DEPARTMENT OF COMPUTER ENGINEERING

The Department of Computer Engineering (CPEG) offers an ABET-accredited Bachelor of Science degree in Computer Engineering (CPE). Individuals enrolled in these degree programs are given opportunities to develop a strong background in the engineering sciences and to learn the analysis, design, and synthesis tools necessary to function successfully as active participants in traditional, new, and emerging areas of electrical and computer engineering-related technologies. The CPEG department continues to be recognized locally and nationally for the quality of its undergraduate programs. As a result, CPEG graduates continue to find high-paying jobs or are accepted into graduate schools nationwide.

Direct Admission Criteria

Applicants entering UTSA as Freshmen or Freshmen Transfers (fewer than 12 transferable semester credit hours) will be directly admitted to the CPE or EE program if they:

- meet all UTSA undergraduate admission requirements,
- qualify for enrollment in MAT 1213 Calculus I, or a higher level mathematics course, and
- are ranked in the top 10 percent of their high school class (no minimum SAT or ACT scores required), *or*
- are ranked below the top 10 percent of their high school class and have a minimum 1200 SAT or 25 ACT score.

Applicants with SAT scores below 1200 or ACT scores below 25 may be considered for admission by committee review.

Transfer requirements for direct admission to the CPE or EE program for students who have earned 12 or more transferable semester credit hours:

- meet all UTSA undergraduate transfer admission requirements, and
- have completed MAT 1213 Calculus I and WRC 1013 Freshman Composition I , or the equivalents, with grades of “C-” or better, and
- meet grade point average requirements:
  - applicants with a transfer grade point average of 3.00 or higher may be granted direct admission to the major, or
  - applicants with a transfer grade point average below 3.00 may be granted admission to the College by committee review.

Applicants who do not meet CPE and EE admission requirements will be admitted to the Engineering, Math, and Sciences Studies major in the University College. Students have three semesters to complete Calculus I with a grade of "C-" or better and meet the major Transfer Requirements.

“C-” Grade Rule

A grade of “C-” or better in any science, engineering, or mathematics course required for an engineering degree or any other course that is a prerequisite to any required Computer Engineering (CPE), Electrical Engineering (EE), or Engineering (EGR) course indicates satisfactory preparation for further engineering education. Any course assigned a grade below a “C-” must be repeated before enrolling in any course for which it is a prerequisite. This requirement is subject to both the Gateway Course and Three-Attempt Limit rules.

Program Educational Objectives

The educational objectives of the Computer Engineering program are that our graduates will:

1. Engage in life-long learning, remaining current and becoming leaders in their profession
2. Advance and expand in their computer engineering-related careers by applying their engineering knowledge and skills
3. Contribute productively to the workforce in state, regional, national, and international industries and government organizations
4. Communicate effectively, provide enabling solutions to societal challenges, and respond to technical, business, social, ethical, and human needs of the society through their professional endeavors.

Meeting Program Objectives

To meet the program objectives, the curriculum for the B.S. degree in Computer Engineering is organized into a flexible 126-semester-credit-hour structure that provides high-quality education in the fundamentals of engineering, in addition to a thorough coverage of the major specialties within electrical engineering and computer engineering. For electrical engineering students, a selection of technical electives is provided to allow in-depth concentration in selected areas such as: communication, computers, digital signal processing (DSP), electronic materials and devices, systems and control, and electric power engineering. For students seeking the B.S. degree in Computer Engineering, the selection of technical electives are from areas of digital system design, computer architecture, VLSI design, engineering programming languages, and embedded systems.

Department faculty of outstanding quality work in concert to provide the two degree programs that are challenging to students, with depth in engineering sciences, design orientation, and modern laboratory experience. The program objectives are accomplished via a three-tiered curriculum structure comprised of the lower-division core (the first two years), the upper-division core (concentrated primarily in the third year), and the senior-level electives, each of which are briefly described below.

Lower-Division Core

The lower-division core provides students with a diverse range of courses over a broad base of basic technical and specialized courses in mathematics, physics, and chemistry; computer hardware and software fundamentals; electric circuit fundamentals and electrical engineering laboratory experience; statics and dynamics; and communication skills, humanities, and social sciences.

Upper-Division Core

The upper-division core for computer engineering provides students with a basic education in the fundamentals of electrical and computer engineering.

The upper-division core in computer engineering includes: fundamentals of circuits (3 semester credit hours), C++ and data structures (3 semester credit hours), microcomputer systems (3 semester credit hours), electronics (6 semester credit hours), electronic devices (3 semester credit hours), and probability and random processes (3 semester credit hours). Many of these fundamental courses include the use of modern software tools for design and analysis. These fundamental courses are supplemented with one hands-on laboratory course (3 semester credit hours). Written and technical communication is further emphasized in the laboratory course.

