Computer Engineering

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Professors: Denenberg
Associate Professors: Lyon (Chair), Porter, Ramsey
Assistant Professors: Conti, Guelakis, Hye, Ramachandran
Senior Instructors: Angelo, Corcoran, DeCarli, Medalis, Muccio, Raulerson, Reed, Whiskeyman

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Bachelor of Science

Students are given the tools they need to take the lead in creating the next generation computer technologies. They are immersed in computer science, software engineering, electrical engineering, physics, mathematics and the liberal arts. Sequences of general and restricted electives, as well as a senior project, customize the program to the needs of the student.

  Students are exposed to the high-tech areas of **signal processing**, **visualization** and **computer systems**. Topics include networking, computer graphics, image processing, video compression, transmission, visualization, display techniques and multimedia systems. Students become skilled in creating unique object-oriented designs. State of the art facilities are available and close interactions are maintained with industry.

Computer engineers are employed by all sectors of industry, government, and academic institutions. They are active in the areas of hardware and software design, information technologies and can take the lead in the research and development of new computer systems and applications. The curriculum for the Computer Engineering major is comprised of 132 credits, and it is shown below.

CE Curriculum (132 credits)

Year 1 / Fall		yr	SFU	grade	Year 1 / Spring	
MA 125 CALCULUS I	3				MA 126 CALCULUS II	3
PS 15 GEN.PHYSICS I	3				PS 16 GEN.PHYSICS II	3
PS 15L GEN.PHYS.LAB	1				PS 16L GEN PHYS LAB	1
EG. 31 Fund. of Eng.	3				EG. 32 Fund. of Eng.	3
CS 131 COMP. PROGRAMMING	3				CS 132 COMP. PROGRAMMING II	3
EN 11 COMPOSITION & PROSE	3				EN 12 INTRO to LITERATURE	3
total	16				total	16
Year 2 / Fall					**Year 2 / Spring**	
MA 227 CALCULUS III	3				MA 228 CALCULUS IV	3
EE 213 Analog Electronics & Circu	3				CS 232 Data Structures	3
EE 213L Analog Electronics & Circu	1				AH 10 INTRO TO ART HISTORY I	3
CPE 245 DIGITAL DESIGN I	3				CPE 246 DIGITAL DESIGN II	3
CPE 245L DIGITAL DESIGN Labo	1				HI 30 EUROPE & WORLD IN TRANS	3
ME 201 STATICS	3				PH 10 INTRO to PHILOSOPHY	3
RS 10 INTRO RELIGIOUS STUDY	3					
total	17				total	18
Year 3 / Fall					**Year 3 / Spring**	
MA 321 ORD DIFF EQUAT	3				MA 211 Applied Matrix Theory	3
CPE 310 Voice and Signal Processi	3				Ma 217 Applied Statistics	3
PS 222 OPTICS & WAVE	3				CPE 311 Image Processing	3
PS 203 LAB OPT. & LASERS	1				EC 11 Microeconomics	3
Major Elective 1	3				CD 211 Engr. Graphics CAD I	3
ENGLISH ELECTIVE	3				General Elective	3
total	16				total	18
Year 4 / Fall					**Year 4 / Spring**	
CPE 320 Computer Networks	3				CPE 325 Computer Graphics	3
PH ELECTIVE	3				History Elective	3
Restricted Elective 2	3				PH/RS ELECTIVE (ETHICS)	3
PS 206 Lab in Adv. Opt. Comm	1					
CPE 390 SENIOR PROJECT I	3				General Elective or CPE 391 SENIOR	3
RS ELECTIVE	3				Social Science Elective	3
total	16				total	15

Computer Engineering Electives

The domains of the computer engineering program include **signal processing**, **visualization** and **computer systems**. Students may specialize in any of the domains. Some restricted elective sequences permit students to explore more that one domain. For example, *robotics* permits expertise in both computer systems and visualization. The communications sequence allows for an exploration of the signal processing domain. Computer systems is supported by *computer hardware, electronic devices* or the *computer science* elective sequences. Mathematics supports all three domains and is generally useful in all branches of engineering.

Each restricted elective sequence is taken late in the students program. It is up to the student and the advisor to formulate a plan of study that meets the students educational needs and interests. Also, the courses listed have prerequisites that constrain when the sequence may be taken.

Robotics (prerequisite for this sequence, ME 201)
ME203 Kinematics/Dynamics
MF 361 Automation and Robotics I

Communications(prerequisite for this sequence, CPE 245)
EE 301 Signals and Systems
EE 350 Communication Systems

Computer Hardware (prerequisite for this sequence, CPE 245)
EE 345 Digital Comp. Syst's
EE 346 Microprocessor Hardware Control

Electronic Devices(prerequisite for this sequence, EE 213)
EE231, EE231L Electron. I
EE331,EE331L Electron. II

Mathematics (prerequisite for this sequence, MA 272)

MA 371 Real Analysis
MA 383 Modern Geometry

Comp. Science Plan B (prerequisite for this sequence, CS 232)
CS331 Operat. Systems I
CS332 Operat. Systems II

Comp. Science Plan A (prerequisite for this sequence, none)
CS231 Discrete Math
CS342 Theory of Computations

Keep in mind that the CS courses listed here, e.g., CS342, 331,332, may not be a regular fare of the CS curriculum. We neeed to interact with the CS people regarding the CE need for these courses. *OK!*
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Computer Engineering

