Electrical Engineering Course Descriptions

EE 5283 (PHYS 5283) Plasma Technology Laboratory (2 semester hours) Laboratory will provide a hands-on experience to accompany EE 5383. Topics to include: Vacuum technology [pumps, gauges, gas feed], plasma uses [etch, deposition, lighting and plasma thrusters] and introductory diagnostics. Co-requisite: EE 5383. Recommended Co-requisite: EE 7171. (0-2) Y

EE 5300 Advanced Engineering Mathematics (3 semester hours) Advanced mathematical topics needed in the study of engineering. Topics may include advanced differential equations, linear algebra, vector calculus, complex analysis, and numerical methods. Credit does not apply to the 33 hour M.S.E.E. requirement. (3-0) T

EE 5301 (CS 5301) Professional and Technical Communication (3 semester hours) EE 5301 utilizes an integrated approach to writing and speaking for the technical professions. The advanced writing components of the course focus on writing professional quality technical documents such as proposals, memos, abstracts, reports, letters, emails, etc. The advanced oral communication components of the course focus on planning, developing, and delivering dynamic, informative and persuasive presentations. Advanced skills in effective teamwork, leadership, listening, multimedia and computer generated visual aids are also emphasized. Graduate students will have a successful communication experience working in a functional team environment using a real time, online learning environment. (3-0) Y

EE 5305 Radio Frequency Engineering (3 semester hours) Introduction to generation, transmission, and radiation of electromagnetic waves. Microwave-frequency measurement techniques. Characteristics of guided-wave structures and impedance matching. Fundamentals of antennas and propagation. Prerequisite: EE 4301 or equivalent. (3-0) Y

EE 5320 Introduction to Devices and Circuits (3 semester hours) This course provides a background in Electrical Engineering for students entering the M.S.E.E. program from other fields of science and engineering. Topics include circuit analysis and simulation, semiconductor device fundamentals and operation, and basic transistor circuits. Credit does not apply to the 33 hour M.S.E.E. requirement. Prerequisite: differential equations. (3-0) T

EE 5321 Introduction to Circuits and Systems (3 semester hours) Continuation of EE 5320. Topics include analog circuits, digital circuits, digital systems and communication systems. Credit does not apply to the 33 hour M.S.E.E. requirement. (3-0) T

EE 5325 (CE 5325) Hardware Modeling Using VHDL (3 semester hours) This course introduces students to VHDL beginning with simple examples and describing tools and methodologies. It covers the language, dwelling on fundamental simulation concepts. Students are also exposed to the subset of VHDL that may be used for synthesis of custom logic. VHDL simulation and synthesis labs and projects are performed using commercial and/or academic VLSI CAD tools. Prerequisite: EE 3320 or equivalent. (3-0) T

EE 5350 Signals, Systems, and Digital Communications (3 semester hours) Advanced methods of analysis of electrical networks and linear systems. Laplace transforms, Fourier series, and Fourier transforms. Response of linear systems to step, impulse, and sinusoidal inputs. Convolution, system functions, and frequency response. Z transforms and digital systems. Fundamentals of digital communication systems such as information, digital transmission, channel capacity, modulation and demodulation techniques are introduced. Signaling schemes and performance of binary as well as M-ary modulated digital communication systems are introduced. Overall design considerations and performance evaluation of various digital communication systems are discussed. Prerequisite: EE 3300 or equivalent. (3-0) T

EE 5360 Introduction to Communications and Signal Processing (3 semester hours) This course is designed to provide the necessary background for someone with a technical degree to enter the M.S.E.E. program in the Communications and Signal Processing concentration. It will focus on linear systems theory, to include Fourier series, Fourier and Laplace transforms, transfer functions, frequency response, and convolution. It will also include introductions to the solution of ordinary differential equations and to communications systems. Credit does not apply to the 33 hour M.S.E.E. requirement. Prerequisites: One year of calculus and one semester of probability theory. (3-0) T

EE 5365 Engineering Leadership (3 semester hours) Interpersonal influence and organizational influence in leading engineering organizations. Leadership is addressed from the point of view of the technical

manager as well as from that of the technical professional. Topics include staffing, motivation, performance evaluation, communication, project selection and planning, intellectual property and professional ethics. (3-0) T

EE 5381 Curriculum Practical Training in Electrical Engineering (3 semester hours) This course is required of students who need additional training in engineering practice. Credit does not apply to the 33 hour M.S.E.E. requirement. Consent of Graduate Adviser required. (May be repeated to a maximum of 9 hours) (3-0) S

