Computer Engineering

In the College of Engineering

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Faculty

Emeritus: Iosupovici, Panos

Chair: Tummala

Coordinator for Computer Engineering: Marino

Professors: Gupta, harris, f., Harris, J., Lee, Marino, Tummala

Associate Professor: Ozturk

Assistant Professor: Liu

Offered by the Department of Electrical and Computer Engineering

Major in computer engineering with the B.S. degree.

Transfer Credit

No credit will be given for upper division engineering coursework taken at an institution having an engineering program which has not been accredited by the Accreditation Board for Engineering and Technology, Inc., unless the student successfully completes the first 12 units of engineering work attempted at this University. At that time, and upon recommendation of the department, credit will be given for the unaccredited work.

General Education

Students will complete a minimum of 50 units in General Education, to include a minimum of nine upper division units taken after attaining junior class standing. No more than 12 units may be used for General Education credit from any one department or academic unit. No more than 7 units from one department can be used in Sections II, III, and IV combined (Foundations, American Institutions, and Explorations).

I. Communication and Critical Thinking: 9 units
1. Oral Communication (3 units)
2. Composition (3 units)
3. Intermediate Composition and Critical Thinking (3 units)

II. Foundations: 29 units

A. Natural Sciences and Quantitative Reasoning (17 units):
1. Physical Sciences (7 units)
   Physics 195 (3 units)
   Physics 196 and 196L (4 units)
2. Life Sciences (3 units)
3. Laboratory (satisfied under A.1. above)
4. Mathematics/Quantitative Reasoning
   Mathematics 150 (3 units)
   Mathematics 151 (4 units)

B. Social and Behavioral Sciences (3 units)

C. Humanities (9 units)
Complete three courses in three different areas. One of these courses and the one under IV.A. below must be taken in the same department.

III. American Institutions: Three units of the six units of coursework which meet the American Institutions graduation requirement may be used in General Education, excluding courses numbered 500 and above.

IV. Explorations: Courses in this area must not be taken sooner than the semester in which you achieve upper division standing (60 units passed). Upper division courses in the major department may not be used to satisfy General Education. Total 9 units; must include one course of cultural diversity.

A. Upper division Humanities (3 units)
Three units must be taken from the same department as one of the Humanities courses selected in Foundations.

B. Upper division Humanities (3 units from a department not selected in A above.)

C. Upper division Social and Behavioral Sciences (3 units)

The Major

Computers are machines that store and process information. Desktop computers, portables, workstations, and mainframe computers are the most readily recognized examples of such devices. Equally important, however, are the millions of tiny computers (microprocessors) that are embedded in machines, instruments, and products of all sorts. For example, there are embedded computers in VCRs, cameras, telephones, CD players, tape players, televisions, washing machines, ovens, robots, automobiles, airplanes, medical instruments, toys, and many other devices, both familiar and exotic.

Computer Engineers are involved in the design, development, manufacture, installation, and operation of general purpose and embedded computers of all sorts. They are both concerned with hardware (i.e., the electronic circuits and devices that actually store and process information) and software (i.e., the programs that control the operation of the hardware). The B.S. degree program in Computer Engineering provides a solid foundation in the fundamentals of mathematics, science, computer hardware, computer software, and engineering design that are needed to practice the profession or to pursue a graduate degree in the field.

In addition to fundamentals, the curriculum also includes training in the areas of rapid growth that are important to modern practice of computer engineering. These include: Very Large Scale Integrated Circuits design (i.e., the design of electronic circuits implemented on silicon chips); Multimedia Systems (i.e., systems that process audio and visual information as well as text and numbers); Embedded Systems; Digital Signal Processing (DSP), which plays a vital role both in processing the continuous signals that are common in embedded system applications and in compressing and processing the large volumes of information that are common in multimedia systems; Computer Networks, which have become vital for connecting multiple computers in distributed control applications, and connecting users of general purpose computers who wish to share information and computing resources (e.g., Local Area Networks, the Internet); Graphical User Interfaces (GUIs), which are rapidly replacing text-based interfaces in nearly all applications; and Object Oriented Programming (OOP), a technique for designing more reliable and maintainable software.

The computer engineering curriculum provides a balance between theory and practice that prepares the graduate both for immediate employment and for continued study. The process of engineering design is emphasized throughout the curriculum by including open-ended problems with realistic design constraints. Creativity, consideration of economic and social factors, and the application of systematic design procedures are required in major design projects during the senior year.

Educational Objectives

The objectives of the computer engineering program are to provide graduates with:

A. The ability to function as knowledgeable professionals in computer engineering, and as responsible and productive members of society;
B. The fundamental background and critical thinking skills that will facilitate continued learning in either an academic or professional setting;
C. A general education that provides a background for understanding ethical and social issues related to the profession.

