

# COMPUTER ENGINEERING (CPE)

## CPE 64. Introduction to Logic Design. 4 Units

**Prerequisite(s):** CSC 15 or CSC 25 or ENGR 50.

**Term Typically Offered:** Fall, Spring

Covers the following topics: logic gates, binary number system, conversion between number systems, Boolean algebra, Karnaugh maps, combinational logic, digital logic design, flip-flops, programmable logic devices (PLDs), counters, registers, memories, state machines, designing combinational logic and state machines into PLDs, and basic computer architecture. Lab emphasizes the use of software equation entry design tools, the use of a schematic entry, and the use of a logic simulation design tool. Lab assignments are design-oriented. Lecture three hours; laboratory three hours.

Cross listed: EEE 64

## CPE 64P. Peer-Assisted Learning CPE 64. 1 Unit

**Corequisite(s):** CPE 64.

**Term Typically Offered:** Fall, Spring

Students concurrently enrolled in CPE 64 work through faculty-designed problems sets under the guidance of a trained student facilitator to improve their understanding of CPE 64 content. Pedagogical strategies that encourage active, engaged learning are employed to facilitate student success.

Crosslisted: EEE 64P.

Credit/No Credit

## CPE 64W. Introduction to Logic Design Workshop. 1 Unit

**Corequisite(s):** CPE 64.

**Term Typically Offered:** Fall, Spring

Designated to assist students in developing a more thorough understanding of logic simulation and logic design. Focus is on problem solving and design. Activity two hours.

Cross Listed: EEE 64W; only one may be counted for credit.

Credit/No Credit

## CPE 138. Computer Networking Fundamentals. 3 Units

**Prerequisite(s):** CSC 35, CSC 60, CSC 130. Not currently enrolled in CSC/ CPE 138.

**Term Typically Offered:** Fall, Spring

Overview, structure, models, concepts, principles and protocols of computer networking. Network architecture, ISO/OSI reference model, TCP/IP protocol stack, layering. Protocol, encapsulation, socket. HTTP, FTP, SMTP, DNS, P2P, TCP, UDP. Multiplexing and demultiplexing, reliable data transfer, flow control, congestion control. Internet addressing, routing, forwarding, IP, ICMP. Error detection and correction, multiple access problem, LAN vs WAN, Ethernet, ARP, switching. Wireless standards. Network security, threats and attacks, defense and countermeasures.

Cross Listed: CSC 138; only one may be counted for credit.

## CPE 142. Advanced Computer Organization. 3 Units

**Prerequisite(s):** CSC 137 or CPE 166 and CPE 185.

**Term Typically Offered:** Fall, Spring

Design and performance issues of computers. Instruction set architecture, computer arithmetic, processor design, survey of contemporary architectures, interfacing I/O devices, hierarchical memory design and analysis, parallelism and multiprocessing, distributed systems, techniques for enhancing performance, and an introduction to EDA tools for design and verification of computers. Design and simulation of a microcomputer in an HDL.

**Note:** Open to students with full CSC or CPE major standing only. Cross Listed: CPE 142; only one may be counted for credit.

## CPE 144. Dsp Architecture Design. 3 Units

**Prerequisite(s):** CPE 142.

**Term Typically Offered:** Fall, Spring

Fundamental principles of Digital Signal Processing (DSP): sampling theory, aliasing effects, frequency response, Finite Impulse Response filters, Infinite Impulse Response filters, spectrum analysis, Z transforms, Discrete Fourier Transform, and Fast Fourier Transform. Emphasis on hardware design to achieve high-speed real and complex multiplications and additions. Pipelining, Harvard, and modified Harvard architectures are included. Concludes with architectural overviews of modern DSP applications: modems, speech processing, audio and video compression and expansion, and cellular.

## CPE 151. CMOS and Digital VLSI Design. 3 Units

**Prerequisite(s):** CPE 64 and EEE 108.

**Term Typically Offered:** Fall, Spring

Introduction to CMOS logic gates and the design of CMOS combinational and sequential functions at the gate level, including CMOS memory. CMOS transistor theory is covered including: DC equations, threshold voltage, body effect, subthreshold region, channel length modulation, tunneling, and punch through. A basic exposure to VLSI includes: CMOS processing technology, layout, and CMOS logic design including power, delay and timing considerations. Students will use industry standard Computer Aided Design tools to verify designs and layouts.

## CPE 153. Vlsi Design. 3 Units

**Prerequisite(s):** CPE 151.

**Term Typically Offered:** Fall, Spring

Review basic CMOS VLSI technology, circuit characterization and performance estimation, and provides detailed information on synthesis, placing and routing, clocking strategies, quality and reliability, and I/O structures. Design examples, design techniques, and testing techniques will be presented via current EDA design tools. Students assigned one project from concept design through validation.