EE 5383 (PHYS 5383) Plasma Technology (3 semester hours) Hardware oriented study of useful laboratory plasmas. Topics will include vacuum technology, gas kinetic theory, basic plasma theory and an introduction to the uses of plasmas in various industries. (3-0) Y

EE 5385 Analog Filters (3 semester hours) This course aims at bridging the intermediate-level and the advanced-level knowledge in analog filter design. It moves from basic theory of analog passive filters to theoretical and practical aspects of active, switched-capacitor, and continuous time filters. For active solutions the focus is on integrated implementations on silicon. Prerequisites: EE 3301 and EE 3111. (3-0) Y

EE 5V80 Special Topics In Electrical Engineering (1-6 semester hours) For letter grade credit only. (May be repeated to a maximum of 9 hours.) ([1-6]-0) S

EE 6283 (PHYS 6283) Plasma Science Laboratory (2 semester hours) Laboratory will provide a hands on experience to accompany EE 6383. Experiments will include measurements of fundamental plasma properties and understanding of important plasma diagnostics. Co-requisite: EE 6383, recommended co-requisite: EE 7171. (2-0) T

EE 6301 (CE 6301) Advanced Digital Logic (3 semester hours) Modern design techniques for digital logic. Logic synthesis and design methodology. Link between front-end and back-end design flows. Field programmable gate arrays and reconfigurable digital systems. Introduction to testing, simulation, fault diagnosis and design for testability. Prerequisites: EE 3320 or equivalent and background in VHDL/Verilog. (3-0) T

EE 6302 (CE 6302) Microprocessor Systems (3 semester hours) Design of microprocessor based systems including I/O and interface devices. Microprocessor architectures. Use of emulators and other sophisticated test equipment. Extensive laboratory work. Prerequisite: EE 4304 or equivalent and background in VHDL/Verilog. (2-3) Y

EE 6303 (CE 6303) Testing and Testable Design (3 semester hours) Techniques for detection of failures in digital circuits and systems. Fault modeling and detection. Functional testing and algorithms for automatic test pattern generation (ATPG). Design of easily testable digital systems. Techniques for introducing built-in self test (BIST) capability. Test of various digital modules, like PLA's, memory circuits, datapath, etc. Prerequisite: EE 3320 or equivalent and background in VHDL/Verilog. (3-0) Y

EE 6304 (CE 6304, CS 6304) Computer Architecture (3 semester hours) Trends in processor, memory, I/O and system design. Techniques for quantitative analysis and evaluation of computer systems to understand and compare alternative design choices in system design. Components in high performance processors and computers: pipelining, instruction level parallelism, memory hierarchies, and input/output. Students will undertake a major computing system analysis and design project. Prerequisite: EE 4304 and C/C++. (3-0) Y

EE 6305 (CE 6305) Computer Arithmetic (3 semester hours) Carry look ahead systems and carry save adders. Multipliers, multi-bit recoding schemes, array multipliers, redundant binary schemes, residue numbers, slash numbers. High-speed division and square root circuits. Multi-precision algorithms. The IEEE floating point standard, rounding processes, guard bits, error accumulation in arithmetic processes. Cordic algorithms. Prerequisites: EE 3320 and C/C++. (3-0) Y

EE 6306 (CE 6306) Application Specific Integrated Circuit Design (3 semester hours) This course discusses the design of application specific integrated circuits (ASIC). Specific topics include: VLSI system design specification, ASIC circuit structures, synthesis, and implementation of an ASIC digital signal processing (DSP) chip. Prerequisites: EE 3320 (3-0) Y

EE 6307 (CE 6307) Fault-Tolerant Digital Systems (3 semester hours) Concepts in hardware and software fault tolerance. Topics include fault models, coding in computer systems, fault diagnosis and fault-tolerant routing, clock synchronization, system reconfiguration, etc. Survey of practical fault-tolerant systems. Prerequisite: EE 6301, EE 3341 or equivalent. (3-0) R

EE 6308 (CE 6308, CS 6396) Real-Time Systems (3 semester hours) Introduction to real-time applications and concepts. Real-time operating systems and resource management. Specification and design

methods for real-time systems. System performance analysis and optimization techniques. Project to specify, analyze, design, implement and test small real-time system. Prerequisite: CS 5348. (3-0) R

EE 6309 (PHYS 5361) Fourier Optics (3 semester hours) Description of coherent optics using a linear systems approach. The concepts of impulse response and transfer functions for unbounded wave propagation, diffraction, and image formation. Introduction to holography and optical data processing. Prerequisites: EE 3302 and EE 4301 or equivalents. (3-0) R

