GRADUATE PROGRAMS COURSE DESCRIPTIONS

EE 212 Linear System Theory. Theory and application of discrete and continuous-time linear dynamical systems. Review of applied linear algebra; least-norm and least-squares methods. Autonomous linear dynamical systems; interpretations of eigenvalues, eigenvectors, matrix exponential, and invariant sets. Singular value decomposition with applications. Linear dynamical systems with inputs and outputs; transfer matrices. Observability and state estimation; controllability and state transfer. Examples and applications from digital filters, circuits, signal processing, and control systems. Prereq: EEE 35 and Math 114 or equiv. 5 h (2 lec, 3 lab) 3 u.


EE 221 Electronic Amplifier Design. Linear and non-linear models of field-effect and bipolar junction transistors at low and high frequencies; theory, design and application of class A, B, C, D, E, F amplifiers, wide band low-pass amplifiers, distributed amplifiers, power amplifiers, tuned amplifiers, feedback amplifiers, operational amplifiers, parametric amplifiers, sense amplifiers, and other special amplifiers; biasing; gain-bandwidth; noise mechanisms and low-noise design; passive components; performance evaluation and optimization; integrated circuit implementations; design projects. Prereq: COI. 4 u.


EE 227 Modern VLSI Design. Digital systems and VLSI. Transistors and layout. Logic functions. Combinational logic networks. Sequential machines. Systems architecture design and HDLs. Subsystem design and IP components. CAD systems and algorithms. Prereq: EEE 21 or equiv. 5 h (2 lec, 3 lab) 3 u.


EE 233 Digital Control Systems Design. Z-transforms and state variable representation of discrete-time systems; models for mixed continuous and discrete-time systems; modeling asynchronous sampling; analysis and design by root locus, frequency response, and state-space techniques; controllability, observability and observer design; linear quadratic optimal control and state estimation; optimization and design issues of mixed continuous and discrete-time systems; inter sample behavior; robust control; sampling rate selection; effects of quantization and finite precision errors; multi-variable control and optimization; multirate systems; computer simulations; design projects. Prereq: EE 101 or equiv. 5 h (2 lec, 3 lab) 3 u.


EE 240 Power Electronics I. Application of semiconductor devices and circuits to power systems; power control, conditioning, processing and switching. Prereq: EEE 53 or equiv. 5h (2 lec, 3 lab) 3u.

EE 241 Linear and Switching Power Supplies. Linear converters. Switchmode topologies. DC/DC, AC/DC, DC/AC converters. Applications. Power supply simulation. Prereq: EEE 53 or equiv. 5 h (2 lec, 3 lab) 3 u.


EE 245 Advanced Theory of Electrical Machines. Reference frames and generalized machine theory. Modeling and analysis of rotating machines during steady state, transient, and dynamic conditions. Prereq: EEE 43 or equiv. 3 u.


EE 248 Power Amplifiers. Linear amplification. Voltage and current mode amplifiers. Amplifier classes A, B, AB, C. Trans-conductance amplifiers. Composite amplifiers. Resonant and switchmode amplifiers. Prereq: EEE 53 or EE 121 or equiv. 5 h (2 lec, 3 lab) 3 u.


EE 251 Fault Studies. Symmetrical components. Sequence impedances of transmission lines, synchronous machines and transformers. Phase-domain and sequence-domain analysis of unbalanced and simultaneous faults. Prereq: EEE 103 or equiv. 5 h (2 lec, 3 lab) 3 u.


EE 256 Power System Protection. Fundamental principles. Selection and application of protective devices and protection algorithms. Protection of transmission lines, transformers, generators, motors, buses, and other equipment. Phase and ground fault protection. Coordination of protective devices. Testing of relays and protection algorithms. Prereq: EEE 103 or equiv. 5 h (2 lec, 3 lab) 3 u.


EE 270 Digital Communications I. Methods of digital modulation and demodulation. Signal space methods in digital communications. Communication over AWGN and band-limited channels, including channel capacity. Carrier and symbol synchronization. Source coding and lossless compression. Channel coding, including block codes, convolutional codes and Viterbi decoding. Current topics of interest. Prereq: EEE 107 or equiv. 5 h (2 lec, 3 lab) 3 u.


EE 286 Digital Audio Signal Processing. Digital audio signal analysis and manipulation. Speech and musical instrument synthesis. Digital audio recording and reproduction. EEE 35 and EEE 11, or COI. 5 h (2 lec, 3 lab) 3 u.