## CPE 159. Operating System Pragmatics. 3 Units

**Prerequisite(s):** CSC 139.

**Term Typically Offered:** Fall, Spring

Application of operating system principles to the design and implementation of a multi-tasking operating system. Students will write an operating system for a computer system. Topics include scheduling of processes, control and allocation of computer resources and user interfacing.

Cross Listed: CSC 159; only one may be counted for credit.

**CPE 166. Advanced Logic Design.****4 Units****Prerequisite(s):** CPE 64, ENGR 17.**Term Typically Offered:** Fall, Spring

VHDL and Verilog Hardware Description Languages are studied and used on the following advanced level logic design topics: synchronous state machines, asynchronous state machines, metastability, hazards, races, testability, boundary scan, scan chains, and built-in self-tests. Commercial Electronic Design Automation (EDA) toolsets are used to synthesize lab projects containing a hierarchy of modules into Field Programmable Gate Arrays (FPGAs). Post synthesis simulations by these same tools verify the design before implementation on rapid prototyping boards in the lab.

**CPE 185. Computer Interfacing.****4 Units****Prerequisite(s):** CPE 64, CSC 35 and CSC 60.**Term Typically Offered:** Fall, Spring

Design of microcomputer systems including memory systems, parallel and serial input/output, timer modules, and interrupt structures; designing "C" language code, in laboratory, to exercise interface modules of parallel and serial input/output, timer modules, and interrupts; extensive study of interrupt handlers, assemblers, linkers, and loaders. Practical features of interfaces, handshaking techniques, displays, keypads, and trackballs are included.

**CPE 186. Computer Hardware System Design.****3 Units****Prerequisite(s):** CPE 185 or EEE 174.**Term Typically Offered:** Fall, Spring

Study of Intel and Motorola architectures, bus structures, interrupts, memory interface and controllers, bus arbitration, DMA controllers, I/O interface, bridges and microcontroller. Electromagnetic compatibility and regulations, cabling and shielding, grounding, digital circuit noise and layout.

**CPE 187. Embedded Systems Design.****3 Units****Prerequisite(s):** CPE 185 or EEE 174.**Term Typically Offered:** Fall only

Introduction to embedded systems with applied projects. The ISA, memory map, register architecture and configuration for one processor are studied in depth. Topics include: Overview of embedded systems; hardware, firmware, and software design; interrupt programming; application of contemporary interfacing protocols like USB and Bluetooth; use of an integrated development environment (IDE) for development; functional debugging; Real Time Operating Systems (RTOS) considerations and scheduling. One two hour lecture and one three hour lab per week.

**CPE 190. Senior Design Project I.****2 Units****Prerequisite(s):** CPE 166, CPE 187, EEE 108**Corequisite(s):** CPE 142**Term Typically Offered:** Fall, Spring

Centers on developing hardware and software project planning and engineering design skills. Emphasis is placed on design philosophies, problem definition, project planning and budgeting, written and oral communication skills, working with others in a team arrangement, development of specifications and effective utilization of available resources. Lecture one hour per week, laboratory three hours per week.

**CPE 191. Senior Design Project II.****2 Units****Prerequisite(s):** CPE 190, and (GWAR Certification before Fall 09, or WPJ score of 70+, or at least a C- in ENGL 109M or ENGL 109W).**Term Typically Offered:** Fall, Spring

Continuation of CPE 190. Students are expected to continue the project started by design teams in CPE 190. The hardware will be completed, tested and redesigned if necessary. At the same time, software for the project will be finished and debugged. The final results of the team project will be presented to the CPE faculty and students at a prearranged seminar. Lecture one hour, laboratory three hours.

**CPE 195. Fieldwork in Computer Engineering.****1 - 15 Units****Prerequisite(s):** Petition approval by Program Coordinator.**Term Typically Offered:** Fall, Spring

Directed observations and work experience in computer engineering with firms in the industry or public agencies. Supervision is provided by the instructional staff and the cooperating agencies. Faculty approval required.

**Note:** May be repeated for credit.

Credit/No Credit

**CPE 195A. Professional Practice.****1 - 12 Units****Prerequisite(s):** Instructor permission.**Term Typically Offered:** Fall, Spring

Supervised employment in a professional engineering or computer science environment. Placement arranged through the College of Engineering and Computer Science. Requires satisfactory completion of the work assignment and a written report.