EE 6310 Optical Communication Systems (3 semester hours) Operating principles of optical communications systems and fiber optic communication technology. Characteristics of optical fibers, laser diodes, laser modulation, laser and fiber amplifiers, detection, demodulation, dispersion compensation, and network topologies. System topology, star network, bus networks, layered architectures, all-optical networks. Prerequisite: EE 3350 or equivalent. (3-0) T

EE 6311 Microwave Circuits and Systems (3 semester hours) Operating principles of devices at microwave and millimeter wave frequencies. Sources, detectors, waveguides, cavities, antennas, scattering parameters, impedance matching, system design. Prerequisite: EE 4368 or equivalent. (3-0) R

EE 6312 Laser and Modern Optics (3 semester hours) Theory and applications of lasers, including ray and beam optics. Design issues include power maximization, noise properties, spectral purity and high-speed modulation. Particular emphasis on semiconductor lasers and their relevance to optical communications. Prerequisite: EE 4301 or equivalent. (3-0) Y

EE 6313 Semiconductor Opto-Electronic Devices (3 semester hours) Physical principles of semiconductor optoelectronic devices: optical properties of semiconductors, optical gain and absorption, wave guiding, laser oscillation in semiconductors; LEDs, physics of detectors, applications. Prerequisite: EE 3310 or equivalent. (3-0) T

EE 6314 Principles of Fiber and Integrated Optics (3 semester hours) Theory of dielectric waveguides, modes of planar waveguides, strip waveguides, optical fibers, coupled-mode formalism, directional couplers, diffractive elements, switches, wavelength-tunable filters, polarization properties of devices and fibers, step and graded-index fibers, devices for fiber measurements, fiber splices, polarization properties, and fiber systems. Prerequisites: EE 3300 and EE 4301 or equivalents. (3-0) T

EE 6315 Engineering Optics (3 semester hours) Fundamental concepts of geometrical optics, first-order optical system design and analysis, paraxial ray tracing, aperture and field stops. Optical materials and properties; third order aberration theory. Prerequisite: PHYS 2326 or equivalent. (3-0) T

EE 6316 Fields and Waves (3 semester hours) Study of electromagnetic wave propagation beginning with Maxwell's equations; reflection and refraction at plane boundaries; guided wave propagation; radiation from dipole antennas and arrays; reciprocity theory; basics of transmission line theory and waveguides. Prerequisite: EE 4301 or equivalent. (3-0) Y

EE 6317 Physical Optics (3 semester hours) Study of optical phenomena based primarily on the electromagnetic nature of light; mathematical description of polarized light; Jones and Mueller matrices; interference of polarized waves; interferometers, diffractive phenomena based on scalar formalisms; diffraction gratings; and diffraction in optical instruments. Prerequisite: EE 4301 or equivalent. (3-0) T

EE 6319 (MSEN 6319) Quantum Physical Electronics (3 semester hours) Quantum-mechanical foundation for study of nanometer-scale electronic devices. Principles of quantum physics, stationary-state eigenfunctions and eigenvalues for one-dimensional potentials, interaction with the electromagnetic field, electronic conduction in solids, applications of quantum structures. Prerequisite: EE 3300 or equivalent. (3-0) Y

EE 6320 Fundamentals of Semiconductor Devices (3 semester hours) Semiconductor material properties, equilibrium carrier distribution and non-equilibrium current-transport processes; properties of semiconductor interfaces, including MOS, Schottky-barrier and p-n junctions. Prerequisite: EE 3310. (3-0) Y

EE 6321 Active Semiconductor Devices (3 semester hours) The physics of operation of active devices will be examined, including bipolar junction transistors and field-effect transistors: MOSFETs, JFETS, and MESFETS. Special-purpose MOS devices including memories and imagers will be presented. Prerequisite: EE 6320. (3-0) Y

EE 6322 Semiconductor Processing Technology (3 semester hours) Modern techniques for the manufacture of semiconductor devices and circuits. Techniques for both silicon and compound semiconductor processing are studied as well as an introduction to the design of experiments. Topics include: wafer growth, oxidation, diffusion, ion implantation, lithography, etch and deposition. (3-0) T

EE 6323 Circuit Modeling of Solid-State Devices (3 semester hours) Provide physical insight into the

operation of MOSFETs and BJTs, with particular emphasis on new physical effects in advanced devices. Compact (SPICE-level) transistor models will be derived from basic semiconductor physics; common simplifications made in the derivations of model equations will be detailed to provide an appreciation for the limits of model capabilities. Prerequisites: EE 6320 and EE 6321. (3-0) R