Computer Engineering Major

With the B.S. Degree (Major Code: 09094)

The program below describes the 129 units required for the degree.

Preparation for the Major. Computer Engineering 160, 260, 270, 271; Electrical Engineering 210; Engineering 280; Mathematics 150, 151, 245, 254; Physics 195, 196, 196L. (40 units)

General Education. Engineering students must follow the specific General Education program outlined on this page. Other General Education requirements and limitations, as well as listings of specific General Education course electives are presented in Section IX of Graduation Requirements for the Bachelor's Degree. (Forty-nine units, including 14 units from preparation for the major which count toward General Education credit, and three units of American institutions which count toward General Education credit.)

Graduation Writing Assessment Requirement. Completing one of the approved upper division writing courses (W) with a grade of C (2.0) or better or passing the Writing Proficiency Assessment with a score of 10 or above.

Major. A minimum of 50 upper division units to include Computer Engineering 361, 375, 460, 470, 470L, 475; Electrical Engineering 300, 310, 330, 330L, 410; one approved elective in mathematics or science (3 units); three engineering design electives selected from Computer Engineering 490A-490B, 560, 561, 565, 572, Electrical Engineering 530, 539, 556, 570, 581 or other approved elective (9 units); three approved technical electives in computer engineering, computer science, or electrical engineering (9 units). After enrollment in Computer Engineering at SDSU, the Computer Engineering major must take all upper division computer science and engineering courses at SDSU unless prior approval is obtained from the department.

Elective courses are subject to the approval of the faculty adviser and the department chair. The student must file an approved Master Plan during the first semester of the junior year specifying the electives selected. Changes in the Master Plan are permitted at any time, with approval of the department chair.

COMPUTER ENGINEERING MAJOR

FRESHMAN YEAR

Fall Semester	*Units*	*Spring Semester*	*Units*
Mathematics 150, Calculus I	5	COMPE 160, Intro. to Computer Prog.	3
General Education*	12	Mathematics 151, Calculus II	4
		Physics 195, Principles of Physics	3
		General Education*	6
	17		16

SOPHOMORE YEAR

Fall Semester	*Units*	*Spring Semester*	*Units*
COMPE 270, Digital Systems	3	COMPE 260, Data Structures and Object-Oriented Programming	3
Engineering 280, Methods of Analysis	3	COMPE 271, Computer Organization	3
Mathematics 245, Discrete Mathematics	3	Mathematics 254, Intro. to Linear Algebra	3
Physics 196, 196L Principles of Physics	4	EE 210, Circuit Analysis I	3
American Institutions*	3	General Education*	3
	16		15

JUNIOR YEAR

Fall Semester	*Units*	*Spring Semester*	*Units*
COMPE 375, Embedded Systems Prog.	3	COMPE 361, Windows Programming	3
COMPE 470, Digital Circuits	3	COMPE 470L, Digital Circuits Lab.	1
EE 300, Comp. and Stat. Methods	3	EE 410, Signals and Systems	3
EE 310, Circuit Analysis II	3	Technical Elective+	3
EE 330, 330L, Fund. Engr. Electronics	4	General Education*	6
	16		16

SENIOR YEAR

Fall Semester	*Units*	*Spring Semester*	*Units*
COMPE 460, Software Design and Engr.	3	Technical Electives+	9
COMPE 475, Microprocessors	3	General Education*	6
Technical Electives+	9		
American Institutions*	3		
	18		15

* See previous page for specific requirements.
\+ Check with department for approved courses.

Courses (COMPE)

NOTE: Prerequisites will be enforced in all undergraduate computer engineering and electrical engineering courses numbered 100 through 599. A copy of an official transcript will be accepted as proof. For corequisites, an enrollment confirmation form will be accepted.

Any course at the 300 level or below must be passed with a grade of C- or better in order to be used as a prerequisite for any subsequent course.

LOWER DIVISION COURSES

COMPE 160. Introduction to Computer Programming (3) I, II

Two lectures and three hours of laboratory.

Prerequisite: Credit or concurrent registration in Mathematics 150.

Editors, compilers, and operating systems. Fundamentals of computer programming using C++ language. Binary representation of information. Selection and iteration structures. Functions. Arrays. Pointers. File io. Scope and duration of variables. Systematic design and development of computer programs.

COMPE 260. Data Structures and Object-Oriented Programming (3)

Prerequisites: Computer Engineering 160 and Mathematics 245.

Data structures using object-oriented programming. Disciplined approach to design, coding, and testing using OOP, teach use and implementation of data abstractions using data structures. Arrays, linked lists, stacks, queues, trees. Sorting, searching, recursive algorithms.

COMPE 270. Digital Systems (3) I, II

Prerequisite: Mathematics 151.

