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 214 Probability and Random Processes in Electrical Engineering. Review of combinatorial probability. Random variables and vectors. Discrete and continuous distributions. Conditional and multivariate probabilities. Functions of random variables. Mathematical expectations. Autocorrelation and power spectral density. Stochastic models. Stationarity and cyclostationarity. Higher order statistics, cumulants and polyspectra. Spectral-correlation density. Prereq: EEE 25 or equiv. 5 h (2 lec, 3 lab) 3 u.

EE 217 Electromagnetic Fields II. Review of Maxwell's equations. Propagation phenomena of plane waves in dielectric and conducting media. Transmission lines, waveguides and resonators. Antennas and radiation. Fiber optics and optoelectronic systems. Prereq EEE 23 or equiv. 3 u.

EE 218 System Identification. Introduction to point estimation, least squares, Bayes risk, and maximum likelihood. Optimum mean-square recursive estimation for non-dynamic stochastic systems. State estimation for discrete-timeand continuous-time dynamic systems. Parameter identification of stochastic systems using maximum likelihood. Stochastic approximation, least squares, and random search algorithms. Applications to controls, communication, and signal processing. Prereq: EE 212 and EE 214. 3 u.

EE 220 Analog Integrated Circuits. Integrated circuit devices and modeling. Noise analysis and modeling. Review of basic operational amplifier design and compensation. Advanced current mirrors and operational amplifiers. Operational transconductance amplifiers. Common-mode feedback circuits. Comparators. Sample and holds. Voltage references and translinear circuits. Discrete-time signals. Switched-capacitor circuits. Co-req: CoE 143 or equiv. 6h (3 lec, 3 lab) 4 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 223 Design of Signal Processing Systems. System modeling. Computational algorithms. Architecture mapping. Hardware optimizations. SoC applications. Prereq: EE 227 and EE 274. 3 u.

EE 224 Mixed Signal Systems. Signals and filters. Sampling and aliasing. Analog and digital filters. Analog-to-digital converters. Digital-to-analog converters. Sample/hold amplifiers. Mixed-signal applications. Prereq: EE 220. 5 h (2 lec, 3 lab) 3 u.

EE 225 Solid State Electronics and Semiconductor Devices. Conduction mechanisms in semiconductors and metals. Physics, characteristics and models of p-n junction diode. Bipolar junction transistors. Junction and MOS field-effect transistors. Trends in scaled MOSFETs. Short channel MOSFETs. Prereq: EEE 41 or equiv. 4 u.

EE 226 Digital Integrated Circuits. Fundamentals of MOSFETS. Technology and modeling. Scaling and limits of scaling. Design for deep-submicron CMOS – high speed. Design techniques for low power. Arithmetic circuits. Driving interconnect, high-speed signaling. Timing. Memory design. Design for testability. Prereq: CoE 141 or equiv. 6h (3 lec, 3 lab). 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 229 RF Integrated Circuit Design. Introduction to RF and wireless technology. Characteristics of passive devices at RF. High-frequency amplifier design. Analysis of distortion in amplifiers. Low-noise amplifiers and mixers. Oscillators. Frequency synthesizers. Power amplifiers. Phased-locked loops. Modulators and demodulators. Transceiver architectures. Prereq: EE 220. 3 u.

EE 231 Advanced Feedback Control Systems. Transfer functions. Block diagrams. Signal flow graphs. Root locus, Bode, Nyquist and polar plots. Sensitivity. Stability. Compensation techniques. Multivariable systems. Disturbance rejection. Robust control. Adaptive control. state-variable representation and feedback; state-space design; optimal control, computer simulations; design projects. Prereq: EEE 101 or equiv. 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: EEE 101 or equiv. 5 h (2 lec, 3 lab) 3 u.

EE 234 Advanced Data Acquisition Systems. Sensors and industrial standards. Storage and display devices. Sensor networks. Prereq: COI. 5 h (2 lec, 3 lab) 3 u.

EE 235 Nonlinear Control Theory. Introduction to nonlinear control with emphasis on differential geometric methods. Linear and nonlinear dynamical systems analysis methods. Describing functions. Lyapunov theory. Popov and the circle criteria. Bifurcation analysis. Controllability, accessibility and observability of nonlinear systems. Differential geometry and nonlinear control from the geometric point of view. Prereq: EE 212. 3 u.