EE 6324 Electronic Materials (3 semester hours) Principles of selection, preparation, and characterization of electronic materials with emphasis on semiconductors. Fundamentals of crystallography and crystal growth. Defect and impurity control. Thermodynamics and phase equilibria as applied to semiconductor processing. Preparation and properties of epitaxial and heteroepitaxial structures. Advanced techniques for structural, chemical and electrical characterization of electronic materials. Prerequisite: EE 6320 or equivalent. (3-0) T

EE 6325 (CE 6325) VLSI Design (3 semester hours) Introduction to MOS transistors. Analysis of the CMOS inverter. Combinational and sequential design techniques in VLSI; issues in static, transmission gate and dynamic logic design. Design and layout of complex gates, latches and flip-flops, arithmetic circuits, memory structures. Low power digital design. The method of logical effort. CMOS technology, and rationale behind various design rules. Use of CAD tools to design, layout, check, extract and simulate a small project. Prerequisites: EE 3320, EE 3301 or equivalent. (3-0) Y

EE 6326 Analog Integrated Circuit Design (3 semester hours) Introduction to MOS transistor, CMOS technology and analog circuit modeling. Basic analog circuits: MOS switches, active resistors, current sources, current mirrors, current amplifiers, inverting amplifier, differential amplifier, cascade amplifier and the output amplifier. Complex circuits: comparators and operational amplifiers. Use of CAD tools to layout and simulate analog circuits. Prerequisite: EE 4340 (3-0) Y-T

EE 6328 Nonlinear Optics (3 semester hours) Survey of nonlinear optical effects; origins of optical nonlinearities; laser-pulse propagation equations in bulk media and optical fibers; the nonlinear optical susceptibility tensor; second-order nonlinear optical effects (second harmonic generation, optical rectification, parametric mixing and amplification); third-order nonlinear optical effects in fiber optic communication systems (self-phase modulation, cross-phase modulation, stimulated Brillouin scattering, stimulated Raman scattering, four-wave mixing, nonlinear polarization mode dispersion); self-focusing and self-defocusing in bulk media; computational methods for nonlinear optics. Prerequisite: EE 4301 or equivalent; EE 6310 recommended. (3-0) T

EE 6329 Optical Signal Conditioning (3 semester hours) Engineering principles and applications of laser beam modulation and deflection (acousto-optics and electro-optics), harmonic generation and optical parametric processes, optical pulse compression and shaping. Prerequisites: EE 4301 or equivalent and EE 6317 recommended. (3-0) T

EE 6331 Linear Systems and Signals (3 semester hours) Systems and control theory: state space, convolution integrals, transfer functions, stability, controllability, observability, and feedback. Prerequisites: EE 2300 and EE 4310. (3-0) Y

EE 6332 Advanced Control (3 semester hours) Modern control techniques in state space and frequency domain: optimal control, robust control, and stability. Prerequisite: EE 6331. (3-0) T

EE 6334 Advanced Geometrical and Physical Optics (3 semester hours) Geometrical optics as a limiting case of the propagation of electromagnetic waves; geometrical theory of optical aberrations; the diffraction theory of aberrations; image formation with partially coherent and partially polarized light; computational methods for physical optics. Other topics may be selected from the following: diffraction theory of vector electromagnetic fields, diffraction of light by ultrasonic waves, optics of metals, Lorenz-Mie theory of the scattering of light by small particles, and optics of crystals. Prerequisite: EE 6317. (3-0) R

EE 6336 Nonlinear Control Systems (3 semester hours) Differential geometric tools, feedback linearization, input-output linearization, output injection, output tracking, stability. Prerequisite: EE 6331. (3-0) R

EE 6340 Introduction to Telecommunications Networks (3 semester hours) Circuit, message and packet switching. The hierarchy of the ISO-OSI Layers. The physical layer: channel characteristics, coding, and error detection. The data link control layer: retransmission strategies, framing, multiaccess protocols, e.g., Aloha, slotted Aloha, CSMA, and CSMA/CD. The network layer: routing, broadcasting, multicasting, flow control schemes. Co-requisite: EE 6349. (3-0) Y

EE 6341 Information Theory I (3 semester hours) Self information, mutual information, discrete memoryless sources, entropy, source coding for discrete memoryless channels, homogeneous Markov

sources, discrete memoryless channels, channel capacity, converse to the coding theorem, noisy channel coding theorem, random coding exponent, Shannon limit. Prerequisite: EE 6352. (3-0) R