Senior-Level Electives

In the senior year, computer engineering students are required to choose five technical electives from a list of approved technical electives for Bachelor of Science in Computer Engineering. The engineering cooperative program provides an opportunity for students to obtain practical experience by enrolling in the co-op course for 3 credit hours and working in an approved industry. Students who want to pursue graduate studies are encouraged to enroll in a graduate class during their last year, which will be counted as one of the remaining technical electives.

Engineering Design Experience

Design process in electrical engineering and in computer engineering is emphasized throughout all four years. Engineering design is distributed throughout the programs starting from the second semester in EE 2513 Logic Design. During their junior and senior years, students take five technical elective courses which all have design components. During the seventh semester, students also take EE 4113 Electrical and Computer Engineering Laboratory II, in which they must design complex circuits. Modern software tools usage, design and analysis, and formal written report writing are integrated components of several of the electrical and computer engineering courses. EE 3113 Electrical and Computer Engineering Laboratory I and EE 4113 Electrical and Computer Engineering Laboratory II emphasize hands-on experiments using basic to advanced capability instruments and formal written, as well as oral, reports. In EE 4812 Electrical Engineering Design I CPE 4812 Computer Engineering Design I, EE 4813 Electrical Engineering Design II, and CPE 4813 Computer Engineering Design II, students are required to design, implement, test, demonstrate, and make an oral presentation on an electronic or computer system.

Other courses with design emphasis that electrical engineering students take include: EE 3213 Electromagnetic Engineering, EE 3323 Electronic Devices, EE 3413 Analysis and Design of Control Systems, EE 2583 Microcomputer Systems I, EE 4313 Electronic Circuits II, and EE 4323 Dielectric and Optoelectronic Engineering Laboratory.

Other courses with design emphasis that computer engineering students take include: EE 3313 Electronic Circuits I, EE 3323 Electronic Devices, EE 3563 Digital Systems Design, EE 2583 Microcomputer Systems I, and EE 4513 Introduction to VLSI Design.

Degree-Specific Requirements

All program requirements should be unchanged from previous versions of the 2024-2026 Undergraduate Catalog. To confirm your degree requirements, you can visit DegreeWorks (https://dworkswebprod.sis.utsa.edu/) or consult your Advisor (https://www.utsa.edu/advising/advisor/).

The degree program in the Department of Computer Engineering (p. 1) maintains the same Admission Policy and degree requirements, including Gateway Courses, Three-Attempt Limit, and Signature Experience requirements, as the Klesse College of Engineering and Integrated Design (http://catalog.utsa.edu/undergraduate/engineeringintegrateddesign/), in addition to any department or degree-specific requirements.

- B.S. degree in Computer Engineering (p. 2)
  - Integrated B.S./M.S. Program (p. 4)

Bachelor of Science Degree in Computer Engineering

The Bachelor of Science (B.S.) degree in Computer Engineering gives students the opportunity to acquire broad engineering skills and knowledge to enable them to design and implement computer and digital systems. The discipline of computer engineering includes topics such as logic design; digital systems design; discrete mathematics; computer organization; embedded systems design requiring assembly programming of microprocessors, high-level programming and interfacing of processors to other circuits; high-level digital design languages (HDL) and Field Programmable Gate Arrays (FPGA's); Very Large Scale Integrated (VLSI) circuit design; and fundamental electrical engineering, mathematics, and science. The program is currently accredited by the Engineering Accreditation Commission of ABET, http://www.abet.org (http://www.abet.org/).

The minimum number of semester credit hours required for this degree is 126, at least 39 of which must be at the upper-division level. At least 42 of the required computer engineering credits must be taken at UTSA. All candidates for this degree must fulfill the Core Curriculum requirements, the General Engineering requirements, and the Computer Engineering requirements, which are listed below.

Core Curriculum Requirements (42 semester credit hours)

Students seeking the B.S. degree in Computer Engineering must fulfill University Core Curriculum requirements in the same manner as other students. The courses listed below satisfy both major requirements and Core Curriculum requirements; however, if these courses are taken to satisfy both requirements, then students may need to take additional courses in order to meet the minimum number of semester credit hours required for this degree.

MAT 1213 may be used to satisfy the core requirement in Mathematics, as well as one of the General Engineering requirements. PHY 1943 and PHY 1963 may be used to satisfy the core requirement in Life and Physical Sciences, as well as two of the General Engineering requirements.

