Computer Engineering (CEC)

Courses

CEC 220 Digital Circuit Design 3 Credits (3,0)
This course provides a knowledge and facility in logic design, interfacing digital circuits, Boolean algebra, combinatorial logic circuits, circuit minimization techniques, flip-flop storage elements, shift registers, counting devices, sequential logic circuits, state machines and computer structure.
Corequisites: CEC 222

CEC 222 Digital Circuit Design Laboratory 1 Credit (0,3)
Laboratory experiments in the measurement and verification of digital circuits. Discrete and integrated logic circuit design analysis and measurements.
Corequisites: CEC 220

CEC 299 Special Topics in Computer Engineering 1-6 Credit
Individual independent or directed studies of selected topics.

CEC 300 Computing in Aerospace and Aviation 3 Credits (3,0)
This course explores the computer engineering aspects of systems ranging from embedded sensor and actuator controllers to high-performance computing systems used in air traffic control and weather forecasting. The critical factors that impact the engineering decisions involved, including technological, economic, social, and professional issues are discussed. Key engineering techniques and practices, including database, human-computer interaction, and networks of systems are explored through case studies and representative examples from the aerospace and aviation domains. Pre-Requisite: Junior Standing
Prerequisites: EGR 115 or CS 223

CEC 315 Signals and Systems 3 Credits (3,0)
Introduction to signal processing systems for both digital and analog systems. Mathematics of signal representation and signal processing, including functional descriptions of signals and systems. Implications of linearity and time-invariance, and input-output behavior of linear, time-invariant systems. Causality and stability. Zero-input and zero-state responses. Z and Laplace Transforms. Fourier Series and Fourier Transforms for discrete and continuous systems. Extensive use of MATLAB and Simulink.
Prerequisites: EGR 115 or CS 223 **Corequisites:** MA 345

CEC 320 Microprocessor Systems 3 Credits (3,0)
Study of digital computer organizations. Introduction to microcomputer systems using a current microprocessor. Assembly language programming techniques for microcomputers will be used to study digital computer operation. Input and output techniques, memory devices, RS 232, and other interfacing techniques will be studied. Hardware and software relationships will also be discussed.
Prerequisites: CEC 220 **Corequisites:** CEC 322

CEC 322 Microprocessor Systems Laboratory 1 Credit (0,2)
Hands-on experience with a microprocessor is provided through weekly experiments involving hardware and software techniques.
Prerequisites: CEC 222 **Corequisites:** CEC 320

CEC 330 Digital Systems Design with Aerospace Applications 4 Credits (3,2)
Principles of advanced digital design, building on logic design principles learned in CEC 220. Use of computer-aided design tools to develop complex digital circuits and prototype designs using programmable logic devices and field-programmable gate arrays. Lab component involving VHDL and FPGAs.
Prerequisites: CEC 220 and CEC 222 **Corequisites:** CEC 330L

CEC 399 Special Topics in Computer Engineering 1-6 Credit
Individual independent or directed studies of selected topics.

CEC 410 Digital Signal Processing 3 Credits (3,0)
Specification, design, and implementation of offline signal processing systems on general-purpose computers and real-time signal processing systems on special-purpose digital signal processing microprocessors (DSPs). Review of sampling theory and discrete time filtering. Filter design tools. Digital-to-analog and analog-to-digital conversion hardware. DSP core architectures and hardware interrupts. Aspects of system-on-a-chip DSPs for data transfer, cache management, external memory reference, and co-processor interface. Real-time operating systems for DSPs. Applications to modern communication and control systems.
Prerequisites: CEC 315 **Corequisites:** CEC 411

CEC 411 Digital Signal Processing Laboratory 1 Credit (0,3)
Laboratory companion course to CEC 410 featuring development of signal generation, processing, and analysis systems using digital signal processing microprocessors (DSPs). DSP software development and debugging environments. Chip- and board-support libraries. Use of algorithm libraries for rapid system development. System development tools, including automatic code generation with Simulink. Culminates in development of stand-alone board-based DSP system.
Prerequisites: CEC 315 **Corequisites:** CEC 410

CEC 420 Computer Systems Design I 3 Credits (2,3)
This is the first course in the senior project sequence (CEC 420 and CEC 421). This course introduces students to discussing issues of management, planning, task assignment, resource allocation, requirement collection, and system specification and design. The team working in a distributed environment will develop a base for implementation of a computer-centered system with elements of both hardware and software. The artifacts developed during this course will be used as the foundation for further development during the second course (CEC 421) in the sequence. Pre-Requisite: Computer Engineering Major and Senior status
Prerequisites: Computer Engineering majors and Senior standing

CEC 421 Computer Systems Design II 3 Credits (1,6)
This is the second course in the senior project sequence (CEC 420 and CEC 421). This is the continuation of CEC 420. This course continues with project development, focusing on issues of detailed design, modularization, component selection, coding, assembling, and testing. The team working in a distributed environment will implement and test a computer-centered system with elements of both hardware and software.
Prerequisites: CEC 420

CEC 440 Autonomous Vehicle Design 3 Credits (3,0)
This course introduces students to the issues involved in the development of autonomous vehicles as applied in aerospace and aviation. This multidisciplinary course is designed to give students a variety of basic concepts and hands-on experience in robotics and automation. Topics include control, sensing, vision, intelligence, and mechanics. To gain hands-on experience, students will participate in a project in which they will design and build an autonomous vehicle that will participate in an international robotics competition.
Prerequisites: CEC 320

CEC 450 Real-Time Embedded Systems 3 Credits (3,0)
Overview of real-time embedded systems. Concepts of real-time systems from the user and designer viewpoint. The requirements, design, implementation, and basic properties of real-time embedded application software. Related topics: interrupts, concurrent task synchronization, sharing resources, and software reliability.
Prerequisites: CS 225 and CEC 320

CEC 460 Telecommunications Systems 3 Credits (3,0)
******OFFERED ON PRESCOTT CAMPUS ONLY****** Techniques and applications in telecommunications. Types of data communication versus line discipline methodology. Hardware requirements and constraints. Speed versus quality. Security and encoding algorithms.
Prerequisites: CEC 320

CEC 470 Computer Architecture 3 Credits (3,0)
This course describes in detail the Von Neuman computer architecture, which includes processors, memory, input/ output, and transfer of information; examples of machine language, assembly language, microprogramming, and operating systems will be discussed. Additional topics in advanced computer architecture and computer systems will be covered.
Prerequisites: CEC 320

CEC 499 Special Topics in Computer Engineering 1-6 Credit
Individual independent or directed studies of selected topics.