MSCPE Course Descriptions

ECE 501. Contmp Digital Sys. 3 Hours
CONTEMPORARY DIGITAL SYSTEMS Introduction to sequential logic; state machines; high performance digital systems: theory and application of modern design; alternative implementation forms and introduction to HDL; productivity, recurring and non-recurring costs, flexibility, and testability; software drivers; hardware/software integration; finite state machines. Prerequisite(s): ECE 215 or equivalent.

ECE 532. Embedded Systems. 3 Hours
EMBEDDED SYSTEMS This course will introduce the student to the concept of embedded systems and the constraints imposed on hard real-time systems. Course will consist of design, development and test of selected hard-deadline hardware and software using Altera's DE2 development boards. The student will design selected hardware interfaces and develop real-time executive and application code in assembly language and C. Each student will design and implement hardware using Verilog HDL. Prerequisite(s): ECE 501 or equivalent.

ECE 533. Computer Design. 3 Hours
COMPUTER DESIGN Design considerations of the computer; register transfer operations; hardware implementation of arithmetic processors and ALU; instruction set format and design and its effect on the internal micro engine; hardware and micro-programmed control design; comparative architectures. Prerequisite(s): ECE 501 or equivalent.

CPS 510. Systems Analysis. 3 Hours
SYSTEM ANALYSIS Process-oriented, data-oriented, and object-oriented approaches for systems development; comparison of various systems development life cycles; DFD methodology for systems analysis using state-of-the-art CASE (Computer Aided Software Engineering) tools; logical and event analyses of DFD specifications; tools and techniques for modeling real-time systems; data modeling; introduction to object-oriented analysis methodologies. Prerequisite(s): CPS 350.

CPS 536. Operating Systms I. 3 Hours
OPERATING SYSTEMS I Models and algorithms pertinent to the design of computer operating systems; concurrent processes including synchronization, communication and deadlock problems, process and device scheduling policies, design of file systems, reliability and protection. Prerequisite(s): CPS 350.

CPS 570. Data Communications. 3 Hours
DATA COMMUNICATIONS The study of networks of interacting computers. The analysis of distributed processing and distributed databases. Prerequisite(s): CPS 350.

ECE 506. Microelectronic Dev. 3 Hours
MICROELECTRONIC DEVICES Crystalline structure of matter, quantum mechanics and energy band theory; bulk properties of semiconductors; p-n and metal-semiconductor junctions; bipolar junction transistors; field-effect transistors; heterostructures; optical properties of semiconductors; devices, modeling and applications. Prerequisite(s): ECE 304 or permission of instructor.

ECE 531. Microelectronic Sys. 3 Hours
MICROELECTRONICS SYSTEMS Introduction to the design and application of engineering microelectronics; bipolar and MOS device theory and processing technology; CMOS logic and circuitry; design principles fundamental to chip design and fabrication; case studies employing introduction to HDL. Prerequisite(s): ECE 304.

ECE551. Parallel Computing. 3 Hours
A study of the hardware and software issues in parallel computing. Topics include an introduction to the basic concepts, parallel architectures and network topologies, parallel algorithms, parallel metrics, parallel languages,

granularity, applications, parallel programming design and debugging. Students will become familiar with various types of parallel architectures and programming environments.

ECE 632. Contemp Microel Desgn. 3 Hours
CMOS analog circuit design (oscillators, amplifiers, op-amps), mixed signal design (data converters), introduction to micro electron-mechanical system (MEMS) and wireless communications systems design, advanced VLSI digital design projects, seminar topics covering contemporary designs and techniques. Prerequisite(s): ECE 531.

ECE 538. Objct Orient Prg App. 3 Hours
OBJECT-ORIENTED PROGRAMMING APPLICATIONS A semi-formal approach to the engineering applications of object-oriented programming. Application of the concepts of classes, inheritance, polymorphism in engineering problems. Introduction to the use of class libraries. Effective integration of the concepts of application programmer interfaces, language features and class libraries. Prerequisite(s): C-programming experience.

CPS 512. Systems Design. 3 Hours
SYSTEM DESIGN Principles of design, introduction to software design methodologies; issues in transition from analysis to logical and physical designs; detailed discussion of structured design methodology (Yourdon, Constantine, Myers); design guidelines; transform analysis; Warnier/Orr design methodologies; designing methodologies for real-time systems; introduction to object-oriented design; CASE tools and code generators. Prerequisite(s): CPS 510.

CPS 522. Software Proj Mgmt. 3 Hours
SOFTWARE PROJECT MANAGEMENT Cost and effort estimation models for software projects, planning techniques, productivity metrics, risk management, maintenance, reuse, quality assurance, configuration management, Capability Maturity Models (CMM and P-CMM), and ISO 9001. Prerequisite(s): CPS 510 or CPS 518 or CPS 520.

CPS 530. Algorithm Design. 3 Hours
ALGORITHM DESIGN The design and analysis of computer algorithms, including order notation, sorting, dynamic programming, graph algorithms, string matching, matrix multiplication, NPcompleteness. Prerequisite(s): CPS 350.

CPS 542. Database Mgt Sys I. 3 Hours
DATABASE MANAGEMENT SYSTEMS Physical and logical organization of data files; hierarchical, network, and relational database models; data definition language and data manipulation language of a commercial database management system; query languages. Prerequisite(s): CPS 350.

CPS 543. Comparatve Languages. 3 Hours
COMPARATIVE LANGUAGES The evolution of programming languages. Study of the concepts common to languages, constructs, organization, specification, and analysis of languages. The role of languages in software development. Prerequisite(s): CPS 350.