Credit/No Credit

**CPE 195B. Professional Practice.****1 - 12 Units****Prerequisite(s):** Instructor permission.**Term Typically Offered:** Fall, Spring

Supervised employment in a professional engineering or computer science environment. Placement arranged through the College of Engineering and Computer Science. Requires satisfactory completion of the work assignment and a written report.

Credit/No Credit

**CPE 195C. Professional Practice.****1 - 12 Units****Prerequisite(s):** Instructor permission.**Term Typically Offered:** Fall, Spring


Supervised employment in a professional engineering or computer science environment. Placement arranged through the College of Engineering and Computer Science. Requires satisfactory completion of the work assignment and a written report.

Credit/No Credit

**CPE 199. Special Problems.****1 - 3 Units****Prerequisite(s):** Instructor permission.**Term Typically Offered:** Fall, Spring

Individual projects or directed reading.

**Note:** Open only to those students who appear competent to carry on individual work. Admission to this course requires approval of the faculty member under whom the individual work is to be conducted, in addition to the approval of the advisor. May be repeated for credit.

<p><b>CPE 201. Research Methodology.</b>  <b>2 Units</b>  <b>Prerequisite(s):</b> Graduate standing or instructor permission.  <b>Term Typically Offered:</b> Fall, Summer</p>	<p><b>CPE 299. Special Problems.</b> <b>1 - 3 Units</b>  <b>Prerequisite(s):</b> Instructor permission.  <b>Term Typically Offered:</b> Fall, Spring</p>
<p>Immersion in the discourse of Computer Engineering: genres, literacies, stylistic conventions, research methodology. Collective and individual study of selected issues and problems relating to fields of study in the Computer Engineering. Orientation to the requirements for the master's degree culminating experience.  <b>Note:</b> Must be taken in the first semester of the graduate program.  Crosslisted: EEE 201.</p>	<p>Open to qualified students who wish to pursue problems of their own choice. Projects must have approval and supervision of a faculty advisor.  <b>CPE 500. Culminating Experience.</b> <b>5 Units</b>  <b>Prerequisite(s):</b> Advanced to candidacy and graduate coordinator's permission.  <b>Term Typically Offered:</b> Fall, Spring</p>
<p><b>CPE 273. Hierarchical Digital Design Methodology.</b> <b>3 Units</b>  <b>Prerequisite(s):</b> CSC 205, EEE 285 or their equivalents.  <b>Term Typically Offered:</b> Fall, Spring</p> <p>Advanced logic modeling, simulation, and synthesis techniques. Topics include modeling, simulation, and synthesis techniques, using Hardware Description Language (HDL's), Register Transfer Level (RTL) representation, high level functional partitioning, functional verification and testing, computer-aided logic synthesis, logical verification and testing, timing and delay analysis, automated place and route process', and design with Application Specific Integrated Circuits (ASICs) and programmable logic.</p>	<p>Completion of a thesis or project approved for the master's degree.  <b>Note:</b> May be repeated for credit.</p>
<p><b>CPE 274. Advanced Timing Analysis.</b> <b>3 Units</b>  <b>Prerequisite(s):</b> EEE 273, CSC 273, CPE 273 or instructor permission.  <b>Term Typically Offered:</b> Fall, Spring</p> <p>Timing analysis of Application Specific Integrated Circuit (ASIC) designs: Topics include ASIC design methodology, static timing analysis, timing design constraints, design reports, clock timing issues, timing exceptions, operating conditions, hierarchical analysis, analyzing designs with asynchronous logic, performance measurement and power issues.  Cross-listed: EEE 274; only one may be counted for credit.</p>	
<p><b>CPE 280. Advanced Computer Architecture.</b> <b>3 Units</b>  <b>Prerequisite(s):</b> CSC 205, fully classified graduate status.  <b>Term Typically Offered:</b> Fall, Spring</p> <p>Introduction to parallel architecture covering computer classification schemes, fine and course grain parallelism, processor interconnections, and performance issues of multiprocessor systems. Includes parallel and pipelined instruction execution, structure of multiprocessor systems, memory hierarchy and coherency in shared memory systems, programming issues of multiprocessor systems, arithmetic pipeline design, and design for testability.</p>	
<p><b>CPE 296T. Digital Speech Processing.</b> <b>3 Units</b>  <b>Prerequisite(s):</b> EEE 181 or instructor permission.  <b>Term Typically Offered:</b> Fall, Spring</p> <p>The objective of this course is to cover the digital processing of speech signals. Topics include speech production and perception, speech processing in the time frequency domains. Short-time energy and Short-time Fourier analysis, homomorphic and linear predictive coding methods. Also covered are speech coding, basic introduction of text-to-speech synthesis and speech recognition.  Cross listed: EEE 296T.</p>	