COMPUTER ENGINEERING (CPE)

CPE 500 SOFTWARE ENGINEERING (3 Hours)
Examination of the software development life cycle; requirements elicitation; system design; Unified Modeling Language (UML) focus on design; risk analysis; configuration management; testing; maintenance; software project management; team building.

CPE 503 COMPUTATIONAL METHODS (3 Hours)
Computational methods for solving problems in engineering analysis; variational methods; finite-difference analysis; optimization methods; finite-difference analysis; matrix methods; focus is on real-world engineering problems; techniques and algorithms for simulating large-scale digital and analog circuits.

CPE 505 ANALYSIS OF ALGORITHMS (3 Hours)
Mathematical foundations of algorithms and algorithm analysis; sorting and searching algorithms, graph algorithms, algorithm design techniques, lower bound theory, fast Fourier transforms, NP-completeness.

CPE 508 OPERATING SYSTEMS (3 Hours)
Examination of concepts of process communication and synchronization; protection; performance measurement; study of mutual exclusion; concurrent processes; device and memory management; I/O and interrupt structures.

CPE 512 COMPUTER ARCHITECTURE (3 Hours)
Study of architectural features of modern processors, including cache memories and memory systems, pipeline designs, branch prediction techniques; design of superscalar, multithreaded VLIW processors, code optimization for such systems will be studied; quantitative evaluation of architectural features.

CPE 515 ADVANCED LOGIC DESIGN (3 Hours)
Advanced concepts in Boolean algebra; use of hardware description languages as a practical means to implement hybrid sequential and combinational designs; digital logic simulation; rapid prototyping techniques; design for stability concepts; focuses upon the actual design and implementation of sizeable digital design problems using a representative set of Computer Aided Design (CAD) tools.

CPE 520 ADVANCED ENGINEERING ANALYSIS (3 Hours)
A comprehensive course to familiarize engineering professionals with advanced applied mathematics as it relates to solving practical engineering problems. The course of intensive study blends the theoretical underpinnings of advanced applied mathematics with an understanding of how these powerful tools can be used to solve practical engineering problems. The material covered includes Ordinary Differential Equations; Linear Algebra, Vector Calculus; Fourier Analysis and Partial Differential Equations.

CPE 521 ADVD ENGINEERING ANALYSIS II (3 Hours)
A comprehensive course to familiarize engineering professions with advanced applied mathematics as it relates to solving practical engineering problems. The course of intensive study blends theoretical and advanced applied mathematics with an understanding of how these powerful tools can be used to solve practical engineering problems. The material covered includes Complex Analysis; Numerical Methods; Optimization; Graphs; and Probability and Statistics.

CPE 530 VLSI DESIGN (3 Hours)
Theory of MOS transistors: fabrication, layout, characterization; CMOS circuit and logic design; circuit and logic simulation, fully complementary CMOS logic, pseudo-NMOS logic, dynamic CMOS logic, pass-transistor logic, clocking strategies; sub system design; ALUs, multipliers, memories, PLAs; architecture design: data path, floor planning, iterative cellular arrays, systolic arrays; VLSI algorithms; chip design and test; full custom design of chips, possible chip fabrication by MOSIS and subsequent chip testing.

CPE 532 DIGITAL INTEGRATED CIRCUITS (3 Hours)
Design methodologies for digital systems using a modern hardware description language; algorithmic, architectural and implementation aspects of arithmetic processing elements; design of Complex Instruction Set (CISC), Reduced Instruction Set (RISC), and floating point processors; synthesis, simulation and testing of processors with computer-aided design tools.

CPE 541 COMPUTER NETWORK (3 Hours)
Study of computer network architectures, protocols, and interfaces; OSI reference model; Internet architecture; networking techniques (multiple access, packet/cell switching, and internetworking); end-to-end protocols; congestion control; high-speed networking; network management.

CPE 544 ELECTROMAGNETIC FIELD ANALYSIS (3 Hours)
Maxwell¿s equations; solutions of Laplace¿s equation; Green¿s Function; scalar and vector potentials; energy and momentum in electromagnetic fields; interaction of fields and material media.