EE 6343 Detection and Estimation Theory (3 semester hours) Parameter estimation. Least-square, mean-square, and minimum-variance estimators. Maximum A Posteriori (MAP) and Maximum-Likelihood (ML) estimators. Bayes estimation. Cramer-Rao lower bound. Continuous and discrete time detection and estimation. Prerequisite: EE 6349. (3-0) R

EE 6344 Coding Theory (3 semester hours) Groups, fields, construction and properties of Galois fields, error detection and correction, Hamming distance, linear block codes, syndrome decoding of linear block codes, cyclic codes, BCH codes, error trapping decoding and majority logic decoding of cyclic codes, non-binary codes, Reed Solomon codes, burst error correcting codes, convolutional codes, Viterbi decoding of convolutional codes. Prerequisite: EE 6352. (3-0) R

EE 6345 (CE 6345) Engineering of Packet-Switched Networks (3 semester hours) Detailed coverage, from the point of view of engineering design, of the physical, data-link, network and transport layers of IP (Internet Protocol) networks. This course is a masters-level introduction to packet networks. Prior knowledge of digital communication systems is strongly recommended. Prerequisite: EE 3350 or equivalent. (3-0) Y

EE 6349 Random Processes (3 semester hours) Random processes concept. Stationarity and independence. Auto-correlation and cross-correlation functions, spectral characteristics. Linear systems with random inputs. Special topics and applications. Prerequisite: EE 3302 and EE 3341 or equivalent. (3-0) Y

EE 6350 Signal Theory (3 semester hours) Signal processing applications and signal spaces, vector spaces, matrix inverses and orthogonal projections, four fundamental subspaces, least squares and minimum norm solutions, the SVD and principal component analysis, subspace approximation, infinite dimensional spaces, linear operators, norms, inner products and Hilbert spaces, projection theorems, spectral properties of Hermitian operators, Hilbert spaces of random variables, linear minimum variance estimation and the Levinson-Durbin algorithm, general optimization over Hilbert spaces, methods and applications of optimization. Prerequisite: EE 3302 or equivalent. (3-0) Y

EE 6351 Computational Electromagnetics (3 semester hours) Review of Maxwell's equations; numerical propagation of scalar waves; finite-difference time-domain solutions of Maxwell's equations; numerical implementations of boundary conditions; numerical stability; numerical dispersion; absorbing boundary conditions for free space and waveguides; selected applications in telecommunications, antennas, microelectronics and digital systems. Prerequisite: EE 4301 or equivalent. (3-0) Y

EE 6352 Digital Communication Systems (3 semester hours) Digital communication systems are discussed. Source coding and channel coding techniques are introduced. Signaling schemes and performance of binary and M-ary modulated digital communication systems. The overall design considerations and performance evaluations of various digital communications systems are emphasized. Prerequisite: EE 6349 or equivalent. (3-0) Y

EE 6353 Broadband Digital Communication *(3 semester hours)* Characterization of broadband wireline and wireless channels. Intersymbol Interference (ISI) effects. Equalization methods to mitigate ISI including single-carrier and multi-carrier techniques. Equalization techniques and structures including linear, decision-feedback, precoding, zero-forcing, mean square-error, FIR versus IIR. Multi-Input Multi-Output (MIMO) Equalization. Implementation issues including complexity, channel estimation, error propagation, etc. Real-world case studies from Digital Subscriber Lines (DSL) and wireless systems. Students work individually or in small teams on project and present their findings to class. Prerequisite: EE 4361 and knowledge of MATLAB. Co-requisites: EE 6352 or equivalents. (3-0) T

EE 6355 RF and Microwave Communication Circuits (3 semester hours) Design of high-frequency communication circuits. Prerequisite: EE 4368 or equivalent.. (3-0) R

EE 6360 Digital Signal Processing I (3 semester hours) Analysis of discrete time signals and systems, , Z-transform, discrete Fourier transform, fast Fourier transform, analysis and design of digital filters. Prerequisite: EE 3302 or EE 4361 or equivalent. (3-0) Y

EE 6361 Digital Signal Processing II (3 semester hours) Continuation of EE 6360. Includes advanced topics in signal processing such as: Digital filter structures and finite-word-length effects, digital filter design and implementation methods, multirate digital signal processing, linear prediction and optimum filtering, spectral analysis and estimation methods. Prerequisite: EE 6360. (3-0) T