Modelling, analysis and design of digital systems, primarily at the Logic Design level. Combinational and sequential networks. Not open to students with credit in Electrical Engineering 370.

COMPE 271. Computer Organization (3) I, II

Prerequisites: Computer Engineering 160 and 270.

Organization and operation of computer hardware and software. Operating system shell and services. Program design and development. Input-output programming. Multi-module and mixed-language programming. Assembler and C language.

UPPER DIVISION COURSES
(Intended for Undergraduates)

COMPE 361. Windows Programming (3)

Prerequisites: Computer Engineering 260 and 271.

Graphical user interface programming: Dialog boxes, menus, toolbars, status bars, fonts, icons, bitmaps. Event-driven programming, processes, event message processing, timers, on-idle processing, multithreaded programming. C++ windows class libraries: Integrated development environments, application framework, document view architecture. Visual programming.

COMPE 375. Embedded Systems Programming (3)

Two lectures and three hours of laboratory.

Prerequisite: Computer Engineering 271.

Embedded system architecture; IO programming using parallel ports, serial ports, timers, and D/A and A/D converters; interrupts and real-time programming; program development and debugging tools; C language and assembler.

COMPE 460. Software Design and Engineering (3)

Prerequisites: Computer Engineering 260 and 361.

Software design and engineering using object-oriented concepts. Object-oriented software development, classes, inheritance, design by abstraction, design patterns, object-oriented application framework, and introduction to concurrent and distributed computing. Application through design case study. (Formerly numbered Computer Engineering 360.)

COMPE 470. Digital Circuits (3) I

Prerequisite: Computer Engineering 270.

Design of digital electronic systems using commercially available high-speed digital devices and circuits.

COMPE 470L. Digital Logic Laboratory (1) I, II

Three hours of laboratory.

Prerequisites: Computer Engineering 470 and Electrical Engineering 330L.

Hands-on experience in characterization and application of standard digital integrated circuit devices.

COMPE 475. Microprocessors (3) II

Prerequisites: Computer Engineering 271 and 470.

Bus design, memory design, interrupt structure, and input/output for microprocessor-based systems.

COMPE 490A-490B. Senior Project (490A: 1 unit, Cr/NC) (490B: 2 units)

Computer Engineering 490A: Three hours of activity. Computer Engineering 490B: Six hours of activity.

Prerequisites: Computer Engineering 361, 375, and prior approval of project by supervising instructor.

Supervised team design projects. Each team completes a single design project in the two-semester sequence. Written and oral reports.

COMPE 496. Advanced Computer Engineering Topics (1-3)

Prerequisite: Consent of instructor.

Modern developments in computer engineering. See Class Schedule for specific content. Maximum credit nine units for any combination of Computer Engineering 496 and 596 applicable to a bachelor's degree.

COMPE 499. Special Study (1-3) I, II

Prerequisite: Approval of project adviser and department chair.

Individual study. Maximum credit six units.

UPPER DIVISION COURSES
(Also Acceptable for Advanced Degrees)

COMPE 560. Computer and Data Networks (3)

Two lectures and three hours of laboratory.

Prerequisites: Computer Engineering 271 and Electrical Engineering 410.

Wide area and local area networks. Multi-layered protocol models, telephone systems, modems, and network applications.

COMPE 561. Advanced Windows Programming (3)

Prerequisite: Computer Engineering 361.

Win32 application programmers interface. Microsoft foundation classes. Memory management. Multitasking and multithreading. The clipboard. Dynamic data exchange. Dynamic link libraries. Object linking and embedding. Active template library. ActiveX controls. Internet programming. (Formerly numbered Computer Engineering 577 and 577L.)

COMPE 565. Multimedia Communication Systems (3)

Prerequisite: Credit or concurrent registration in Computer Engineering 560.

Design and implementation of multimedia communication systems. Image compression, JPEG, VQ, cell-B standards. Video and audio compression standards, MPEG, MPEG-2, H.26X, G.72X. Data storage systems and multimedia requirements. Networking requirements and networks as multimedia carriers. Transport and network protocols for carrying multimedia over data networks. Multimedia system design, scheduling, congestion control, traffic shaping, buffer management.

COMPE 572. VLSI Circuit Design (3) I

Prerequisites: Computer Engineering 271 and Electrical Engineering 330.

Design of digital integrated circuits based on CMOS technology; characterization of field effect transistors, transistor level design and simulation of logic gates and subsystems; chip layout, design rules, introduction to processing; ALU architecture.

COMPE 596. Advanced Computer Engineering Topics (1-3) I, II

Prerequisite: Consent of instructor.

Modern developments in computer engineering. See Class Schedule for specific content. Maximum credit of nine units for any combination of Computer Engineering 496 and 596 applicable to a bachelor's degree. Maximum combined credit of six units of Computer Engineering 596 and 696 applicable to a 30-unit master's degree.