Graduate Program in Computer Science

Program Faculty


**Professor Emeritus:** Klaus Truemper

**Associate Professors:** Sergey Bereg, Lawrence Chung, Jorge A. Cobb, Kendra M. L. Cooper, Xiaohu Guo, Kevin Hamlen, Murat Kantarcioglu, Yang Liu, Andrian Marcus, Neeraj Mittal, Yu-Chung (Vincent) Ng, Kamil Sarac, Haim Schweitzer, Rym Zalila-Wenkstern

**Assistant Professors:** Alvaro Cárdenas, Vibhav Gogate, Zhiqiang Lin, Cong Liu, Ryan McMahan, Nicholas Ruozzi, Lingming Zhang

**Research Professors:** Ron Bose

**Senior Lecturers:** Ebru Cankaya, Michael Christiansen, John Cole, Chris I. Davis, Timothy (Tim) Farage, Neeraj Gupta, Shyam Karrah, Pushpa Kumar, Linda Morales, Nhut Nguyen, Greg Ozbirn, Mark Paulk, Miguel Razo-Razo, William (Bill) Semper, Charles Shields Jr., Jason W. Smith, Janell Straach, Jeyakesavan (Jey) Veerasamy, Don G. Vogel

Objectives

The Graduate Program in Computer Science provides intensive preparation in the design, programming, theory, and applications of computers. The Department of Computer Science offers courses of study leading to the MS in Computer Science, the MS in Software Engineering, the PhD degree in Computer Science, and the PhD degree in Software Engineering. Training is provided for both academically oriented students and students with professional goals in the many business, industrial, or governmental occupations requiring advanced knowledge of computer theory and technology. Courses and research are offered in a variety of subfields of computer science, including operating systems, computer architecture, computer graphics, pattern recognition, automata theory, combinatorics, artificial intelligence, data and network security, natural language processing, database design, computer networks, programming languages, software systems, analysis of algorithms, computational complexity, software engineering, software testing, software
reliability, scheduling, visualization, fault-tolerant computing, parallel processing, telecommunications networks, telecommunications software, performance of systems, VLSI, computational geometry, and design automation.

A comprehensive program of evening courses is offered which enables part-time students to earn the master's degree or to select individual courses of interest.

Facilities

The Department of Computer Science systems are comprised of a private virtualization cloud, several individual computer servers, computer workstations, and desktop computers. Research laboratories are available for parallel processing, distributed systems, software engineering, high-performance computing, graphics, programming languages and systems, telecommunications, CAD and graph visualization, image understanding and processing, artificial intelligence, big data, natural language processing, speech processing, and web technologies. The Department of Computer Science network connects through Internet 2 with other research universities, gigabit ethernet intranet, and pervasive wireless connectivity.

Master of Science in Computer Science

33 semester credit hours minimum

Admission Requirements

The university's general admission requirements are discussed on the Graduate Admission page (catalog.utdallas.edu/2014/graduate/admission).

The student entering the Computer Science MS program should have an undergraduate preparation equivalent to a baccalaureate in a quantitative science, including calculus and linear algebra. However, special arrangements (requiring more than the minimal number of hours) can be made for students with good undergraduate preparation in other fields. Minimum requirements are:

- Bachelor's degree which includes 2 semesters of calculus and 1 semester of linear algebra.
- A GPA (grade point average) of at least 3.0 (last 60 hours). GPA in quantitative courses of at least 3.3.
- GRE revised scores of 308, 153, 155, and 4 for the combined, verbal, quantitative, and analytical writing components, respectively, are advisable based on our experience with student success in the program.

Students lacking undergraduate preparation in computer science must complete the courses listed below. At the discretion of the graduate advisor, a diagnostic exam may be required. The required prerequisite courses common to all master's students are:

Required Prerequisite Courses
Additional prerequisite courses required for the various degree plans are:

For the Data Sciences Track:

CS 3341 (SE 3341) Probability and Statistics in Computer Science and Software Engineering

For the Information Assurance Track:

CS 5390 Computer Networks

For the MS in Software Engineering:

CS 3354 (SE 3354) Software Engineering or CS 5354 (SE 5354) Software Engineering

For the Networks and Telecommunications Track:

CS 3341 (SE 3341) Probability and Statistics in Computer Science and Software Engineering
CS 5390 Computer Networks

For the Traditional Computer Science:

CS 5349 Automata Theory
CS 5390 Computer Networks

Degree Requirements

The university's general degree requirements are discussed on the Graduate Policies and Procedures page (catalog.utdallas.edu/2014/graduate/policies/policy).

