Software Engineering (BS)

The Computer Science Department offers the BS degree in Computer Science and the BS degree in Software Engineering. Both are based on a solid foundation of mathematics, including calculus, linear algebra, and discrete mathematics. These programs of study are designed to offer students opportunities to prepare for an industrial, business, or governmental career in a rapidly changing profession and to prepare for graduate study in a field in which further education is strongly recommended. The two programs have the same basis in core computer science, including the analysis of algorithms and data structures, modern programming methodologies, and the study of operating systems. The Computer Science program continues with courses in advanced data structures, programming languages, telecommunications networks, and automata theory, while the Software Engineering program includes courses in requirements engineering, software validation and testing, and software architecture, culminating in a challenging project course in which students must demonstrate use of software engineering techniques. Both programs offer a rich choice of elective studies, including courses in artificial intelligence, computer graphics, databases, and compiler design. The school offers a "fast track" BS / MS option; see Fast Track Baccalaureate/Master's Degree Program.

Mission of the Department of Computer Science

The mission of the Department of Computer Science is to prepare undergraduate and graduate students for productive careers in industry, academia, and government by providing an outstanding environment for teaching, learning, and research in the theory and applications of computing. The Department places high priority on establishing and maintaining innovative research programs to enhance its education quality and make it an important regional, national, and international resource center for discovering, integrating and applying new knowledge and technologies.

Goals of the Software Engineering Program

The focus of the Software Engineering degree is to provide world class education in modern software engineering. The overall goals of the Bachelor of Science in Software Engineering Program are:

- To prepare students for software engineering positions in industry or government.
- To prepare students for graduate study in Software Engineering.
- To provide a solid foundation in Computer Science and Software Engineering principles that will allow graduates to adapt effectively in a quickly changing field.

Program Educational Objectives for Software Engineering

Within a few years after graduation, graduates of the Software Engineering Program should:
• Have a successful, long-lived, software engineering based career path.
• Meet the needs of industry or academia.
• Contribute to, and/or lead, software engineering based teams.
• Actively pursue continuing (lifelong) learning.

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

Bachelor of Science in Software Engineering

**Degree Requirements** *(123 semester credit hours)*

[View an Example of Degree Requirements by Semester](https://catalog.utdallas.edu/2019/undergraduate/programs/ecs/software-engineering)

Faculty


**Associate Professors:** Alvaro Cárdenas, Lawrence Chung, Jorge A. Cobb, Vibhav Gogate, Yang Liu, Ryan McMahan, Neeraj Mittal, Sriraam Natarajan, Tien Nguyen, Haim Schweitzer, Rym Zaïla-Wenkstern

**Assistant Professors:** Kyle Fox, Shuang Hao, Cong Liu, Benjamin Raichel, Nicholas Ruozzi, Shiyi Wei, Lingming Zhang


**Professors Emeritus:** William J. Pervin, Ivan Hal Sudborough, Klaus Truemper

I. Core Curriculum Requirements: 42 semester credit hours

**Communication:** 6 semester credit hours

  - [RHET 1302](#) Rhetoric
  - [ECS 3390](#) Professional and Technical Communication
Mathematics: 3 semester credit hours

**MATH 2413** Differential Calculus\(^4\)

or **MATH 2417** Calculus I\(^4\)

Life and Physical Sciences: 6 semester credit hours

**PHYS 2325** Mechanics\(^5\)

**PHYS 2326** Electromagnetism and Waves\(^5\)

Language, Philosophy and Culture: 3 semester credit hours

Select any 3 semester credit hours from Language, Philosophy and Culture core courses (see advisor)

Creative Arts: 3 semester credit hours

Select any 3 semester credit hours from Creative Arts core courses (see advisor)

American History: 6 semester credit hours

Select any 6 semester credit hours from American History core courses (see advisor)

