Erik Jonsson School of Engineering and Computer Science

Graduate Program in Computer Engineering

Objectives

The master's (MS) and doctoral (PhD) degrees in Computer Engineering (CE) emerged as a bridge between the increasingly overlapping disciplines of Computer Science and Electrical Engineering. The MS CE degree program provides intensive preparation for engineers who seek knowledge and skills necessary for the design of complex systems comprised of both hardware and software components. It has a heavy emphasis on the design of high speed and complex hardware and highly reliable and time critical software systems.

Computer Engineering at UT Dallas is a broadly based engineering discipline dealing with the sensing, processing, and transmission of information by making extensive use of electrical engineering and computer science principles. The CE program at UT Dallas also encourages students and faculty to develop synergies with disciplines outside of engineering, such as medicine and the life sciences. CE faculty members are actively involved in advanced research and teaching in all major areas of computer engineering. The Erik Jonsson School is home to several research centers, and promotes graduate and undergraduate curriculum innovation. It is the driving force behind computer engineering's rapid success and growth. The Erik Jonsson School has a large infrastructure of computing and other laboratory resources. The MS/PhD CE degree program provides intensive preparation for engineers who seek knowledge and skills necessary for the design of complex systems comprised of both hardware and software components. It has a heavy emphasis on the design of high speed and complex hardware and highly reliable and time critical software systems. It is designed to serve the needs of engineers who wish to continue their education. Courses are offered at a time and location convenient for the student who is employed on a full-time basis.

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 electrical engineering, telecommunications, and computer science and engineering.

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.
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 Distributed Computing Laboratory has a network of personal computers running Linux to support network simulation using discrete-event simulation packages. The Hardware/Software Co-design Laboratory has many workstations and PCs with DSP modules to support the experiments for various implementations in DSP and communications.

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 Computer Engineering

30 semester credit hours minimum

Program Faculty


Associate Professors: Jorge A. Cobb, Cong Liu, Rym Zalila-Wenkstern

Assistant Professors: Kanad Basu, Benjamin Carrion Schafer, Joseph Friedman, Chung Hwan Kim, Jin Kim, Wei Yang

Professor Emeritus: Ivor P. Page, William J. Pervin, Kang Zhang

Professors of Instruction: Richard Goodrum, Tooraj Nikouinia, Greg Ozbirn, William (Bill) Swartz, Marco Tacca

Associate Professors of Instruction: Md Ali, Diana Cogan, Chris I. Davis

Admission Requirements

The University's general admission requirements are discussed on the [Graduate Admission](https://catalog.utdallas.edu/2022/graduate/programs/ecs/computer-engineering) page.

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

The student entering the MS CE program should meet the following guidelines:

- An undergraduate preparation equivalent to a baccalaureate in computer science or 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 able to judge the candidate's probability of success in pursuing master's study. 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; 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](https://catalog.utdallas.edu/2022/graduate/programs/ecs/computer-engineering) page.

The MS CE 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 CE degree.

The MS CE program has both a thesis and a non-thesis option. All part-time MS CE 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.

All full-time, supported students are required to participate in the thesis option. The thesis option requires six 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 CE degree plan unless a thesis is written and successfully defended.

**Concentrations**

One of the two concentrations listed below, subject to approval by a graduate advisor, must be used to fulfill the requirements of the MSCE program. Each concentration is defined by four core courses. A student must complete the remaining courses from department and school wide electives. Students must achieve an overall GPA (grade point average) of 3.0 or better, a GPA of 3.0 or better in their core MSCE classes, and a grade of B- or better in all their core MS CE classes in order to satisfy their degree requirements. One 5000 level computer engineering course can be counted towards the graduate semester credit hours.

**Embedded Systems Concentration:**

The focus of embedded systems concentration in computer engineering is on embedded processors. The emphasis of the courses in this concentration is placed on hardware/software aspects of embedded processors to achieve various computer-controlled tasks.

Each student must complete a total of 30 hours from three categories:
I. CE-Depth (Core) Courses: 12 semester credit hours

Each student must complete the following four (4) CE-Depth courses making a B- or better in each course and an overall GPA of 3.0 or better in the Core courses:

- **CE 6304** Computer Architecture
- **CE 6302** Microprocessor and Embedded Systems
- **CE 6370** Design and Analysis of Reconfigurable Systems
- **EESC 6367** Applied Digital Signal Processing

II. CE-Breadth Electives Courses: 12 semester credit hours

Each student must complete four (4) CE-Breadth Electives courses from the following two groups:

**Group 1**

Any two (2) of the following courses:

- **CE 6301** Advanced Digital Logic
- **CE 6325** VLSI Design
- **CE 6303** Testing and Testable Design
- **CE 6306** Application Specific Integrated Circuits Design
- **CE 6375** Design Automation of VLSI Systems
- **EESC 6360** Digital Signal Processing I
- **EESC 6364** Machine Learning and Pattern Recognition

**Group 2**

Any two (2) of the following courses:

- **CE 6308** Real-Time Systems
- **CS 6313** Statistical Methods for Data Science
- **CS 6324** Information Security
- **CS 6360** Database Design
- **CS 6363** Design and Analysis of Computer Algorithms
- **CS 6375** Machine Learning
- **CS 6378** Advanced Operating Systems
- **CS 6390** Advanced Computer Networks

- Non-Thesis Option: The students must take any two courses in Group 1 and any two courses in Group 2.
- Thesis Option: The students must take one course in Group 1, one course in Group 2 and MS CE
Thesis. The student can choose to take either one MS CE Research course or an additional course in Group 1 or Group 2. Pre-approval by MS Thesis advisor is required.

