence in the PhD candidate's research area. A student entering the PhD program with an MS degree must pass this exam within 3 long semesters, and a student entering with a BS degree must pass this exam within 4 long semesters. A student has, at most, two attempts at this qualifying exam. The exam will be given during the fall and spring semesters. Details of the QE policy can be found on the EE department website.
- At least half of the supervising committee must be comprised of core TE faculty members; it must be chaired or co- chaired by a TE faculty member.
- Completion of a major research project culminating in a dissertation demonstrating an original contribution to scientific knowledge and engineering practice. The dissertation will be defended publicly. The rules for this defense are specified by the Office of the Dean of Graduate Education. Neither a foreign language nor a minor is required for the PhD. However, the student's supervising committee may impose these or other requirements that it feels are necessary and appropriate to the student's degree program.

Areas of Research

The principal concentration areas for the Telecommunications Engineering graduate program are:

- Core and wireless networks
- Communications and signal processing
- Network design and protocols
- Embedded and reconfigurable systems
- Optical and photonic devices, materials and systems
- Fault-tolerant data networks

Doctoral level research opportunities include: VLSI design, reconfigurable systems, system architecture, fault-tolerant computing, digital signal processing, digital communications, modulation and coding, electromagnetic-wave propagation, fiber and integrated optics, lasers and optoelectronic devices, optical transmission systems, optical networks, wireless communications, mobile IP, wireless multimedia, DWDM networks, QoS assurance protocols, network design and optimization, ad-hoc and PCS wireless networks, network security and high speed transmission protocols.

Interdisciplinary Opportunities

In keeping with the established tradition of research at UT Dallas, the Telecommunications Engineering Program encourages students to interact with researchers in the strong basic sciences

and mathematics. Cross disciplinary collaborations have been established with faculty across various departments (e.g. CS, BE, ME) and schools (e.g. Management, Natural Sciences, Brain & Behavioral Science).

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