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Notes:

1. Not all courses are offered in all years. Courses not offered in 2004-2005 carry no semester identification.
2. Special Topics and Individual Problems are subject to the limit of two courses or 6 credit hours.
3. General prerequisite: Graduate standing or permission of instructor applies to all courses. Additional pre-requisite may also apply as indicated in individual courses.

500 Special Topics (2-3)

Subjects of current interest to graduate students. Particular subject matter and title will vary from year to year.

503 Introduction to Plasma Processing (3)

Semester: Sp

Introduces plasma processing including plasma deposition, plasma etching, gaseous electronics, gas lasers and plasma materials processing. Topics include basic atomic theory, elementary kinetic theory of gases, motion of charges in electric and magnetic fields, plasma properties, plasma generation and devices, plasma-surface interactions, electrodes and discharge characteristics, plasma diagnostics and plasma simulation. Students prepare web-based presentations in current plasma technologies with focus on applications in electrical engineering field.

505 Electrical Devices I (3)

Semester: Sp

Principles of electromagnetic energy conversion with applications to motors and generators. Topics include magnetic circuits, transformers, hysteresis, field energy, dc and ac motors. Power electronic components and control circuits for various electrical devices are presented. Students will learn the basic fundamentals of electro-mechanical energy conversion. Design project with laboratory validation accounts for 50 % of grade.

507 Advanced Magnetic Transformers (3)

Semester: F

Experimental operations of advanced transformers as an essential component of a graduate project.

Prerequisite: Permission of instructor.

510 Electronic Instrument Design I (3)

Semester: F

Design of electronic instruments, with emphasis on the use of integrated circuits, both analog and digital. Topics include power supplies; signal conditioning, and active filters; frequency counters and micro-controllers; measurement of temperature, displacement, light, and other physical quantities. Individual or group projects required. The instrument is demonstrated and a report is written.

511 Applied Biophotonics (3)

Semester: Sp

This course focuses on the tools that are necessary for biophotonic research. The course begins with an overview of light and optical devices. This is followed by lectures on the fundamentals of basic techniques in preparation of biological samples, use of advanced imaging and microspectroscopy instrumentation and finally the integration of the techniques learned in the first parts of this course. The associated laboratory provides students with basic training in cell culture techniques including handling of pathogenic organisms. Establishment and maintenance of eukaryotic cells will be focused on emphasizing appropriate use of sterile techniques. Appropriate training in laboratory

(lasers and biology) safety will be provided. An introduction to advanced imaging equipment (confocal microscopy, atomic force microscope, optical coherence tomography) will be provided. Skills acquired in biological and imaging sections will be used in a group design project.

513 Communication Electronics (3)

Semester: Sp

Operation and signaling in communications systems with a strong emphasis on circuits. It covers radio frequency systems (AM, FM, TV), telephone switching systems, microwave/wireless systems, fiber optics, modulation schemes, coding, multiplexing/demultiplexing, protocols, and networking. Both analog and digital/data communication systems are discussed. Students are required to complete a capstone design project.

514 Electronic Sensors (3)

Semester: Sp

Analysis and design of electronic sensors, signal processing and interfaces. Standard transducers such as temperature, optical displacement, and pressure will be surveyed. New types of sensors, in particular fiber optic sensors, will be emphasized.

Prerequisite: EE 510

515 Introduction to MEMS (3)

Semester: F

This course is intended for first-year graduate students. Silicon-based integrated MEMS promise reliable performance, miniaturization and low-cost production of sensors and actuator systems with broad applications in data storage, biomedical systems, inertial navigation, micromanipulation, optical display and microfluid jet systems. The course covers such subjects as materials properties, fabrication techniques, basic structure mechanics, sensing and actuation principles, circuit and system issues, packaging, calibration and testing.

516 Digital Signal Processing I (3)

Semester: F

Discrete-time linear systems and their state space representation. The z-transform. Digital filter design techniques. The discrete Fourier transform and its computation. Finite wordlength and quantization effects. Homomorphic signal processing.

517 Digital Signal Processing II (3)

Semester: Sp

Computationally efficient algorithms and architectures for high throughput signal processing. Fast convolution algorithms and transforms. Power spectrum estimation. Applications and implementation considerations.

Prerequisite: EE 516.

519 Industrial Control Systems (3)

Semester: F

An application oriented course to introduce the students to the basic principles and concepts employed in analysis and synthesis of modern day analog and microcomputer control systems. Topics include: review of vectors, matrices and Laplace transforms followed by introduction to block diagram, signal flow graph and state-variable representation of physical systems, network and linear graph techniques of system modeling, time-domain, frequency domain and state-space analysis of linear control systems, control concepts in multi-variable systems, hierarchy of control structures, design of op-amp controllers, and programmable controllers.

