Erik Jonsson School of Engineering and Computer Science

Department of Computer Science

Computer Science (B.S.) and Software Engineering (B.S.)

Faculty

**Professors:** Farokh Bastani, R. Chandrasekaran, Ding-Zhu Du, András Faragó; Gopal Gupta, Dung T. Huynh, Jason Jue, Dan Moldovan, Simeon C. Ntafos, B. Prabhakaran, Balaji Raghavachari, Hsing-Mean (Edwin) Sha, Ivan H. Sudborough, Bhavani Thuraisingham, Klaus Truemper (Emeritus), I-Ling Yen, Kang Zhang, Si-Qing Zheng

**Associate Professors:** Sergey Bereg, Lawrence Chung, Jorge A. Cobb, Kendra M.L. Cooper, Ovidiu Daescu, Sandra Harabagiu, Murat Kantarcioglu, Latifur Khan, Yang Liu, Neeraj Mittal, Vincent Ng, Ivor P. Page, Ravi Prakash, Kamil Sarac, Haim Schweitzer, S. Venkatesan, Yuke Wang, W. Eric Wong, Weili Wu, Rym Zalila-Wenkstern

**Assistant Professors:** Mark Gabel, Vibhav Gogate, Xiaohu Guo, Kevin Hamlen, Zhiqiang Lin

**Senior Lecturers:** Tim Farage, Herman Harrison, Shyam Karrah, Feliks Kluźniak, Linda Morales, Greg Ozbirn, Miquel Razo-Razo, Cort Steinhorst, Janell Straach, Laurie Thompson, Jay Veerasamy

The Computer Science Department offers the B.S. degree in Computer Science and the B.S. 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 include 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" B.S./M.S. option; see Fast Track Baccalaureate/Master's Degree
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.

Software Engineering (B.S.)

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

Bachelor of Science in Software Engineering

Degree Requirements (123 hours)

I. Core Curriculum Requirements\(^1\): 42 hours

**Communication (6 hours)**
- 3 hours Communication (RHET 1302)
- 3 hours Professional and Technical Communication (ECS 3390)\(^2\)

**Social and Behavioral Sciences (15 hours)**
- 6 hours Government (GOVT 2301 and GOVT 2302)
- 6 hours American History
- 3 hours Social and Behavioral Science (ECS 3361)

**Humanities and Fine Arts (6 hours)**
- 3 hours Fine Arts (ARTS 1301)
- 3 hours Humanities (HUMA 1301)

**Mathematics and Quantitative Reasoning (6 hours)**
- 6 hours Calculus (MATH 2413, MATH 2414 or MATH 2417, MATH 2419)\(^3\)

**Science (9 hours)**
- 6 hours Lecture courses (PHYS 2325 and PHYS 2326)
- 2 hours Laboratory courses (PHYS 2125 and PHYS 2126)
- 4 hours Science Elective\(^4\)

II. Major Requirements: 70 hours

**Major Preparatory Courses (20 hours beyond Core Curriculum)**
- ECS 1200 Introduction to Engineering and Computer Science\(^5\)
- CS 1337 Computer Science I
- CS 2305 Discrete Mathematics for Computing I
- CS 2336 Computer Science II
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>MATH 2413</td>
<td>Differential Calculus</td>
<td>3</td>
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<td>or MATH 2417</td>
<td>Calculus I</td>
<td>3</td>
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<tr>
<td>MATH 2418</td>
<td>Linear Algebra</td>
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<td>MATH 2414</td>
<td>Integral Calculus</td>
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<td>or MATH 2419</td>
<td>Calculus II</td>
<td>3</td>
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<tr>
<td>PHYS 2125</td>
<td>Physics Laboratory I</td>
<td>4</td>
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<tr>
<td>PHYS 2126</td>
<td>Physics Laboratory II</td>
<td>4</td>
</tr>
<tr>
<td>PHYS 2325</td>
<td>Mechanics</td>
<td>4</td>
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<tr>
<td>PHYS 2326</td>
<td>Electromagnetism and Waves</td>
<td>4</td>
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<td></td>
<td>4 hours Science Elective</td>
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**Major Core Courses (38 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 3361 Social Issues and Ethics in Computer Science and Engineering
- SE 3376 C/C++ Programming in a UNIX Environment
- ECS 3390 Professional and Technical Communication
- 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 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 4347 Database Systems
SE 4376 Object Oriented Programming Systems
SE 4399 Senior Honors in Computer Science/Software Engineering
Application Domains (9 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.