EE 6362 Speech Processing (3 semester hours) Introduction to the fundamentals of speech signal processing and speech applications. Speech analysis and speech synthesis techniques, speech recognition

using hidden Markov models, speech enhancement and speech coding techniques including ADPCM and linear-predictive based methods such as CELP. Prerequisites: EE 6360 and EE 6349. (3-0) Y

EE 6363 Digital Image Processing (3 semester hours) Image formation, image sampling, 2D Fourier transform and properties, image wavelet transform, image enhancement in spatial and frequency domains, image restoration, color image processing, image segmentation, edge detection, morphological operations, object representation and description, introduction to image compression. Prerequisites: EE 4361 or equivalent and knowledge of C or MATLAB. (3-0) T

EE 6364 Pattern Recognition (3 semester hours) Pattern recognition system, Bayes decision theory, maximum likelihood and Bayesian parametric classifiers, linear discriminant functions and decision boundaries, density estimation and nonparametric classifiers, unsupervised classification and clustering, multilayer neural networks, decision trees, classifier comparison. Prerequisite: Knowledge of C or MATLAB. Co-requisite: EE 6349. (3-0) T

EE 6365 Adaptive Signal Processing (3 semester hours) Adaptive signal processing algorithms learn the properties of their environments. Transversal and lattice versions of the Least Mean Squares (LMS) and Recursive Least Squares (RLS) adaptive filter algorithms and other modern algorithms will be studied. These algorithms will be applied to network and acoustic echo cancellations, speech enhancement, channel equalization, interference rejection, beam forming, direction finding, active noise control, wireless systems, and others. Prerequisites: EE 6349, EE 6360 and knowledge of matrix algebra. (3-0) T

EE 6367 Applied Digital Signal Processing (3 semester hours) Implementation of signal processing algorithms, graphical programming of DSP systems, fixed-point versus floating-point, DSP chip architecture, DSP software development tools, code optimization, application project. Prerequisites: EE 4361 or equivalent and knowledge of C or MATLAB. (2-3) Y

EE 6370 (CE 6370) Design and Analysis of Reconfigurable Systems (3 semester hours) Introduction to reconfigurable computing, programmable logic: FPGAS, CPLDs, CAD issues with FPGA based design, reconfigurable systems: emulation, custom computing, and embedded application based computing, static and dynamic hardware, evolutionary design, software environments for reconfigurable systems. Prerequisite: EE 3320 or equivalent. (3-0) Y

EE 6372 Semiconductor Process Integration (3 semester hours) The integration of semiconductor processing technology to yield integrated circuits. The course will emphasize MOSFET design based upon process integration, in particular as it applies to short channel devices of current interest. Process simulation will be used to study diffusion, oxidation, and ion implantation. (3-0) T

EE 6375 (CE 6375) Design Automation of VLSI Systems (3 semester hours) This course deals with various topics related to the development of CAD tools for VLSI systems design. Algorithms, data structures, heuristics and design methodologies behind CAD tools. Design and analysis of algorithms for layout, circuit partitioning, placement, routing, chip floor planning, and design rule checking (DRC). Introduction to CAD algorithms for RTL and behavior level synthesis, module generators, and silicon compilation. Prerequisite: CS 5343. Co-requisite: CE 6325. (3-0) Y

EE 6378 Power Management Circuits (3 semester hours): Operating principles of rectifiers and different dc-dc converters: switched-mode power converters, charge pumps and linear regulators. Design and analysis of voltage references and frequency compensation techniques for two-stage and three-stage amplifiers. Use of CAD tools to simulate power management circuits. Prerequisite: EE 6326 or equivalent (3-0) Y

EE 6381 Numerical Methods In Engineering (3 semester hours) Numerical techniques in engineering and their applications, with an emphasis on practical implementation. Topics will include some or all of the following: numerical methods of linear algebra, interpolation, solution of nonlinear equations, numerical integration, Monte Carlo methods, numerical solution of ordinary and partial differential equations, and numerical solution of integral equations. Prerequisites: EE 2300 and EE 3300 or equivalents, and knowledge of a scientific programming language. (3-0) T

EE 6382 Introduction to MEMS (3 semester hours) Study of micro-electro-mechanical devices and systems and their applications. Microfabrication techniques and other emerging fabrication processes for MEMS are studied along with their process physics. Principles of operations of various MEMS devices such as mechanical, optical, thermal, magnetic, chemical/biological sensors/actuators are studied. Topics include: bulk/surface micromachining, LIGA, microsensors and microactuators in multi-physics domain. (3-0) T