522 Nanostructure Materials (3)

Semester: Sp

The recent emergence of fabrication tools and techniques capable of constructing nanometer-sized structures has opened up numerous possibilities for the development of new devices with size domains ranging from 0.1 - 50 nm. The course introduces basic single-charged electronics, including quantum dots and wires, single-electron transistors (SETs), nanoscale tunnel junctions, etc. Giant magnetoresistance (GMR) in multilayered structures are presented with their applications in hard disk heads, random access memory (RAM) and sensors. Optical devices to be discussed include semiconductor lasers incorporating active regions of quantum wells and self assembled formation of quantum-dot-structures for new generation of semiconductor layers. Finally, devices based on single and multi. walled carbon nanotubes are presented with emphasizes on their unique electronic and mechanical properties that are expected to lead to ground breaking industrial nanodevices. The course also includes discussions on such fabrication techniques as laser-ablation, magnetron and ion beam sputter deposition, epitaxy for layer structures, rubber stamping for nanoscale wire-like patterns, and electroplating into nanoscale porous membranes.

524 Introduction to Nanoelectronics (3)

Semester: Sp

The objective of this course is to explore the basic physical phenomena that determine the electrical properties of semiconductor nanostructure devices

529 Introduction to Electro-Magnetic Compatibility (EMC) (3)

Semester: F

EMC deals with interference in electronic systems. For senior and first-year graduate students and industrial professionals who have an interest in designing electronic systems that comply with current commercial and military standards on EMC such as the FCC Part 15 and CISPR 22. Both specify limits on radiated and conducted emissions for digital devices which are defined as any electronic device that has digital circuitry and uses a clock signal in excess of 9 kHz. Student projects designed in electronic instrumentation classes without consideration of the limits imposed by these standards would fail to meet the current standards and as a result could not be marketed in the United States or Europe.

531 Probability & Stochastic Processes for Engineering (3)

Semester: F

Review of probability theory. The meaning of probability. The axioms of probability. Bernoulli trials. The concept of a random variable. Functions of one random variable. Two random variables. Sequences of random variables. Stochastic convergence and limit theorems. Stochastic processes. Definition of a stochastic process. Systems with stochastic inputs. The power spectrum. Stationary and ergodic stochastic processes. Applications of stochastic processes. Random walks. Poisson points. Deterministic signals in noise. Spectrum estimation. Mean square estimation. Wiener and Kalman filtering.

535 Java Applet Modeling (3)

The course emphasizes object-oriented analysis, design and programming. Lecture introduces Java syntax, application programmers interface, the object-oriented programming concepts including encapsulation, inheritance, and polymorphism, and the multi-threaded programming including thread synchronization and control. Lecture also introduces graphical programming API and the techniques are applied to the student-chosen, engineering simulation projects. Software engineering process such as architectural design, unit refinement cycles and code reuse are emphasized to develop a reusable class library consisting of at least three packages: a graphical drawing package, a problem simulation package, and a visual presentation package.

Prerequisite: Experience in programming with a high-level language (e.g., C).

536 Mobile Cellular Telecommunication Systems (3)

One of the fastest growing application areas in communications engineering, this course covers elements of cellular radio system design specifications, cell coverage for signal and traffic, cell-site antennas and mobile antennas, co-channel interference reduction, types of non-co-channel interference, frequency management and channel assignment, handoffs, operational techniques and technologies, switching and traffic, data links and microwaves, system evaluations, digital systems, and cellular-related topics.

538 Principles of Modern Digital Communications (3)

Semester: Sp

Basic principles that govern the analysis and design of modern digital communication systems. Quantization (optimum scalar/vector quantization, PCM, DPCM, Delta modulation). Representation of communication signals and systems (ASK, PSK, QAM, NRZ, NRZI, FSK, CPM, MSK). Optimum receivers for the Additive White Gaussian Noise channel. Carrier and symbol synchronization. Block and convolutional channel codes. Receiver design and performance evaluation for channels with Inter-Symbol-Interference and Additive White Gaussian Noise (Viterbi receiver, linear equalizers, decision-feedback equalizers, adaptive equalizers). Fading multipath channels and diversity techniques, RAKE receiver. Introduction to spread spectrum signals and multiuser communications (CDMA techniques).

540 Energy Conservation in Motor Drive Systems (3)

Semester: Sp

An application oriented course covering principles and concepts employed in modern day AC and DC motor drive systems. Topics include: basic principles, construction, equivalent circuit, torque/power equations and application considerations of DC, synchronous and induction machines followed by introduction to static power conversion in motor controllers, their application considerations and industrial applications for energy conservation. Projects from the industry are analyzed and studied. A midterm exam and a case study of an industrial project are required.

541 Special Topics (3)

Subjects of current interest to graduate students. Particular subject matter and title may vary from year to year.

544 CDMA Communications (3)

Introduction to the spread-spectrum concept and its implications. Direct sequence and frequency hopped spread-spectrum systems. Spread-spectrum signal generation: Binary shift-register sequences for spread-spectrum systems. Multiuser CDMA systems. Spread-spectrum signal propagation (multipath, co-channel interference, narrowband interference). Receiver design concepts for CDMA communications. Adaptive interference suppression for CDMA systems. Topics: CDMA technology, Anti-Jam Communications, GPS Technology, OFDM.