Networks (9 hours)

- CS 4390 Computer Networks
- CS 4393 Computer and Network Security
- CS 4396 Networking Laboratory

Information Assurance (9 hours)

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

Embedded Systems (9 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 hours)

- CS 4361 Computer Graphics
- CS 4391 Introduction to Computer Vision
- CS 4392 Computer Animation

Artificial Intelligence and Cognitive Modeling (9 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 hours)**

- CS 4352 Human Computer Interactions I
- CS 4353 Human Computer Interactions II
- CS 4361 Computer Graphics

**III. Elective Requirements: 11 hours**

**Advanced Electives (6 hours)**

All students are required to take at least six hours of advanced electives outside their major field of study. These must be either upper-division classes or lower-division classes that have prerequisites. Four of these hours may be satisfied with MATH 2418 Linear Algebra counted under Major Preparatory courses.

**Free Electives (9 hours)**

All students must accumulate at least 124 hours of university credit to graduate. Both lower- and upper-division courses may count as free electives but students must complete at least 51 hours of upper-division credit 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 exceptionally well-qualified students who choose their courses carefully. At the end of five years of successful study, it is possible to earn both the B.S. degree in Software Engineering and the M.S. degree in Computer Science or the M.S. degree in Computer Science with Major in Software Engineering. Being within 30 hours of graduation, a student admitted to the graduate program and accepted into the Fast Track program may, during the senior year, take 15 graduate 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 admission requirements to the Fast Track program.
Honors Programs

The Department of Computer Science offers upper-division Honors for outstanding students in both the B.S. in Computer Science and B.S. in Software Engineering degree programs. These programs offer special sections of designated classes and other activities designed to enhance the educational experience of exceptional students. Admission to the Honors programs requires a 3.500 or better GPA in at least 30 hours of coursework. Graduation with Honors requires a 3.500 or better GPA and completion of at least 6 honors classes, including a Senior Thesis or Senior Design Project class. For more details, contact the Office of Undergraduate Advising (ECS South 2.502; 972-883-2004).

Departmental Honors with Distinction may be awarded to students whose Senior Thesis or Senior Design Project is judged by a faculty committee to be of exemplary quality. Only students graduating with Departmental Honors are eligible. Thesis/projects must be submitted by the deadline that applies to M.S. Theses and Ph.D. Dissertations in the graduating semester to allow for proper evaluation. Students interested in Honors with Distinction are encouraged to start working on their thesis/project a year prior to graduation.

Minors

A minor in Software Engineering requires 21 credit hours earned through the following courses:

- CS 1337 Computer Science I
- CS 2305 Discrete Mathematics for Computing I
- CS 2336 Computer Science II
- SE 3306 Mathematical Foundations of Software Engineering
- CS 3345 Data Structures and Introduction to Algorithmic Analysis
- CS 3354 Software Engineering
- SE 43XX Elective (any 4000-level organized SE class)

1. Curriculum Requirements can be fulfilled by other approved courses from accredited institutions of higher education. The courses listed in parentheses are recommended as the most efficient way to satisfy both Core Curriculum and Major Requirements at UT Dallas.

2. Hours fulfill the communication elective of the Core Curriculum.

3. Six hours of Calculus are counted under Mathematics Core, and two hours of Calculus are counted as Major Preparatory Courses.

4. Nine hours of Science are counted under Science Core. Three hours are counted as Major Preparatory Courses. Students should consult an advisor for specific classes that satisfy this requirement.

5. Transfer students with sufficient background may petition to substitute upper level hours in the major for this class.
6. Hours contribute to the Social and Behavioral Sciences component of the Core Curriculum.