Electrical Engineering Course Descriptions

**EE 2305 (ENGR 2305) Fundamentals of Electrical Engineering** (3 semester hours) An introduction to some of the unifying concepts in electrical engineering; analysis and synthesis of signal waveforms; modification of waveforms by electrical systems; current-voltage relationships for common components; DC circuit analysis. Corequisites or Prerequisites: PHYS 2326, MATH 2420. (3-0) S

**EE 2310 Computer Organization and Design** (3 semester hours) Introduction to hardware structures that form the basis of the design of modern computer systems. Internal data representation and arithmetic operations in a computer. Components of memory and Input/Output systems. Assembly language programming is used to demonstrate the effects of hardware alternatives. Prerequisite: CS 1315. (3-0) S

**EE 2V95 Individual Instruction in Electrical Engineering** (1-6 semester hours) Independent study under a faculty member's direction. May be repeated for credit. Consent of instructor required. ([1-6]-0) R

**EE 2V99 Topics in Electrical Engineering** (1-4 semester hours) May be repeated as topics vary (9 hours maximum). ([1-4]-0) R

**EE 3201 Electrical Network Analysis Laboratory** (2 semester hours) Laboratory to accompany EE 3301. Design, assembly and testing of linear electrical networks and systems. Use of computers to control electrical equipment and acquire data. Corequisite: EE 3301. (0-3) S

**EE 3210 Electronic Devices Laboratory** (2 semester hours) Laboratory to accompany EE 3310. Experimental determination and illustration of properties of carriers in semiconductors including carrier drift, photoconductivity, carrier diffusion; p-n junctions including forward and reverse bias effects, transient effects, photodiodes, and light emitting diodes; bipolar transistors including the Ebers-Moll model and secondary effects; field effect transistors including biasing effects, MOS capacitance and threshold voltage. Corequisite: EE 3310. (0-3) S

**EE 3211 Electronic Circuits Laboratory** (2 semester hours) Laboratory to accompany EE 3311. Design, assembly and testing of electronic circuits that use diodes, transistors and operational amplifiers in configurations typically encountered in practical applications. Prerequisite: EE 3201. Corequisite: EE 3311. (0-3) S

**EE 3300 Advanced Engineering Mathematics I** (3 semester hours) Survey of advanced mathematics topics needed in the study of engineering. Topics include linear algebra, vector calculus, complex variables, numerical methods. Examples are provided from microelectronics and communications. Prerequisite: MATH 2420. (3-0) S

**EE 3301 Electrical Network Analysis** (3 semester hours) Analysis and design of RC, RL, and RLC electrical networks. Sinusoidal steady state analysis of passive networks using phasor representation; mesh and nodal analyses. Introduction to the concept of impulse response and frequency analysis using the Laplace transform. Prerequisites: EE 2305, MATH 2420. Corequisite: EE 3201. (3-0) S

**EE 3302 Signals and Systems** (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. Prerequisites: MATH 2420, EE 3301. (3-0) S

**EE 3310 Electronic Devices** (3 semester hours) Theory and application of solid state electronic devices. Physical principles of carrier motion in semiconductors leading to operating principles and circuit models for diodes, bipolar transistors, and field effect transistors. Introduction to integrated circuits. Prerequisites: MATH 2420, PHYS 2326, EE 3301. Corequisite: EE 3210. (3-0) S

**EE 3311 Electronic Circuits** (3 semester hours) Analysis and design of electronic circuits using diodes, transistors and operational amplifiers with feedback. Gain and stability of basic amplifier circuits using BJT's, JFET's and MOSFET's; classes of amplifiers; performance of ideal and non-ideal operational amplifiers. Prerequisites: EE 3301, EE 3310. Corequisite: EE 3211. (3-0) S

**EE 4190 Seminar in Industrial Practice** (1 semester hour) Seminar on current issues of industrial practice, corporate structure and technology issues. Prerequisite: senior standing. (1-0) Y

**EE 4220 Digital Circuits Laboratory** (2 semester hours) Laboratory to accompany EE 4320. Design, assembly, and testing of logic circuits. Corequisite: EE 4320. (0-3) S