Government / Political Science: 6 semester credit hours

**GOVT 2305** American National Government

**GOVT 2306** State and Local Government

Social and Behavioral Sciences: 3 semester credit hours

**ECS 2361** Social Issues and Ethics in Science and Technology\(^6\)

Component Area Option: 6 semester credit hours

**MATH 2417** Calculus I\(^4\)

**MATH 2419** Calculus II\(^4\)

**PHYS 2125** Physics Laboratory I\(^5\)

II. Major Requirements: 73 semester credit hours

Major Preparatory Courses: 20 semester credit hours beyond Core Curriculum

**ECS 1100** Introduction to Engineering and Computer Science\(^7\)

**CS 1200** Introduction to Computer Science and Software Engineering

**CS 1337** Computer Science I

**CS 2305** Discrete Mathematics for Computing I
CS 2336 Computer Science II
MATH 2413 Differential Calculus\(^4\)
   or MATH 2417 Calculus I\(^4\)
MATH 2418 Linear Algebra
MATH 2414 Integral Calculus\(^4\)
   or MATH 2419 Calculus II\(^4\)
PHYS 2125 Physics Laboratory I\(^5\)
PHYS 2126 Physics Laboratory II
PHYS 2325 Mechanics\(^5\)
PHYS 2326 Electromagnetism and Waves\(^5\)
3 semester credit hours Science Elective

Major Core Courses: 41 semester credit hours beyond Core Curriculum

SE 3162 Professional Responsibility in Computer Science and Software Engineering
SE 3306 Mathematical Foundations of Software Engineering
SE 3340 Computer Architecture
SE 3341 Probability and Statistics in Computer Science and Software Engineering
CS 3345 Data Structures and Introduction to Algorithmic Analysis
CS 3354 Software Engineering
ECS 2361 Social Issues and Ethics in Science and Technology\(^6\)
SE 3377 C/C++ Programming in a UNIX Environment
ECS 3390 Professional and Technical Communication\(^8\)
SE 4347 Database Systems
CS 4348 Operating Systems Concepts
SE 4351 Requirements Engineering
SE 4352 Software Architecture and Design
SE 4367 Software Testing, Verification, Validation and Quality Assurance
SE 4381 Software Project Planning and Management
SE 4485 Software Engineering Project

Major Guided Electives: 12 semester credit hours

SE guided electives are 4000 level CS/SE courses approved by the student's CS/SE advisor. The following courses may be used as guided electives without the explicit approval of an advisor:
CS 4141 Digital Systems Laboratory
CS 4314 Intelligent Systems Analysis
CS 4315 Intelligent Systems Design
CS 4334 Numerical Analysis
CS 4337 Organization of Programming Languages
CS 4341 Digital Logic and Computer Design
CS 4349 Advanced Algorithm Design and Analysis
CS 4352 Human Computer Interactions I
CS 4353 Human Computer Interactions II
CS 4361 Computer Graphics
CS 4365 Artificial Intelligence
CS 4375 Introduction to Machine Learning
CS 4384 Automata Theory
CS 4386 Compiler Design
CS 4389 Data and Applications Security
CS 4390 Computer Networks
CS 4391 Introduction to Computer Vision
CS 4392 Computer Animation
CS 4393 Computer and Network Security
CS 4394 Implementation of Modern Operating Systems
CS 4395 Human Language Technologies
CS 4396 Networking Laboratory
CS 4397 Embedded Computer Systems
CS 4398 Digital Forensics
CS 4485 Computer Science Project
EE 4325 Introduction to VLSI Design
SE 4376 Object-Oriented Design
SE 4399 Senior Honors in Software Engineering

Application Domains: 9 semester credit hours

An important aspect of Software Engineering education is the use of software engineering concepts in a particular application domain. Students should use two or three of their guided electives to complete one of the applications domains below. Additional application domains may become available. Completing an application domain may require careful scheduling since many of these classes will not be offered
every semester. It is strongly encouraged that you consult with an advisor. Courses in each of the domain can be substituted by other appropriate elective courses offered in a particular semester with consent of the Computer Science Department.