EE 236 Principles of Robotics. Definition of robots and manipulators. Different transformations involved in the study of manipulators. Kinematics and dynamics. Trajectory planning. Prereq: COI. 3 u.

EE 237 Advanced Robotics. Dynamical models for manipulator in Lagrange and Newton-Euler formulations. Controller design based on manipulator dynamics. PID-controllers, eigenvalue assignment and adaptive self-tuning control. Controllers for compliant motion. Prereq: ECE 131. 3 u.

EE 238 Mobile Robotics. Locomotion. Robot kinematics. Perception. Navigation and planning. Map-building. Mobile robot localization. Prereq: COI. 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 242 Industrial Electronics. Electrical transients. Three phase circuits. Fourier series. Transformers. Rectification. AC/DC thyristor converters. Forced Ccmmutation. PWM motor control. AC power control. Applications. Prereq: EEE 101 and EEE 103 or equiv. 3 u.

EE 243 Electromagnetic Compatibility. Transmission lines. Emissions. Modeling. Susceptibility. PCB Design. Shielding. Grounding. Prereq: EEE 23 and EEE 53 or equiv. 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 246 Dynamics and Control of Electric Motor Drives. Phase- and chopper-controlled DC motor drives. Dynamic modeling of AC machines. Frequency-, phase-, and vector-controlled induction motor drives. Permanent magnet AC, brushless DC, and switched-reluctance motor drives. Simulation of electric drive systems. Prereq: EEE 43 and EEE 51 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 249 Power Electronics II. Principles of steady state converter analysis. Steady state equivalent circuit modeling. Converter circuits. AC circuit modeling. Converter transfer functions. Prereq: EE 240 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. 5h (2 lec, 3 lab) 3 u.

EE 252 Load Flow Analysis. System modeling and matrix analysis of balanced and unbalanced three-phase power systems. Solution of a system of linear and nonlinear equations. Solution of a system of linear and non-linear equations. Sparsity techniques and optimal ordering. Load flow of balanced and unbalanced three-phase power systems. Prereq: EEE 103 or equiv. 5h (2 lec, 3 lab). 3 u.

EE 254 Surge Protection in Power Systems. Electrical surges including traveling waves due to lightning and switching. Principles of lightning protection. Multi-velocity waves. Electromagnetic transient simulations. Insulation coordination. Application of surge protection devices. Prereq: EEE 25 or equiv. 5h (2 lec, 3 lab) 3 u.

EE 255 Electric Power Transmission and Distribution System Planning. Forecasting models for network planning. Cost models for transmission and distribution facilities. Technical and Economic evaluation. Optimization in transmission and distribution planning. Reliability evaluation of transmission and distribution networks. Prereq: 103 or equiv. 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) 3u..

EE 257 Electric Power Transmission and Distribution Network Automation. Transmission and distribution (T&D) system automation requirements. Sensors, actuators, and controllers. T&D automation equipment. Remote Terminal Units (RTUs). Distribution Management Systems. Supervisory Control and Data Acquisition Systems (SCADA) Decision Support Applications. Communications options and communications protocol for T&D utility automation. Design of transmission, substation, and distribution feeder automation/ Case studies and applications. Prereq: EEE 103 or equiv. 5 h (2 lec, 3 lab) 3 u.

EE 258 Electric Power Quality. Modeling for power quality analysis. Harmonics. Time and frequency domain methods of analysis. Grounding. Voltage sags and swells. Electrical transients. Measurement techniques. Mitigation techniques. Power quality standards. Prereq: EEE 103 and EEE 51 and EEE 35 or equiv. 5 h (2 lec, 3 lab) 3 u.

EE 260 Embedded Systems Hardware I. Design of 8, 16, 32-bit microprocessor-based systems using microprocessor integrated circuits and softcores (system-on-a-programmable-chip). Advanced microprocessor features and peripherals. Memory technologies. Interfacing using simple bus protocols. Prereq: EE 227. 5 h (2 lec, 3 lab) 3 u.

EE 261 Embedded Systems Hardware II. Complex bus protocols. Video. Mass storage. Circuit board-level design of embedded systems. High speed circuit board design techniques. Signal integrity issues. Prereq: EE 260. 5 h (2 lec, 3 lab) 3 u.