**EE 4250 Communication Systems Laboratory** (2 semester hours) Laboratory to accompany EE 4350. Fundamental
elements of communications systems hardware; use of spectrum analyzers and other measurement instruments typically encountered in communication systems; design of active filters in communications systems; analog frequency and amplitude modulators and demodulators; data communication systems. Corequisite: EE 4350. (0-3) S

EE 4300 Advanced Engineering Mathematics II (3 semester hours) Continuing survey of advanced mathematics topics needed in the study of engineering. Topics include Fourier analysis, partial differential equations, probability, statistics, numerical methods. Examples are provided from communications and microelectronics. Prerequisite: EE 3300. (3-0) S

EE 4301 Electromagnetic Engineering I (3 semester hours) Introduction to the general characteristics of wave propagation. Physical interpretation of Maxwell's equations. Propagation of plane electromagnetic waves and energy. Transmission lines. Antenna fundamentals. Prerequisites: PHYS 2326, EE 4300. (3-0) S

EE 4302 Electromagnetic Engineering II (3 semester hours) Continuation of the study of electromagnetic wave propagation. Metallic and dielectrically guided waves including microwave waveguides and optical fibers. Dipole antennas and arrays. Radiating and receiving systems. Propagation of electromagnetic waves in materials and material properties. Prerequisite: EE 4301. (3-0) S

EE 4320 Digital Circuits (3 semester hours) Boolean logic. Design and analysis of combinational logic circuits using SSI and MSI. Design and analysis of synchronous state machines. Use of programmable logic devices and simple CAD tools. Prerequisite: CS 2325 or EE 2310. Corequisite: EE 4220. (3-0) S

EE 4325 Introduction to VLSI Design (3 semester hours) Introduction to CMOS digital IC design using semi-custom and full-custom design techniques with an emphasis on techniques for rapid prototyping and use of various VLSI design tools. FPGA's, standard cell and full-custom design styles. Introduction to a wide variety of CAD tools. Prerequisite: EE 4320 (or, for CS majors, CS 4340). (3-0) T

EE 4330 Integrated Circuit Technology (3 semester hours) Principles of design and fabrication of integrated circuits. Bipolar and MOS technologies. Passive and active component performance, fabrication techniques including epitaxial growth, photolithography, oxidation, diffusion, ion-implantation, thin and thick film components. Design and layout of integrated devices. Relations between layout and fabrication technique. Prerequisites: EE 3310, EE 4300. (3-0) T

EE 4340 Analog Integrated Circuit Analysis and Design (3 semester hours) Analog integrated circuits and systems. Analysis and design of linear amplifiers, including operational, high-frequency, broad-band and feedback amplifiers. Use of monolithic silicon systems. Prerequisite: EE 3311. (3-0) T

EE 4341 Digital Integrated Circuit Analysis and Design (3 semester hours) Digital integrated circuits. Large signal model for bipolar and MOS transistors. MOS inverters and gates. Propagation delay and noise margin. Dynamic logic concepts. Bipolar transistor inverters and gates, regenerative logic circuits, memories. Prerequisites: EE 3311, EE 4320. (3-0) T

EE 4350 Communications Systems (3 semester hours) Fundamentals of communications systems. Review of probability theory and Fourier transforms. Filtering and noise. Modulation and demodulation techniques, including amplitude, phase, pulse code, pulse position, and pulse width modulation concepts. Time division multiplexing. Prerequisites: EE 3302, EE 4300. (3-0) S

EE 4360 Digital Communications (3 semester hours) Information, digital transmission, channel capacity, delta modulation, and differential pulse code modulation are discussed. Principles of coding and digital modulation techniques such as Amplitude Shift Keying (ASK), Frequency Shift Keying (FSK), Phase Shift Keying (PSK), and Continuous Phase Frequency Shift Keying (CPFSK) are introduced. M-ary signaling such as Quadrature amplitude and phase shift keying, and M-ary PSK and FSK are also discussed. Prerequisite: EE 4350. (3-0) T

EE 4361 Introduction to Digital Signal Processing (3 semester hours) An introduction to the analysis and design of discrete linear systems, and to the processing of digital signals. Topics include time and frequency domain approaches to discrete signals and systems, the Discrete Fourier Transform and its computation, and the design of digital filters. Prerequisites: EE 3302, EE 4300. (3-0) T