EE 6383 (PHYS 6383) Plasma Science (3 semester hours) Theoretically oriented study of plasmas. Topics to include: fundamental properties of plasmas, fundamental equations (kinetic and fluid theory, electromagnetic waves, plasma waves, plasma sheaths) plasma chemistry and plasma diagnostics. (3-0) T

EE 6390 Introduction to Wireless Communication Systems (3 semester hours) Principles, practice, and system overview of mobile systems. Modulation, demodulation, coding, encoding, and multiple-access techniques. Performance characterization of mobile systems. MMIC and low-power mobile devices. Prerequisite: EE 3350 or equivalent. (3-0) Y

EE 6391 Signaling and Coding for Wireless Communication Systems (3 semester hours) Study of signaling and coding for wireless communication systems. Topics which will be covered include digital modulation schemes, digital multiple access technologies, their performance under wireless channel impairments, equalization, channel coding, interleaving, and diversity schemes. Prerequisites: EE 6352 and EE 6390. (3-0) T

EE 6392 Propagation and Devices for Wireless Communications (3 semester hours) Mobile communication fundamentals, models of wave propagation, simulation of electromagnetic waves in the cellular environment, multipath propagation, compensation for fading, mobile and cell antenna designs, problems of interference and incompatibility, design of active and passive cellular components, comparison of analog and digital cellular designs. Prerequisites: EE 4301 or equivalent; EE 6390. (3-0) T

EE 6393 Imaging Radar Systems Design and Analysis (3 semester hours)
Radar systems, antenna systems, the radar equation, electromagnetic waves scattering from targets, radar signal and noise, detection and extraction of signal from noise or clutter, range and Doppler profiles, radar image formation, real aperture radar imaging, SAR imaging, ISAR imaging, image distortion, super resolution radar imaging techniques, and advanced holographic radar imaging techniques. Prerequisites: EE 3350 and EE 4301 or equivalents. (3-0) T

EE 6394 Antenna Engineering for Wireless Communications (3 semester hours) Operating principles for microwave antennas used in modern wireless communications systems. Prerequisite: EE 6316 or equivalent. (3-0) T

EE 6395 Advanced Radio Frequency Engineering (3 semester hours) Sources, components, antennas, and detectors used in wireless communication systems. Microwave-frequency component technology. Propagation paths and their effects on communications. Prerequisite: EE 5305 or equivalent. (2-3) R

EE 6398 (CE 6398, CS 6398) DSP Architectures (3 semester hours) Typical DSP algorithms, representation of DSP algorithms, data-graph, FIR filters, convolutions, Fast Fourier Transform, Discrete Cosine Transform, low power design, VLSI implementation of DSP algorithms, implementation of DSP algorithms on DSP processors, DSP applications including wireless communication and multimedia. Prerequisite: CS 5343. (3-0) Y

EE 7171 Current Topics in Plasma Processing (1 semester hour) Discussion of current literature on plasma processing; applications, diagnostics, sources, chemistry and technology. May be repeated for credit. Prerequisite: Knowledge of plasma processing technology (EE 5383 or EE 6383 preferred) or consent of instructor. (1-0) Y

EE 7283 Advanced Plasma Processing Laboratory (2 semester hours) Laboratory will provide advanced studies of individual plasma diagnostics and/or plasma properties. Intended to foster research project development. Co/Prerequisite: EE 7383. (May be repeated by consent of instructor for a total of 6 hours.) Recommended co-requisite: EE 7171. (2-0) T

EE 7304 (CE 7304) Advanced Computer Architecture (3 semester hours) Advanced research topics in multi-processor, network and reconfigurable architectures. Focuses on current research in the area of computer system architecture to prepare students for a career in computer architecture research. Course will use articles from current technical literature to discuss relevant topics, such as digital signal processors and VLIW processors. Prerequisites: EE 6304, CS 5348, EE 3341 and knowledge of C/C++. (3-0) R

EE 7320 Advanced Semiconductor Device Theory (3 semester hours) Quantum mechanical description of fundamental semiconductor devices; carrier transport on the submicron scale; heterostructure devices; quantum-effect devices. Prerequisite: EE 6320. (3-0) R

EE 7325 (CE 7325) Advanced VLSI Design (3 semester hours) Advanced topics in VLSI design covering topics beyond the first course (EE 6325). Topics include: use of high-level design, synthesis, and simulation tools, design for testability, clock distribution and routing problems, synchronous circuits, low-power design techniques, study of various VLSI-based computations, systolic arrays, etc. Discussions on current research topics in VLSI design. Prerequisite: EE 6325 or equivalent. (3-0) R