EE 263 Finite State Machines. Review of clocked sequential circuits. State minimization. State assignment. Pulsed sequential circuits. Fundamental mode sequential circuits. Delays and hazards. State identification. State machine Testing. FSM applications. Prereq: EEE 21 or equiv. 3 u.

EE 264 Computer Architecture. Evolution of computer architecture. Principles of computer system design. Computer system components. Instruction set design. Processor micro-architecture. Pipelining. Cache and virtual memory organizations. I/O structures. Instruction level parallelism. Prereq: EEE 105 or equiv.: 3 u.

EE 265 Advanced Computer Architecture. Vector machines. Out-of-order execution. Dynamic scheduling. Thread level parallelism. VLIW machines. Speculation techniques. Compiler support. Multiprocessor architectures. Multicore architectures. Coherency issues. Interconnection networks. Prereq: EE 264. 3 u.

EE 267 Embedded Software and Operating Systems. Overview of embedded systems. Kernel. Bootloader. Toolchain. Root Filesystems. Memory Technology Devices. I/O Susbsystem. Device Driver. Introduction to Applications Programming. Prereq: EE 260 and EEE 13 or equiv. 5 h (2 lec, 3 lab) 3 u.

EE 268 Embedded Software Applications Development. Software engineering methodologies applied to embedded systems program development. Quality Assurance techniques. Software maintenance issues. Functional and non-functional software properties. Prereq: COI. 3 u.

EE 269 Digital Systems Testing. Test economics and motivation. Fault models and simulation. Test pattern generation. Measures for testability. Design for testability. Memory testing. Prereq: EEE 21 & EEE 41 or equiv. 3u.

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 271 Microwave Theory and Techniques. Analysis and synthesis of transmission lines and waveguides. Microwave resonators. Microwave network analysis. Analysis and design of passive and active microwave devices. Noise in microwave circuits. Circuit models of active devices. Magnetic materials and their applications. Microwave test and measurement principles. Prereq: EE 217. 3 u.

EE 272 Radiowave Propagation and Radio Link Design. Transmission loss. Free-space propagation. Propagation at low and high frequencies. Microwave propagation. Propagation over plane and spherical surfaces. Propagation in the ionosphere, troposphere and near-earth. Antennas. Design considerations for noise, diffraction, refraction, absorption, multipath interference, and scattering in wireless communications, including mobile communications and satellite links. Prereq: EEE 23 or equiv. 3 u.

EE 273 Antenna Engineering. Radiation from simple and extended sources and arrays. Antenna theorems. Scattering concepts. Analysis and design of wire, aperture, traveling wave, reflector, microstrip and miniaturized antennas. Modern antenna systems. Receiving antenna considerations. Prereq: EEE 23 or equivalent. 3 u.

EE 274 Digital Signal Processing I. Sampling theorem. Discrete time signals and LTI systems. Discrete convolution. Z- transform. FIR and IIR digital filters. Discrete Fourier transform. Fast Fourier Transform. State-space analysis. Prereq*:* EEE 35 or equiv. 5 h (2 lec, 3 lab) 3 u.

EE 275 Networking Technologies I. Layered network architecture. Link layer protocols. Packet switching. LAN and WAN routing. Transport protocols. Applications. Prereq*:* EEE 13 and EEE 107 or equiv. 3 u.

EE 276 Statistical Communication Theory. Principles and applications of detection and estimation theories in communication systems. Bayes and the Neyman-Pearson criteria. Cramer-Rao bound. Minimum variance unbiased estimation, maximum likelihood, EM, MAP, linear MMSE estimation. Hypothesis testing. Applications in modern digital communications, radar and sonar signal processing. Prereq: EE 214 and EE 274. 3 u.

EE 277 Coding and Information Theory. Error detecting and error correcting codes. Block codes and convolutional codes. Analysis and design of error-control channel codes. Modeling of information sources, including zero-memory and Markov models. Construction of compact source codes. Entropy, mutual information and channel capacity. Shannon's noiseless and noisy coding theorems. Examples of modern source and error control codes. Prereq: EEE 25 or equiv. 3 u.

EE 279 Networking Technologies II. Distributed systems and applications. Network architectures and technologies. Network protocols. Routing and congestion control. Modeling, simulation, and performance analysis. Emerging applications. Prereq*:* COI. 5 h (2 lec, 3 lab) 3 u.