EE 4365 Introduction to Wireless Communication (3 semester hours) Introduction to the basic system concepts of cellular telephony. Mobile standards, mobile system architecture, design, performance and operation. Voice digitization and modulation techniques; PCS technologies. Prerequisite: EE 4350. (3-0) Y

EE 4367 Telecommunications Switching and Transmission (3 semester hours) Trunking and queuing, switching technologies: voice, data, video, circuit switching and packet switching, transmission technologies and protocols, transmission media - copper, fiber, microwave, satellite, protocols - bipolar formats, digital hierarchy, optical hierarchy, synchronization, advanced switching protocols and architectures; frame relay, ATM, HDTV, SONET. Prerequisite or
TEE 3201 Electrical Network Analysis Laboratory (2 semester hours) Laboratory to accompany TE 3301. Design, assembly, and testing of linear electrical networks and systems. Use of computers to control electrical equipment and acquire data. (0-2) S

TEE 3301 Electrical Network Analysis (3 semester hours) Analysis and design of RC, RL, and RLC electrical networks. Time domain and phasor domain approaches. Introduction to resistors, capacitors and inductors. Analysis tools such as Kirchoff's laws, Thévenin and Norton equivalents, transfer functions, frequency response, and Bode plots. Prerequisites: differential equations (may be taken concurrently). (3-0) Y

TEE 3302 Signals and Systems (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. Prerequisites: MATH 2420, EE 3301. (Same as EE 3302.) (3-0) Y

TEE 3341 Probability, Statistics and Random Processes in Engineering (3 semester hours) Introduction to probability modeling and the statistical analysis in engineering and computer science. Introduction to Markov chains models for discrete and continuous time queuing systems in Telecommunications. Computer simulations. Prerequisite: MATH 2419, EE 3302 recommended. (3-0) Y

TEE 3354 Software Engineering (3 semester hours) Introduction to software life cycle models. Software requirements engineering, formal specification and validation. Techniques for software design and testing. Cost estimation models. Issues
in software quality assurance and software maintenance. Prerequisites: CS 2315 or CS 3333, and CS 2305 (3-0) S
Prerequisites: Discrete mathematics, experience programming in a high level language such as C/C++. (3-0) Y

TE 4348 Operating System Concepts (3 semester hours) An introduction to fundamental concepts in operating systems, their design, implementation, and usage. Topics include: process management, main memory management, virtual memory, I/O and device drivers, file systems, secondary storage management, introduction to critical sections and deadlocks. Prerequisites: CS 3345 (may be taken concurrently), CS 4340 and a working knowledge of C and UNIX. (Same as CS 4348.) (3-0) S

TE 4380 Senior Design Project (3 semester hours) Senior design project. Requirements will be set by individual faculty members, but will include a written report and a formal oral presentation of the final design product. (0-3) R

TE 4390 Computer Networks (3 semester hours). The design and analysis of computer networks. Topics include the ISO reference model, transmission media, medium-access protocols, LANs, data link protocols, routing, congestion control, internetworking, and connection management. Prerequisite: CS 4348 and CS 4348. (Same as CS 4390.) (3-0) S

TE 4V95 Undergraduate Topics in Telecommunications Engineering (1-9 semester hours) Subject matter will vary from semester to semester. May be repeated for credit (9 hours maximum). ([1-9]-0) R

TE 4V97 Independent Study in Telecommunications Engineering (1-9 semester hours) Independent study under a faculty member's direction. May be repeated for credit (9 hours maximum). Consent of instructor required. ([1-9]-0) R

TE 4V98 Undergraduate Research in Telecommunications Engineering (1-9 semester hours) May be repeated for credit. ([1-9]-0) R

Engineering Science

ENGS 3302 Dynamics in Electrical Engineering Systems (3 semester hours) Fundamentals of particle, rigid-body, and continuum dynamics. Motion of charged particles in electric and magnetic fields. Micromechanical devices. Heat transfer. Computer solutions of linear and nonlinear models. Prerequisites: PHYS 2325, EE 3300. (3-0) S