General Engineering Requirements

All degree-seeking candidates in engineering must complete the following 22 semester credit hours, as well as the Core Curriculum requirements and major requirements:

CHE 1103	General Chemistry I	3
EGR 2302	Linear Algebra for Engineers	2
EGR 3423	Differential Equations for Engineers	3
MAT 1213	Calculus I	3
MAT 1223	Calculus II	3
or EGR 1333	Calculus II for Engineers	
PHY 1943 & PHY 1951	Physics for Scientists and Engineers I and Physics for Scientists and Engineers I Laboratory	4
PHY 1963 & PHY 1971	Physics for Scientists and Engineers II and Physics for Scientists and Engineers II Laboratory	4
Total Credit Hours		**22**

Gateway Courses

Students pursuing the B.S. degree in Computer Engineering must successfully complete each of the following Gateway Courses with a grade of "C-" or better in no more than two attempts. A student who is unable to successfully complete these courses within two attempts, including dropping a course with a grade of "W" or taking an equivalent course at another institution, will be required to change their major.

EE 1322	Introduction to Electrical and Computer Engineering
EE 2513	Logic Design
MAT 1213	Calculus I

Computer Engineering Degree Requirements

All degree-seeking candidates in Computer Engineering must complete the following semester credit hours, as well as the Core Curriculum requirements and General Engineering requirements:

A. Required courses		
1. Electrical and Computer engineering courses:		
EE 1322	Introduction to Electrical and Computer Engineering	2
EE 2423	Electric Network Theory	3
EE 2511	Digital Circuit Laboratory	1
EE 2513	Logic Design	3
EE 2583	Microcomputer Systems I	3
EE 3113	Electrical and Computer Engineering Laboratory I	3
EE 3223	C++ and Data Structures	3
EE 3233	Systems Programming for Engineers	3
EE 3313	Electronic Circuits I	3
EE 3323	Electronic Devices	3
EE 3423	Mathematics in Signals and Systems	3
EE 3533	Probability and Random Signals	3
EE 3563	Digital Systems Design	3
EE 4113	Electrical and Computer Engineering Laboratory II	3
EE 4243	Computer Organization and Architecture	3
CPE 4812	Computer Engineering Design I	2
CPE 4813	Computer Engineering Design II	3
2. Supporting courses		
CPE 2073	Introduction to Computer Programming for Engineers	3
or CS 2073	Computer Programming with Engineering Applications	
CS 2233	Discrete Mathematical Structures	3
EGR 2313	Multivariable Calculus and Series for Engineers	3
B. Computer engineering electives		
Take two required prescribed courses (marked with *) from one of the following concentrations. The other three courses may be selected from any of the concentration areas and graduate courses in Electrical and Computer Engineering. With prior approval, EGR 3303 (Co-Op class for internships) and EGR 4993 may be counted as technical electives.		15
AI and Autonomous Systems		
EE 4463	Introduction to Machine Learning (*)	
EE 4733	Intelligent Control (*)	
EE 4643	Digital Signal Processing	
EE 4663	Digital Image Processing	
EE 4953	Special Studies in Electrical and Computer Engineering (Introduction to Optimization)	
Computer Systems		
EE 4563	FPGA-Based System Design (*)	
EE 4583	Microcomputer Systems II (*)	
EE 4593	Embedded System Design	
CPE 4953	Special Studies in Computer Engineering (Superscalar Systems)	
Digital Hardware		
EE 4513	Introduction to VLSI Design (*)	
EE 4553	VLSI Testing (*)	
EE 4563	FPGA-Based System Design	
CPE 4953	Special Studies in Computer Engineering (AI Hardware and Programming)	
Network and IoT		
EE 4673	Data Communication and Networks (*)	
CPE 4953	Special Studies in Computer Engineering (Computer and Networking Security (*))	
CPE 4953	Special Studies in Computer Engineering (IoT Security)	
CPE 4953	Special Studies in Computer Engineering (AI in Networked Systems)	
Systems/Computer Programming		
CPE 4953	Special Studies in Computer Engineering (Engineering Programming I (*))	
CPE 4953	Special Studies in Computer Engineering (Engineering Programming II (*))	
CPE 4953	Special Studies in Computer Engineering (Engineering Algorithms)	
CPE 4953	Special Studies in Computer Engineering (Cloud Computing for Engineers)	
CPE 4953	Special Studies in Computer Engineering (AI Hardware and Programming)	
Total Credit Hours		**71**