EE 7326 Analog Integrated Systems Design (3 semester hours) Introduction to the types of systems environment in which analog integrated circuit design is employed. The topics are A/D and D/A converters, including over-sampled S-D A/D converters, switched capacitor amplifiers, multipliers, wave-shaping circuits, oscillators, PLLs, and the design of filters. Prerequisite: EE 6326 (3-0) Y

EE 7327 Analog to Digital and Digital to Analog Converters (3 semester hours) This course provides the basic and the specific knowledge for the design and the use of data converters. Topics include fundamentals on sampling and quantization, Nyquist-rate and oversampled techniques, circuit design issues, testing, digital calibration and correction. Prerequisite: Analog Integrated circuit design. EE 6324 and EE 6325. (3-0) Y

EE 7328 (CE 7328) Physical Design of High-Speed VLSI Circuits (3 semester hours) Techniques for the physical design of high-speed VLSI circuits. Topics related to interconnection circuit modeling, performance-driven routing, buffer and wire sizing, placement and floor planning, technology mapping and performance evaluation issues encountered in high-speed VLSI circuit designs. Discussion of state-of-the-art practical industrial design examples. A project related to the development of a prototype CAD tool. Prerequisites: EE 6325 and knowledge of programming in C. (3-0) T

EE 7329 Advanced Analog Integrated Circuit Design (3 semester hours) The course will cover, but not be limited to, advanced architectures for voltage references, current references, operational amplifiers (including voltage, current, transconductance, and transresistance), comparators, linear regulators, etc. Emphasis will be on why one topology might be better than another for a given set of specifications or applications. Prerequisite: EE 6326 (3-0) T

EE 7331 Physics of Noise (3 semester hours) The physics of fluctuation phenomena, generically called Noise. The class will cover the fundamental physical principles underlying generation-recombination, thermal, shot, 1/f noise and other, related fluctuation phenomena. The statistical nature of these physical processes will be developed. The physics of noise in resistors, diodes, bipolar, JFETS, and MOSFETs will be discussed and how to model it in circuits. Approximately two thirds of the class will be devoted to the physics of noise and the rest will cover how to use this knowledge to design low-noise integrated circuits. Prerequisite: EE 6326. Y

EE 7340 Optical Network Architectures and Protocols (3 semester hours) Introduction to optical networks. The ITU Optical Layer. First-generation optical networks. Standards, e.g. SONET/SDH, FDDI. Second-generation optical networks. Broadcast and select networks. The lightpath concept. Wavelength routing networks. Virtual topology design. Photonic packet switching. Advanced solutions and test beds. Prerequisite: EE 6340 (3-0) T.

EE 7383 Advanced Plasma Processing Systems (3 semester hours) An in-depth study of advanced plasma processing environments. Topics to include detailed studies of hardware and theory behind modern plasma processing tools, modern plasma chemistry and advanced diagnostics. (3-0) T

EE 7V81 Special Topics In Digital Systems (1-6 semester hours) For letter grade credit only. (May be repeated to a maximum of 9 hours.) ([1-6]-0) S

EE 7V82 Special Topics In Microelectronics (1-6 semester hours) For letter grade credit only. (May be repeated to a maximum of 9 hours.) ([1-6]-0) S

EE 7V83 Special Topics in Optics and Fields (1-6 semester hours) For letter grade credit only. (May be repeated to a maximum of 9 hours.) ([1-6]-0) S

EE 7V84 Special Topics in Telecommunications (1-6 semester hours) For letter grade credit only. (May be repeated to a maximum of 9 hours.) ([1-6]-0) S

EE 7V85 Special Topics in Signal Processing (1-6 semester hours) For letter grade credit only. (May be repeated to a maximum of 9 hours.) ([1-6]-0) S

EE 7V86 Special Topics in Wireless Communications (1-6 semester hours) For letter grade credit only. (May be repeated to a maximum of 9 hours.) ([1-6]-0) S

EE 8V40 Individual Instruction in Electrical Engineering (1-6 semester hours) (May be repeated for credit.) For pass/fail credit only. ([1-6]-0) R

EE 8V70 Research In Electrical Engineering (3-9 semester hours) (May be repeated for credit.) For pass/fail credit only. ([3-9]-0) R

EE 8V98 Thesis (3-9 semester hours) (May be repeated for credit.) For pass/fail credit only. ([3-9]-0) S

EE 8V99 Dissertation (3-9 semester hours) (May be repeated for credit.) For pass/fail credit only. ([3-9]-0) S