CPS 544. Systms Programming. 3 Hours
SYSTEMS PROGRAMMING Analysis of compilers and their construction; programming techniques discussed in the current literature; advanced computer applications in both mathematical and nonnumeric areas. Prerequisite(s): CPS 350.

CPS 552. Discrte Evnt Simultn. 3 Hours
DISCRETE EVENT SIMULATION TECHNIQUES Simulation models; random number generation testing, special purpose simulation languages, statistical analysis of output; regenerative models; trace-driven

models. Emphasis on models related to computer operating system design and performance evaluation. Prerequisite(s): CPS 350; statistics.

CPS 560. Computer Graphics. 3 Hours
COMPUTER GRAPHICS Types of graphic hardware and their characteristics. Overview of software and techniques used in computer graphics. Two- and three-dimensional graphics displays. Prerequisite(s): CPS 350; programming ability in a procedure-oriented language.

CPS 562. Database Mgt Sys II. 3 Hours
DATABASE MANAGEMENT SYSTEMS II Study of query execution and optimization, transaction management, concurrency control, recovery and security techniques. Advanced data models and emerging trends in database systems, like object-oriented database systems, distributed database systems, client-server architecture, multi-database and heterogeneous systems. Other current database topics and emerging technologies will be discussed. Prerequisite(s): CPS 542.

CPS 580. Artifcl Intellg. 3 Hours
ARTIFICIAL INTELLIGENCE Presentation of theoretical concepts for artificial intelligence in the areas of knowledge representation and search techniques. These are examined in the context of applications for expert systems, semantic networks, and planning problems. Issues concerning functional programming and logic programming are also presented. Prerequisite(s): CPS 350.

CPS 581. Adv Artifcl Intell. 3 Hours
ADVANCED ARTIFICIAL INTELLIGENCE This course continues the studies pursued in Artificial Intelligence CPS 580. It delves more deeply into certain areas such as multiple agent systems and induction, and introduces new areas, such as neural networks and planning, not covered in CPS 580. As in CPS 580, each student shall complete a final project investigating some area of research in Artificial Intelligence. The project will encompass a literature search, paper, presentation, and implementation.

CPS 582. Automata Theory. 3 Hours
AUTOMATA THEORY Finite automata, sequential machines. Turing machines, computability, existence of self-reproducing machines. Prerequisite(s): CPS 528.

ECE 536. Microprocessr Appl. 3 Hours
MICROPROCESSOR APPLICATIONS Project studies, applications of microprocessors in practical implementations; logic implementation using software; memory mapped I/O problems and interrupt structure implementation; use of compilers; study of alternate microprocessor families including industrial controllers. Prerequisite(s): ECE 314 or equivalent; ECE 501.

ECE 636. Adv Comptr Architec. 3 Hours
ADVANCED COMPUTER ARCHITECTURE Examination of modern high performance computing architectures, including out-of-order execution RISC multicore processors and GPGPUs. Design projects integrate the concepts learned in class. Prerequisite (s): ECE 533.

ECE 637. Concurrent Proc. 3 Hours
CONCURRENT PROCESSING Introduction to the concepts and practices of parallel processing and concurrency. Multiprogramming and multitasking. Synchronous and asynchronous events. Critical sections, mutexes and semaphores. Use of shared memory in engineering applications. Atomicity on CISC and RISC machines. Applications of interval timers. Case studies in engineering applications. Prerequisite(s): ECE 537, ECE 636, or equivalent.

ECE 503. Random Processes. 3 Hours
RANDOM PROCESSES Random variables as applied to system theory, communications, signal processing

and controls. Topics include advanced engineering probability, random variables, random vectors and an introduction to random processes Prerequisite(s): ECE 340 or equivalent.

ECE 509. Analy-Linear Systms. 3 Hours
ANALYSIS OF LINEAR SYSTEMS State variable representation of linear systems and its relationship to the frequency domain representation using transfer functions and the Laplace transform. State transition matrix and solution of the state equation, stability, controllability, observability, state feedback and state observers are studied.

ECE 521. Digital Communctn I. 3 Hours
DIGITAL COMMUNICATIONS I Fundamental limits on performance; Shannon's theorem; prefix codes; Huffman codes; signal vectors; orthonormal basis functions; signal detection and estimation; Wiener and adaptive filters; matched filters; sampling theory and process; waveform coding techniques; baseband shaping concepts. Prerequisite(s): ECE 503.

ECE 522. Digtl Communctn II. 3 Hours
DIGITAL COMMUNICATIONS II Waveform coding techniques, including binary and Mary PAM, DPCM, DM, ADM; baseband shaping concepts, including binary and M-ary PAM, ISI; digital modulation techniques, including ASK, PSK, FSK, QPSK, CPFSK, MSK, DPSK, M-ary PSK; error control, including Block codes, cyclic codes; spread-spectrum modulation concepts. Prerequisite(s): ECE 521.

ECE 561. Digtl Signal Proc. 3 Hours
DIGITAL SIGNAL PROCESSING A study of one-dimensional digital signal processing, including a review of continuous system analysis and sampling. Topics include z-transform techniques, digital filter design and analysis, and fast Fourier transform processing techniques. Prerequisite(s): ECE 334 or equivalent.

CPS 572. Computer Networking. 3 Hours
COMPUTER NETWORKING A unified view of the broad field of local area and long haul networks. A survey of the state of the art. Topics covered include networking theory, design approaches, standards, topologies and protocols. Prerequisite(s): CPS 536, CPS 570.