CPE 545 ANTENNAS (3 Hours)
Examine the theory and properties of various communication antennas covering the range from RF frequencies to millimeter wavelengths; examine actual antennas and their characteristics.

CPE 551 DIGITAL SIGNAL PROCESSING (3 Hours)
Signals and systems; sampling continuous-time signals and reconstructions of continuous-time signals from samples; spectral analysis of signal using the discrete Fourier transform; the fast Fourier transform and fast convolution methods; z-transforms; finite and infinite impulse response filter design techniques; signal flow graphs and introduction to filter implementation.

CPE 552 COMPUTER VISION (3 Hours)
Examination of information processing approaches to computervision; algorithmsand architectures for artificial intelligence and robotic systems capable of vision; inference and robotic systems capable of vision; inference of three-dimensional properties of a scene from its images, such as distance, orientation, motion, size and shape, acquisition and representation of spatial information for navigation and manipulation in robotics.

CPE 555 CONTROL SYSTEMS (3 Hours)
Analysis and design of control systems with emphasis on modeling and dynamic response; transform and time domain methods for linear control systems; stability theory; root locus, bode diagrams and Nyquist plots; design specification in time and frequency domains; state-space design with computer solutions; compensation design in the time and frequency domain; modern design principles.

CPE 557 ROBOTICS (3 Hours)
Fundamentals of robotics; rigid motions; homogenous transformation; forward and inverse kinematics; velocity kinematics; motion planning; trajectory generation; sensing; vision; and control.

CPE 560 EMBEDDED DESIGN W/MICHROPROCES (3 Hours)
Microcomputer system design and use of microprocessors and single chip microcomputers as basic system components; basic microcomputer design and the interface between microprocessor and external devices; course examines the software aspects of microcomputers using assembly language and C programming; single chip microcomputers for embedded and power efficient applications; direct memory access, memory design and management, cache memory, fault tolerance issues, parallel processing with emphasis on hardware issues.

CPE 610 PARALLEL COMPUTING AND PROGRAM (3 Hours)
Introduction to processing in parallel and distributed computing environments, general concepts of parallel machine models, processes, mutual exclusion, process synchronization, messing, passing, and programming languages for parallel computing and scheduling; design and analysis of parallel algorithms, parallel programming environments: P threads for shared memory multiprocessor systems and PVM/MPI for distributed networks computers.

CPE 618 HIGH PERFORMANCE COMPUTING (3 Hours)
The class will study a variety of algorithms, their applications, and tradeoffs between different solutions. Issues such as performance analysis, evaluation and prediction will be addressed. There will also be discussions on topics such as parallel computer architectures (memory hierachy, interconnection networks, latency and bandwidth, parallel I/O), and software systems, with the aim of understanding their capabilities, costs and limitations. Students will make use of recent technology through a number of software packages and programming environments appropriate to the topics addressed. High performance computing tools will be used to compare and evaluate the performance of different implementations through a variety of criteria. Students will draw conclusions regarding preferred algorithms, methods, programming paradigms, and programming environments and tools for parallel distributed computing.

CPE 635 ADVANCED CIRCUIT THEORY (3 Hours)
CMOS technology; structured digital circuits; VSLI systems; computer-aided design automation tools and theory for design automation; chip design and integration; microelectronic systems architecture; VLSI circuit testing methods; advanced high-speed circuit design and integration.

CPE 693 ADVANCED TOPICS-IC DESIGN (3 Hours)
Graduate standing in engineering. Lectures on advanced topics of special interest to students in various areas of computer engineering are introduced. This course number is used to offer and test new courses.

CPE 697 INTERNSHIP (1-3 Hours)
Prerequisite: permission of Department.
Supervised graduate internship or externship in selected areas.

CPE 698 INDEPENDENT STUDY (1-4 Hours)
Prerequisite: permission of Department.
Intensive study of a special engineering project including research and literature review selected in accordance with the student¿s interests and arranged in consultations with the advisor. Topics will vary. Student will make periodic reports as well as a paper at the end of the semester.

CPE 699 THESIS (1-6 Hours)
Prerequisite: permission of advisor.
Master's thesis representing independent and original research.

CPE 899 DISSERTATION RESEARCH (1-6 Hours)
Dissertation representing independent and original research.