**Networks: 9 semester credit hours**
- CS 4390 Computer Networks
- CS 4393 Computer and Network Security
- CS 4396 Networking Laboratory

**Information Assurance: 9 semester credit hours**
- CS 4389 Data and Applications Security
- CS 4393 Computer and Network Security
- CS 4398 Digital Forensics

**Embedded Systems: 9 semester credit hours**
- CS 4141 Digital Systems Laboratory
- CS 4341 Digital Logic and Computer Design
- CS 4397 Embedded Computer Systems
- CS 4348 Operating Systems Concepts

**Computer Imaging: 9 semester credit hours**
- CS 4361 Computer Graphics
- CS 4391 Introduction to Computer Vision
- CS 4392 Computer Animation

**Artificial Intelligence and Cognitive Modeling: 9 semester credit hours; take 3 of 5**
- CS 4314 Intelligent Systems Analysis
- CS 4315 Intelligent Systems Design
- CS 4365 Artificial Intelligence
- CS 4375 Introduction to Machine Learning
- CS 4395 Human Language Technologies

**Human-Computer Interaction: 9 semester credit hours**
- CS 4352 Human Computer Interactions I
- CS 4353 Human Computer Interactions II
- CS 4361 Computer Graphics
III. Elective Requirements: 8 semester credit hours

**Free Electives: 8 semester credit hours**

All students must accumulate at least 123 semester credit hours of university credit to graduate. Both lower- and upper-division courses may count as free electives but students must complete at least 51 semester credit hours of upper-division courses 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 post-baccalaureate education in the exciting field of software engineering, a Fast Track program is available to well-qualified UT Dallas undergraduate students. Qualified seniors may take up to 15 graduate semester credit hours that may be used to complete the baccalaureate degree and also to satisfy the requirements for the master's degree. Interested students should see the Associate Dean of Undergraduate Education (ADU) for specific requirements.

Interested students should see the Associate Dean of Undergraduate Education (ADU) for specific admission requirements to the Fast Track program.

**Honors Programs**

The Department of Computer Science offers an Honors Program called Computer Science Computing Scholars (CS2). (CS2) is an intense Bachelor of Science in Computer Science Degree Program created for exceptionally gifted students who wish to pursue a demanding course of study enriched throughout with research experiences. The Computing Scholars Program has a specially designed curriculum. Courses integrate discussion of current research, recent discoveries, and open problems into a rich logical progression of firmly related topics. Course numbers for the Core Curriculum Requirements and Major Requirements are the same as those for the Bachelor of Science in Computer Science, but Computing Scholars take honors versions of the following courses: ECS 1100, CS 2305, CS 3305, CS 3340, CS 3341, CS 3345, CS 3354, CS 4141, CS 4337, CS 4341, CS 4348, CS 4349, CS 4384, CS 4485.

Admission to the program is mainly by nomination and invitation. Those invited to join the Computing Scholars Honors Program will have successfully completed a full and challenging high school curriculum, will have achieved high scores on the SAT or ACT tests, and will be about to graduate from high school, or equivalent, with high class rank. Successful participants will graduate with the added distinction of a Computing Scholars Honors Diploma.

For more information about this program students should contact the Computer Science Department leadership.
Certificates

Certificate in Information Assurance

A Certificate in Information Assurance is offered by the Department of Computer Science. It can be obtained by completing the following (as well as any required prerequisites):

- **CS 4389** Data and Applications Security
- **CS 4393** Computer and Network Security
- **CS 4398** Digital Forensics

The certificate is intended for those individuals who are working in the industry and who already have background similar to a BS degree. CS and SE majors that complete the required classes, as well as students that complete the Minor in Information Assurance will be awarded certificates in Information Assurance.

1. Incoming freshmen must enroll and complete requirements of UNIV 1010 and the corresponding school-related freshman seminar course. Students, including transfer students, who complete their core curriculum at UT Dallas must take UNIV 2020.

2. Curriculum Requirements can be fulfilled by other approved courses. The courses listed are recommended as the most efficient way to satisfy both Core Curriculum and Major Requirements at UT Dallas.

3. Semester credit hours fulfill the communication component of the Core Curriculum.

4. Three semester credit hours of Calculus are counted under Mathematics Core, and five semester credit hours of Calculus are counted as Component Area Option Core.

5. Six semester credit hours of Physics are counted under Science core, and one semester credit hour of Physics (PHYS 2125) is counted as Component Area Option Core.

6. Semester credit hours contribute to the Social and Behavioral Sciences component of the Core Curriculum.

7. Transfer students with sufficient background may petition to substitute upper-division semester credit hours in the major for this class.

8. Semester credit hours fulfill the communication elective of the Core Curriculum.

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