The student may choose a thesis plan or a non-thesis plan. The thesis plan requires a minimum of 27 semester credit hours of courses, plus completion of an approved thesis (six thesis semester credit hours). This thesis is directed by a supervising professor and must be approved by the head of the Department of Computer Science. The non-thesis plan also requires a minimum of 33 semester credit hours of courses.
By a judicious planning of courses chosen from the computer science curriculum, supervised and approved by the graduate advisor, students may pursue the MS degree in Computer Science while emphasizing specific areas of the discipline. Students may also choose to receive the MS degree in Software Engineering. Because of the rapidly changing nature of the computer science discipline, the specific courses required may change by the time of the student's admission. A listing of the required courses will be specified by the student's advisor. Specific degree requirements follow.

**Core Requirements (15 semester credit hours)**

Students are required to complete one of the following:

**Data Sciences Track**

- **CS 6313** Statistical Methods for Data Sciences
- **CS 6350** Big Data Management and Analytics
- **CS 6363** Design and Analysis of Computer Algorithms
- **CS 6375** Machine Learning

One of the following five courses:

- **CS 6301** Special Topics in Computer Science [when topic is Social Network Analytics]
- **CS 6320** Natural Language Processing
- **CS 6327** Video Analytics
- **CS 6347** Statistical Methods in AI and Machine Learning
- **CS 6360** Database Design

**Information Assurance Track**

- **CS 6324** Information Security
- **CS 6363** Design and Analysis of Computer Algorithms
- **CS 6378** Advanced Operating Systems

Two of the following four courses:

- **CS 6332** System Security and Malicious Code Analysis
- **CS 6348** Data and Application Security
- **CS 6349** Network Security
- **CS 6377** Introduction to Cryptography

**Intelligent Systems Track**
CS 6320  Natural Language Processing
CS 6363  Design and Analysis of Computer Algorithms
CS 6364  Artificial Intelligence
CS 6375  Machine Learning
One of the following two courses:
   CS 6360  Database Design
   CS 6378  Advanced Operating Systems

Networks and Telecommunications Track
   CS 6352  Performance of Computer Systems and Networks
   CS 6363  Design and Analysis of Computer Algorithms
   CS 6378  Advanced Operating Systems
   CS 6385  Algorithmic Aspects of Telecommunication Networks
   CS 6390  Advanced Computer Networks

Systems Track
   CS 6304  Computer Architecture
   CS 6363  Design and Analysis of Computer Algorithms
   CS 6378  Advanced Operating Systems
   CS 6396  Real-Time Systems
One of the following four courses:
   CS 6349  Network Security
   CS 6380  Distributed Computing
   CS 6397  Synthesis and Optimization of High-Performance Systems
   CS 6399  Parallel Architectures and Systems

Traditional Computer Science Track
   CS 6363  Design and Analysis of Computer Algorithms
   CS 6378  Advanced Operating Systems
   CS 6390  Advanced Computer Networks
Two of the following three courses:
Master of Science in Software Engineering

33 semester credit hours minimum

Core Requirements

Course Requirements

Track Required Courses

- **CS 6329 (SE 6329)** Object-Oriented Software Engineering
- **CS 6361 (SE 6361)** Advanced Requirements Engineering
- **CS 6362 (SE 6362)** Advanced Software Architecture and Design
- **CS 6367 (SE 6367)** Software Testing, Validation and Verification
- **CS 6387 (SE 6387)** Advanced Software Engineering Project

Credit will be given for only one of the following courses if students take them together to satisfy Computer Science and Software Engineering degree plan requirements:

- **CS 6329** Object-Oriented Software Engineering, and
- **CS 6359** Object-Oriented Analysis and Design

Students must satisfy the core requirements by either earning a 3.19 minimum grade point average OR by earning a 3.0 minimum grade point average in the five core courses and taking an extra approved elective (beyond the minimum degree requirements of 33 semester credit hours) and maintain the required GPA.

Electives (minimum of 18 semester credit hours)

Five (15 semester credit hours) 6000/7000/8000 level elective CS courses, or six hours of thesis or project courses plus three elective courses (6 + 9 = 15 semester credit hours), with approval of a graduate advisor; a minimum grade point average of 3.0 is required. Courses that are prerequisites to the student's core requirements are especially recommended. Approved electives must be taken to make a minimum of 33 semester credit hours.
Note: For the information assurance track, students must also take six elective courses (two approved information assurance electives), and all electives must be 6000 level or above. A course cannot be used to satisfy both core and elective requirements.

While the Department of Computer Science offers both the Master of Science in Computer Science and the Master of Science in Software Engineering degrees, students are not permitted to pursue both degrees.