III. ECS Free Electives: 6 semester credit hours

Each student must complete two (2) 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.
- Only one Special Topic is allowed.
- Pre-approval is required for: (a) one independent study (by a faculty advisor), and (b) up to two non-ECS courses (by MS Thesis advisor).

Computer Systems Concentration:

The focus of computer systems concentration in computer engineering is on general purpose and advanced computer systems. The emphasis of the courses in this concentration area is placed on hardware/software aspects of computer systems to achieve various computing tasks.

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

I. CE-Depth (Core) Courses: 12 semester credit hours

Each student must complete the following four (4) CE-Depth courses making a B- or better in each course and an overall GPA of 3.0 or better in the Core courses:

- **CE 6304** Computer Architecture
- **CE 6325** VLSI Design
- **CS 6363** Design and Analysis of Computer Algorithms
- **CS 6378** Advanced Operating Systems

II. CE-Breadth Electives Courses: 12 semester credit hours

Each student must complete four (4) CE-Breadth Electives courses from the following two groups:

Group 1

Any two (2) of the following courses:

- **CE 6301** Advanced Digital Logic
- **CE 6302** Microprocessor and Embedded Systems
- **CE 6303** Testing and Testable Design
- **CE 6306** Application Specific Integrated Circuits Design
- **CE 6370** Design and Analysis of Reconfigurable Systems
Group 2

Any two (2) of the following courses:

- **CE 6308** Real-Time Systems
- **CS 6324** Information Security
- **CS 6353** Compiler Construction
- **CS 6360** Database Design
- **CS 6375** Machine Learning
- **CS 6390** Advanced Computer Networks

- Non-Thesis Option: The students must take any two courses in Group 1 and any two courses in Group 2.
- Thesis Option: The students must take one course in Group 1, one course in Group 2 and MS CE Thesis. The student can choose to take either one MS CE Research course or an additional course in Group 1 or Group 2. Pre-approval by MS Thesis advisor is required.

III. ECS Free Electives: 6 semester credit hours

Each student must complete two (2) 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.
- Only one Special Topic is allowed.
- Pre-approval is required for: (a) one independent study (by a faculty advisor), and (b) up to two non-ECS courses (by MS Thesis advisor).

Doctor of Philosophy in Computer Engineering

75 semester credit hours minimum beyond the baccalaureate degree

Program Faculty


**Associate Professors:** Jorge A. Cobb, Cong Liu, Rym Zalila-Wenkstern

**Assistant Professors:** Kanad Basu, Benjamin Carrion Schafer, Joseph Friedman, Chung Hwan Kim, Jin Kim, Wei Yang

**Admission Requirements**

The University's general admission requirements are discussed on the [Graduate Admission](https://catalog.utdallas.edu/2022/graduate/) 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 Computer Engineering or a closely associated discipline such as Electrical Engineering or Computer Science 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.

- GPA (grade point average) in graduate level coursework of 3.5 or higher 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's record and able to judge the candidate's probability of success in pursuing doctoral study in Computer 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](https://catalog.utdallas.edu/2022/graduate/) page.

The CE 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 Computer Engineering are the same as the ones for the MS in Computer 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 CE graduate committee, demonstrating competence in the PhD candidate's research area. A student entering the PhD program with a MS degree must pass this exam within 3 long semesters, and a student entering without a MS 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.

- A comprehensive exam consists of: a written dissertation proposal, a public seminar, and a private oral examination conducted by the PhD candidate's supervising committee.

- 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 supervisory committee may impose these or other requirements that it feels are necessary and appropriate to the student's degree program.

## Areas of Research

CE Research areas include:

- Data Analytics
- Biomedical Applications
- Circuits and Systems
- Cloud Computing
- Communications
- Computer Architecture
- Control Systems
- Cyber & Hardware Security
- Digital Forensics
- Digital Systems
- Distributed Algorithms and Systems
- Embedded Systems
- Energy Systems
- Healthcare Technology
- Machine Learning
- Mobile Computing
- Reconfigurable Computing
- Robotics
- Signal/Image Processing
- System Reliability and Safety Assurance
- Telecommunications and Networks
- Vehicular Technology
- Wireless Networks

## Interdisciplinary Opportunities

In keeping with the established tradition of research at UT Dallas, the Computer 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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