EE 290 Directed Studies. Independent study or investigation of directed, current research areas in electrical and electronics engineering. Collaborative peer discussions of study results and findings. Prereq: COI. 3 u.

EE 296 Seminar. 1 u. per sem; max. of 3 u.

EE 298 Special Problems. Course may be repeated for credit, up to a maximum of 12 units, provided that topics are different; topics to be indicated for record purposes. 3 u

EE 299 Electrical Engineering Project. Prereq: COI. 3 u.

EE 300 Thesis. 3 u. to 6 u.

EE 317 Mathematical Methods for Electromagnetics I. Analytical and numerical methods of solving practical problems in electromagnetics, including fundamental theorems, plane wave functions, cylindrical wave functions, variational techniques, geometric theory of diffraction, method of moments, finite difference time domain method and Galerkin’s method. Computer programming exercises. Prereq: EE 217 and ES 204. 3 u.

EE 318 Mathematical Methods for Electromagnetics II. Variational techniques, geometric theory of diffraction, Galerkin’s method, finite difference time domain method, method of moments; recent topics of interest; computer programming exercises. Prereq: EE 317. 3 u.

EE 320 Analysis and Design of High Performance Digital Integrated Circuits. Parasitic models and second-order effects of field-effect and bipolar transistors, and interconnects; clock skew and other timing issues; design of high-performance combinational and sequential logic circuits; arithmetic and memory structures and devices; charge-coupled device circuits; signaling, synchronization, noise and clock and power distribution issues; extraction of circuit parameters from process parameters; optimization at the device and circuit levels; circuit-systems issues; design projects. Prereq: EE 226 Co-req: EE 325. 4 u.

EE 322 Analysis and Design of Monolithic Information Processing and Communication Circuits. Small and large-signal models of field-effect and bipolar transistors; amplifiers, switched capacitor networks, sample and hold, multiplexers, analog to digital and digital to analog converters, active filters, comparators, analog multipliers, relaxation oscillators, phase detectors, phase-locked loops, voltage-controlled oscillators, mixers, sampled-data filters, digital decimation and interpolation filters; charge-coupled device circuits; architectural and circuit level performance evaluation; design projects. Prereq: EE 220. Co-req: EE 325. 4 u.

EE 325 Semiconductor Devices II. Compound semiconductors and hetero-junctions; dielectric and optical properties; optical processes; physics and models of high-frequency, high-speed and optoelectronic devices including HFET, HBT, MESFET, quasi-ballistic transistors and other sub-micron transistor concepts, and charge-coupled devices. Prereq: EE 225. 3 u.

EE 326 Optoelectronic Devices. Optical properties and processes; optical detectors, light-emitting diodes, solar cells, modulators, switches, directional couplers, lasers and others of interest. Prereq: EE 325. 3 u.

EE 327 Advanced VLSI Design. Advanced VLSI technologies; system architecture; system behavior modeling in VHDL or C; CAD tools for standard cell, custom design or hybrid techniques; integration of heterogeneous CAD tools; automated and manual synthesis; advanced circuit design and testing methods; synthesis of the different levels of design hierarchy; design projects. Prereq: EE 227. 3 u.

EE 330 Optimal Control. Theoretical methods in optimal control theory. Topics include the review of the optimality conditions: Lagrange and Kuhn-Tucker. The calculus of variations and the Pontryagin minimum principle with applications to minimum energy problems. Geometric methods will be applied
to the solution of minimum time problems. Computational methods, singular problems, observer theory, and sufficient conditions for existence of solutions are also discussed. Prereq: EE 212. 3 u.


EE 359 Power Systems Operation and Control. Modern power system operational and control problems and solution techniques, including load frequency control, automatic generation control, system voltage control, security assessment, state estimation, and contingency analysis. System control centers. Interconnected systems. Prereq: EEE 103 or equiv. 3 u.


EE 371 Microwave Integrated Circuits I. Computer-aided analysis and design of distributed circuit structures and their applications in passive and active microwave circuits including dividers, directional couplers, circulators, filters, transistor amplifiers, attenuators; experimental characterization; design projects. Prereq: EE 271 and EE 325. 3 u.

EE 372 Microwave Integrated Circuits II. Computer-aided analysis and design of distributed circuit structures and their applications in passive and active microwave circuits including transistor amplifiers, mixers, modulators, demodulators, oscillators, frequency converters, phase shifters, harmonic generators; noise models and low-noise design; monolithic MIC; fabrication processes of monolithic circuits; experimental characterization; design projects. Prereq: EE 371. 3 u.


EE 398 Special Problems. 3 u.

EE 400 Dissertation. 12