B.S. in Computer Engineering – Recommended Four-Year Academic Plan

First Year

Fall		**Credit Hours**
AIS 1243	AIS: Engineering, Mathematics, and Sciences	3
CHE 1103	General Chemistry I	3
EE 1322	Introduction to Electrical and Computer Engineering	2
MAT 1213	Calculus I (core and major)	3
WRC 1013	Freshman Composition I (core)	3
Language, Philosophy & Culture (core)		3
	Credit Hours	**17**

Spring		
CPE 2073 or CS 2073	Introduction to Computer Programming for Engineers or Computer Programming with Engineering Applications	3
EE 2511	Digital Circuit Laboratory	1
EE 2513	Logic Design	3
MAT 1223 or EGR 1333	Calculus II or Calculus II for Engineers	3
PHY 1943	Physics for Scientists and Engineers I (core and major)	3
PHY 1951	Physics for Scientists and Engineers I Laboratory	1
WRC 1023	Freshman Composition II (core)	3
	Credit Hours	**17**
Second Year		
Fall		
EE 2583	Microcomputer Systems I	3
EGR 2302	Linear Algebra for Engineers	2
EGR 2313	Multivariable Calculus and Series for Engineers	3
PHY 1963	Physics for Scientists and Engineers II (core and major)	3
PHY 1971	Physics for Scientists and Engineers II Laboratory	1
American History (core)		3
	Credit Hours	**15**
Spring		
EE 2423	Electric Network Theory	3
EE 3223	C++ and Data Structures	3
EGR 3423	Differential Equations for Engineers	3
CS 2233	Discrete Mathematical Structures	3
American History (core)		3
	Credit Hours	**15**
Third Year		
Fall		
EE 3113	Electrical and Computer Engineering Laboratory I	3
EE 3313	Electronic Circuits I	3
EE 3323	Electronic Devices	3
EE 3423	Mathematics in Signals and Systems	3
POL 1013	Introduction to American Politics (core)	3
	Credit Hours	**15**
Spring		
EE 3233	Systems Programming for Engineers	3
EE 3533	Probability and Random Signals	3
EE 3563	Digital Systems Design	3
Elective/Co-Op		3
EE 4243	Computer Organization and Architecture	3
	Credit Hours	**15**
Fourth Year		
Fall		
CPE 4812	Computer Engineering Design I	2
EE 4113	Electrical and Computer Engineering Laboratory II	3
Technical elective		3
Technical elective		3
POL 1133 or POL 1213	Texas Politics and Society (core) or Civil Rights in Texas and America	3
Creative Arts (core)		3
	Credit Hours	**17**
Spring		
CPE 4813	Computer Engineering Design II	3
ECO 2023	Introductory Microeconomics (core)	3
Technical elective		3
Technical elective		3
Component Area Option (core)		3
	Credit Hours	**15**
	Total Credit Hours	**126**

Integrated Bachelor of Science/Master of Science Program

The integrated B.S./M.S. (Bachelor of Science and Master of Science) program administered by the Department of Electrical Engineering and the Department of Computer Engineering is designed to make it possible for highly motivated and qualified B.S. students to obtain both an undergraduate degree and an advanced degree within an accelerated timeline. Through this program, motivated B.S. students can start working with their faculty advisors on research projects as early as in their senior year.

Program Admission Requirements

Applications to the B.S./M.S. program must be submitted after the completion of 75 semester credit hours of coursework.

The B.S./M.S. program applicants must have a minimum of 3.3 for both cumulative and major grade point averages. To apply for the program, students need to:

- Apply online under the category of Integrated B.S./M.S. (B.S. in Electrical Engineering or Computer Engineering, and M.S. in Electrical Engineering, Computer Engineering, or Advanced Materials Engineering); and
- Submit an official UTSA transcript.

Submission of both recommendation letters and a personal statement is optional but highly recommended for consideration of scholarships.

Degree Requirements

B.S. Degree requirement: The current undergraduate degree programs in Electrical Engineering and Computer Engineering require 126 semester credit hours for completion, with fifteen of these hours (five 3-hour courses) as technical electives. Students accepted into the Integrated B.S./M.S. program will be required to complete 120 undergraduate credit hours and 6 graduate credit hours to replace two of the five undergraduate technical elective courses toward the B.S. degree. Undergraduate students wishing to voluntarily withdraw

from the Integrated B.S./M.S. program must use a combination of five undergraduate technical electives and graduate organized courses to satisfy the original 126-hour regular degree program requirement in order to receive their B.S. degree. Students continuing on in the Integrated B.S./M.S. program will receive their B.S. degrees once they have earned 120 undergraduate credit hours and 6 credit hours of graduate organized courses. The 6 graduate credit hours taken as an undergraduate will be counted toward the M.S. degree requirement.