CPE 245 Digital Electronics Design I
This course will examine both combinational and sequential logic circuits. It will start with basic digital design principles and Boolean algebra. It continues with combinational logic design with gates, MSI, LSI and sequential logic design with registers, counters, memory and PLD. Students learn how to write, implement and simulate elementary digital design; the course culminates by enabling the

students to design and implement finite-state machines. This is a foundations course that enables students to be able to perform well in the follow-on course (Prerequisite: EE213)

3 credits

CPE245L Digital Design I Laboratory

This lab course covers the practical aspects of digital logic design. Logic circuits are designed and implemented using simulators and hardware. Designs are realized using techniques taught in the Digital Design I lecture. State machines are used to implement open-ended design problems.(Corequisite: CPE245*)*

1 credit

CPE 246 Digital Electronics Design II
Computer architecture implemented using a hardware design language and PLDs. Students design, implement and program small RISC machines. They will understand CPU architecture and the VHDL language and will be able to implement and program a CPU using VHDL. Student knowledge of the basics culminates in being able to design and implement programmable finite state machines.(Prerequisite: CPE 245)

3 credits

Please do not capitalize unnecessarily in the next two descriptions.

In contrast to CPE325, CPE302 which is indicated as a prerequisite for this course is not a required course according to the CE curriculum. It is not even listed under Electives. Please adjust accordingly

CPE310 Voice and Signal Processing
This course is designed to support the signal processing and computer systems domain. It is an overview of Digital Audio and its application. Current state of streaming Audio on the Internet, Digital Audio Processing Fundamentals. Students apply the theories of Sampling, Spectra, Fast Fourier Transform Class, convolution and frequency space processing, compression and one dimensional streaming. They will apply the theories by creating programs that read process and write audio streams. They are exposed to the elements of multi-media network delivery of data. They learn about a wide class of FFT algorithms and elementary sound synthesis.
Prerequisite – CS 232, MA 211, CPE302 (Lets strike this out, operating systems is no longer required))

CPE 311 Image Processing
A first course in Image Processing; Image algebra,arithmetic operations, Boolean operations, matrix operations, Achromatic and Colored Light, Selecting Intensities, Gamma Correction, Chromatic Color, psychophysics, Color models, Color Space Conversion, low Level pattern recognition. Theory of 2-D Fast Fourier Transform Class, 2D convolution and frequency space processing, compression and 2D streaming. Multi-resolution multi media network streaming. They learn about a wide class of transforms, including Wavelets, DCT, the PFA FFT and others. This course requires substantial programming effort and emphasis is place on good software engineering practices. Students write image processing applications.
Prerequisite – Prereq: CPE 310

CPE320 Computer Networks
The students will learn the principles of Network Programming, operating system elements, multi-threading, command-line interpreters and monitors. Students write their own operating system, implemented in Java, using a virtual machine. New system commands are added to the JAVAOS. Students deploy a custom-built, distributed, multi-platform, thin-client operating system.
Prerequisite – Prereq: CS 232, MA 217.

In contrast to CPE325, CPE302 which is indicated as a prerequisite for this course is not a required course according to the CE curriculum. It is not even listed under Electives. Please adjust accordingly *ok, also, I made some small format changes to the Computer Networks description, above.*

CPE325 Computer Graphics
This course is designed to support the visualization and computer systems domain It is a unified introductory treatment to two-dimensional and three-dimensional computer graphics concepts. Topics include Human-computer interfaces using the AWT, applied geometry; homogeneous coordinate transforms; Bezier curves, Bernstien Basis Polynomials, Hermite Polynomials, B-Spline curve fitting. Rendering topics: z-buffer algorithm, painters algorithm, raytracing, and texture mapping.
Prerequisite – CS 232, MA 211, , ~~CPE302 (Lets strike this out, operating systems is no longer required)~~)

The following two courses are not listed in the curriculum or under Electives. Hence their description here will be eliminated unless you adjust curriculum accordingly. All course descriptions must correspond to courses in major curriculum or as electives. *OK, I have removed these from the curriculum. I think that I indicated this in a previous e-mail, but the versions have somehow gotten out of sync.*

~~**CE 301 Operating Systems in Java**~~
~~After the student take this course, they will know how to write Java programs that can perform network services. Students will understand the layers and protocols in the Internet and OSI models. Students will understand multi-threaded streaming, message routing, serialization and persistence.~~
~~Student knowledge of the basics culminated in being able to design and implement a client-server system.(PreReq: CS232 Data Structures in Java)~~

~~**CPE302 Eng. Applications of Numerical Methods**~~
~~Root-finding, interpolation, linear algebraic systems, numerical integration, and numerical solution of ordinary and partial differential equations. Substantial programming projects required. The theoretical basis is provided for the students to proceed in computer graphics and voice and signal processing. This course requires substantial programming effort and emphasis is place on good software engineering practices.~~
~~(PreReq: CS232 Data Structures in Java, MA 227)~~

A sample plan of study follows.
A sketch of the courses by pre-requisite follows:

"Computer Engineering"

PS15/L CD211 EG31

MA125

MA217 MA211 MA126 CPE245/L

CPE320 CPE325 MA227 CPE246

MA228 RE1

MA321 RE2

RE3 CPE390

CPE391

CS131

EE213/L ME201 PS16/L CS132

PS203 CS232

PS222 CPE310

PS206 CPE311