EE 280 Wireless Communication Systems. Radio propagation and antennas. Large-scale and small-scale propagation models. Performance of wireless communication systems in fading channels. Coding, equalization and diversity. TDMA, FDMA, CDMA, SDMA and random access protocols. Examples of modern and practical systems, including cellular systems, wireless local area networks, wireless personal area networks and broadband wirelessaccess systems. Co-req: EE 270 or equiv. 3 u.

EE 281 Optical Communications Systems. Optical fiber fundamentals. Single mode and multimode fibers. Optical fiber bandwidth. Optical sources, light-emitting diodes and lasers. Optical detectors, modulators, switches and directional couplers. Optical communications systems design. Wavelength division multiplexing and other topics of interest. Prereq: EEE 41 or equiv. 3 u.

EE 282 Adaptive Filtering and Array Processing. Theory and applications of adaptive filtering in systems and signal processing. Iterative methods of optimization and their convergence properties. Transversal filters. LMS and gradient-search algorithms. Kalman filtering and least-squares algorithms. Array fundamentals. Optimum array processing. Adaptive beam forming. Space-time processing and space-time coding. MIMO. Current topics of interest. Prereq: EE 274 or equiv. 5h (2 lec, 3 lab). 3 u.

EE 283 Digital Image Processing. Digital image fundamentals. Introduction to two-dimensional digital signal Processing. Image enhancements in spatial and frequency domain. Image transforms. Image restoration. Color image processing. Wavelets and image compression. Morphological image processing. Image segmentation, representation, and description. Introduction to object recognition and computer vision. Advanced topics and applications of image processing analysis. Prereq: CoE 121 or EE 274 or COI. 3 u.

EE 284 Speech Signal Processing. Feature Extraction. Speech Recognition. Hidden Markov Modeling. Speech Production Models. Pitch Detection. Prosody. Speech Synthesis. Speech Coding. Prereq: EEE 35 or equiv. 5 h (2 lec, 3 lab) 3 u.

EE 285 Digital Video Signal Processing. Digital video fundamentals. Video formation, perception, and representation. Fourier analysis of video signals. Frequency response of the human visual system. Video sampling and rate conversion. Video modeling. 2-D and 3-D motion estimation. Video coding: waveform-based coding and content-dependent coding. Scalabale video coding. Stereo and multi-view sequence processing. Video components standards. Error control in video communications. Advanced topics and applications of video analysis, processing, streaming, compression, error control, and transmission. Prereq: CoE 121 or EE 274 or COI. 5 h (2 lec, 3 lab) 3u.

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 353 Power System Reliability. Basic reliability concepts. Methods for reliability modeling and evaluation. Reliability measures. Reliability of generation, transmission, distribution, composite, and interconnected systems. Prereq: EEE 25 or equiv. 3 u.

EE 355 Power System Planning. Financial modeling. Load forecasting. Production simulation. Generation planning. Network planning. System planning in a competitive electricity industry. Prereq: EEE 103 or equiv. 3 u.

EE 357 Power System Dynamics and Stability. Modeling, analysis, and simulation of power systems subjected to small and large disturbances. Steady state, transient, and dynamic stability assessment and enhancement. Multimachine studies. Recent developments. Prereq: EEE 103 or equiv. 3 u.

EE 358 Economic Operation of Power Systems. Economics of energy generation and operation. Optimization methods. Mixed-generation dispatch. Unit commitment. Optimal load flow. Competitive markets for electricity generation. Recent developments. Prereq. EEE 103 or equiv. 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 370 Digital Communications II. Communication over band-limited and fading channels. Multipath propagation. Channel equalization and adaptive techniques. Fractionally-spaced equalizers. Decision feedback equalization. Spread spectrum systems, multiuser access and detection. Current topics of interest. Computer exercises. Prereq: EE 270. 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 374 Digital Signal Processing II. Multirate processing. Optimal methods in filter design. Superior filter structures. Advanced finite word length effects. Non-parametric and parametric spectrum estimation. Adaptive filters, Wiener filters and algorithms. Time-frequency analysis and wavelets. Linear prediction. Current topics of interest. Computer exercises. Prereq: EE 214 or equiv. and EE274. 5 h (2 lec, 3 lab) 3 u.

EE 398 Special Problems. 3 u.

EE 400 Dissertation. 12