M.S. Degree requirement: A student enrolled in the Integrated B.S./M.S. program can graduate by completing requirements for a thesis or nonthesis (project) option.

(i) Thesis Option: Students must complete 30 credit hours, including 6 hours of thesis work.

(ii) Nonthesis Option: Students must complete 33 credit hours, including 3 hours of project work.

B.S./M.S. Classification

Once admitted to the Integrated B.S./M.S. program, students are allowed to take graduate courses as undergraduate students. Students admitted to the Integrated B.S./M.S. program will be reclassified from undergraduate to graduate student status when they have completed 126 semester credit hours of coursework (of any combination of graduate and undergraduate hours) toward their degrees. B.S./M.S. students can receive their B.S. degree upon completion of 126 semester credit hours, including two graduate courses, at which point the program will certify the student's eligibility to receive the B.S. degree and request the Graduate School to change the student status in the Student Information System.

Computer Engineering (CPE) Courses

CPE 2073. Introduction to Computer Programming for Engineers. (3-1) 3 Credit Hours.
Prerequisite: MAT 1213 (or MAT 1214 in previous catalogs), and completion of or concurrent enrollment in MAT 1223 (or MAT 1224 in previous catalogs) or EGR 1333. Algorithmic approach to problem solving, basic programming techniques such as conditional execution (e.g., if-else), repetition (loops), and functions, implicit and explicit memory management, and intro to object oriented programming. One hour of problem solving recitation per week. Generally offered: Fall, Spring. Course Fee: LRE1 $25; STSE $30.

CPE 4812. Computer Engineering Design I. (2-1) 2 Credit Hours.
Prerequisite: EE 3563 and concurrent enrollment in or completion of EE 3233 and EE 4113. Business planning and project management in engineering design; discussion of ethical and social issues in design; and selection of a design project, development of a detailed design proposal, and approval of a design project. (Formerly CPE 4811. Credit cannot be earned for both CPE 4812 and CPE 4811.) This course has Differential Tuition. Course Fee: DL01 $50.

CPE 4813. Computer Engineering Design II. (2-3) 3 Credit Hours.
Prerequisite: CPE 4812. Complex system design; advanced ATE; project management, detailed design package, status reporting, formal oral and written technical reports, design reviews, and test plan development and execution; open-ended design project considering safety, reliability, environmental, economic, and other constraints; and ethical and social impacts. Generally offered: Fall, Spring. This course has Differential Tuition. Course Fee: DL01 $75.

CPE 4911. Independent Study. (0-0) 1 Credit Hour.
Prerequisite: Permission in writing (form available) from the instructor, the Department Chair, and Dean of the College. Independent reading, research, discussion, and/or writing under the direction of a faculty member. May be repeated for credit, but not more than 6 semester credit hours of independent study, regardless of discipline, will apply to a bachelor's degree. This course has Differential Tuition. Course Fee: LRE1 $25; STSE $10.

CPE 4912. Independent Study. (0-0) 2 Credit Hours.
Prerequisite: Permission in writing (form available) from the instructor, the student's advisor, the Department Chair, and Dean of the College. Independent reading, research, discussion, and/or writing under the direction of a faculty member. May be repeated for credit, but not more than 6 semester credit hours of independent study, regardless of discipline, will apply to a bachelor's degree. This course has Differential Tuition. Course Fee: LRE1 $25; STSE $20.

CPE 4913. Independent Study. (0-0) 3 Credit Hours.
Prerequisites: Permission in writing (form available) from the instructor, the Department Chair, and Dean of the College. Independent reading, research, discussion, and/or writing under the direction of a faculty member. May be repeated for credit, but not more than 6 semester credit hours of independent study, regardless of discipline, will apply to a bachelor's degree. This course has Differential Tuition.

CPE 4953. Special Studies in Computer Engineering. (3-0) 3 Credit Hours.
Prerequisite: May vary with the topic (refer to the course syllabus on Bluebook or contact the instructor). An organized course offering the opportunity for specialized study not normally or not often available as part of the regular course offerings. Topics may include the following: Topic 1: Computer and Networking Security; Topic 2: IoT Security; Topic 3: AI in Networked Systems; Topic 4: Embedded System Design; Topic 5: Superscalar Systems; Topic 6: Engineering Programming I; Topic 7: Engineering Programming II; Topic 8: Engineering Algorithms; Topic 9: Cloud Computing for Engineers; Topic 10: AI Hardware and Programming. May be repeated for credit as topics vary. (Same as EE 4953. Credit cannot be earned for both EE 4953 and CPE 4953.) This course has Differential Tuition.