Doctor of Philosophy in Computer Science
75 semester credit hours minimum beyond the baccalaureate degree

The Department of Computer Science offers a Doctor of Philosophy in Computer Science.

The doctoral 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.

Admission Requirements

The university's general admission requirements are discussed on the Graduate Admission page (catalog.utdallas.edu/2014/graduate/admission).

A student may be admitted under one of two possible options. The student must have:

Admission Option One

• A master's degree in computer science or its equivalent, and
• A GPA (grade point average) of at least 3.5, and
• GRE revised scores of at least 308, 153, 155, and 4 for the combined, verbal, quantitative, and analytical writing components, respectively, are advisable based on our experience with student success in the program.

Admission Option Two

• A BS in related area that includes two semesters of calculus and linear algebra with
• GPA of at least 3.5 in the last 60 semester credit hours, and
• GRE revised scores of at least 315, 156, 159, and 4 for the combined, verbal, quantitative, and analytical writing components, respectively, are advisable based on our experience with student success in the program.

Degree Requirements

The university's general degree requirements are discussed on the Graduate Policies and Procedures page (catalog.utdallas.edu/2014/graduate/programs/ecs/computer-science).
Core requirements:

The core requirements for the PhD degree in Computer Science are the same as the ones listed on the Master of Science in Computer Science page or on the Master of Science in Software Engineering page.

Also required are:

- Pass a qualifying examination.
- Pass CS 6382 Theory of Computation with a grade of B or better
- Two CS or SE 7000 and above level courses

Sufficient CS electives for a total of at least 75 semester credit hours beyond the baccalaureate degree. At least 9 semester credit hours of organized advanced Computer Science electives must be taken at UT Dallas. The student is encouraged to consult with an advisor in choosing electives.

Dissertation

A dissertation is required and must be approved by the graduate program. A student must arrange for a dissertation advisor willing to guide this dissertation. The student must have a dissertation supervising committee that consists of no less than four members of whom at least three must be from the Computer Science faculty. Students must enroll in a minimum 3 dissertation semester credit hours in the degree plan. The dissertation may be in computer science exclusively or it may involve considerable work in an area of application.

Doctor of Philosophy in Software Engineering

75 semester credit hours minimum beyond the baccalaureate degree

The Department of Computer Science offers a Doctor of Philosophy in Software Engineering.

The doctoral 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.

Admission Requirements

The university's general admission requirements are discussed on the Graduate Admission page (catalog.utdallas.edu/2014/graduate/admission).

A student may be admitted under one of two possible options:

Admission Option One

- A master's degree in computer science or its equivalent, and
• A GPA (grade point average) of at least 3.5 and
• GRE revised scores of at least 308, 153, 155, and 4 for the combined, verbal, quantitative, and analytical writing components, respectively, are advisable based on our experience with student success in the program.

Admission Option Two

• A BS in related area that includes two semesters of calculus and linear algebra with,
• GPA of at least 3.5 in the last 60 hours, and
• GRE revised scores of at least 315, 156, 159, and 4 for the combined, verbal, quantitative, and analytical writing components, respectively, are advisable based on our experience with student success in the program.

Degree Requirements

The university's general degree requirements are discussed on the Graduate Policies and Procedures page (catalog.utdallas.edu/2014/graduate/policies/policy).

Core requirements:

The core requirements for the PhD degree in Software Engineering are the same as those listed on the Master of Science in Software Engineering page.

Also required are:

• Pass a qualifying examination.
• CS 6382 Theory of Computation with a grade of B or better
• Two CS or SE 7000 and above level courses

Sufficient CS electives for a total of at least 75 semester credit hours beyond the baccalaureate degree. At least 9 semester credit hours of organized advanced Computer Science electives must be taken at UT Dallas. The student is encouraged to consult with an advisor in choosing electives.

Dissertation

A dissertation is required and must be approved by the graduate program. A student must arrange for a dissertation advisor willing to guide this dissertation. The student must have a dissertation supervising committee that consists of no less than four members of whom at least three must be from the Computer Science faculty. Students must enroll in a minimum 3 dissertation semester credit hours in the degree plan. The dissertation may be in computer science exclusively or it may involve considerable work in an area of application.

Graduate Certificate in Information Assurance: 15
The Department of Computer Science offers a graduate certificate in information assurance.

Admission Requirements
Students must gain admission to the MS CS program or be eligible to take graduate courses in CS as a non-degree seeking student.

Certificate Requirements
Students must complete the following five courses with a GPA of 3.2 or better.

- **CS 6324** Information Security
- **CS 6348** Data and Applications Security
- **CS 6349** Network Security
- **CS 6363** Design and Analysis of Computer Algorithms
- **CS 6378** Advanced Operating Systems