547 Microlithography & Thin Film Processes (3)

This course covers important physical and chemical aspects, such as visible and UV optics, x-ray optics, molecular structure of microfabrication, and thin film technology. Basic vacuum technology is also included.

548 Microelectronic Device Fabrication (3)

Semester: F

Fabrication technology for microelectronic devices: crystal growth, wafer fabrication and characterization, mask fabrication, epitaxy, lithography, etching, diffusion, CVD, ion implantation, DC and RF plasma reactors (operating principles and fabrication applications), packaging. Operation of microelectronic devices (interconnects, passive devices, and MOS and BJT devices), micro-optical devices (CDRs, etc.) and micro electro-mechanical devices (micro-motors, micro-mirror arrays, etc). Students select a part of the fabrication process (lithography, diffusion, etc.) and use simulation code to design that step of the process to achieve specific device properties.

549 Analog Integrated Circuits Layout (3)

Semester: Sp

Introduces analog integrated circuit fabrication and layout design for analog VLSI. Covers: representative IC fabrication processes (standard bipolar, CMOS and analog BiCMOS); layout principles and methods for MOS transistors and device matching; resistors and capacitors layout; matched layouts of R and C components; bipolar transistors and bipolar matching; and diodes. Also reviews several active-loaded analog amplifier circuits, focusing on CMOS and BiCMOS op amp configuration. Requires a term project on the layout design of simple op amp circuits involving CMOS or BiCMOS

op amps plus several matched devices of resistors, capacitors and transistors. Students design circuits using SPICE simulations. The student term project is to be fabricated through MOSIS.

550 Special Topics – Not offered at this time

553 Microelectronic Fabrication Laboratory (3)

Semester: Sp

Provides students with the experience of fabricating a semiconductor device. Students become versed in fabrication techniques used in the microelectronics industry. Required student activities include mask design, chemical processing, operation of clean room equipment, and testing of the final device. Also requires a report.

555 Photonic Devices (3)

Semester: F

First, discusses the basics of p-n junctions including current flow, and recombination. In addition, discusses solar cell fundamentals, heterojunctions, metal-insulator-semiconductor devices, design, and recent advances. The course ends with a discussion of photodetector principles, design, and applications.

558 Quantum Heterostructures and Devices (3)

The course emphasizes new developments in microelectronics and nanoelectronics. In many respects heterostructure devices are superior to the conventional Si devices. The material is presented on the level of the first graduate course in Solid State Electronics. After a short introduction to quantum mechanics, Chapters 3-9 of the text "Quantum Heterostructures" by V. Mitin, V. Kochelap and M. Stroscio is covered on the level appropriate to the introductory course.

562 Principles of Medical and Radar Imaging (3)

Semester: Sp

This course is concerned with one of the applications of multidimensional signal theory and Fourier analysis. The course begins with the review of signal processing tools and systems that are used in array imaging. These include coherent receivers, pulsed and continuous-wave signaling, temporal Doppler phenomenon, and monostatic, quasi-monostatic, bistatic transmitters/receivers, and two-dimensional signal processing. Then, specific array imaging systems are examined. These imaging systems include phased array imaging, synthetic aperture array (SAR and ISAR) imaging, passive array imaging, and bistatic array imaging with emphasis on transmission imaging problems of diagnostic medicine and geophysical exploration.

565 Video Communications (3)

Semester: Sp

Introduction: Digital representation of images and video sequences. Color formats. Image compression: The Discrete Cosine Transform (DCT). Fast implementations of the DCT. Quantization. Fundamentals of information theory. Encoding of the quantized DCT coefficients using run length coding and Huffman coding. Introduction to image

compression using the Discrete Wavelet Transform. Video Compression: Motion estimation and compensation. Motion Compensation- Discrete Cosine Transform (MC-DCT) based video compression. Video compression standards (MPEG-1, MPEG-2, MPEG-4, H.261, H.263, H.264). Error resilience techniques: An overview of error resilience techniques and their support in the MPEG-4 and H.263 standards. Techniques to be covered include: resynchronization markers, reference picture selection, slice structure, scalability, independent segment decoding, video redundancy coding and Reversible Variable Length Codes (RVLC). Channel coding: Linear block codes. The generator and parity check matrices. Error correction and the syndrome. Cyclic codes. Hamming codes and Bose-Chaudhuri-Hocquenghem (BCH) codes. Convolutional codes. State diagram and trellis representations. Optimal Maximum Likelihood decoding of convolutional codes: The Viterbi algorithm. Distance Properties of convolutional codes. Probability of error. Rate Compatible Punctured Convolutional (RCPC) codes. Interleaving. Radio Channel Modeling: Small scale path loss models. Time delay spread and coherence bandwidth. Doppler spread and coherence time. Flat fading and frequency-selective fading. Fast fading and slow fading. Models for flat fading (narrowband) channels: Rayleigh fading channel, Rician fading channel, Nakagami fading channel. Models for frequency-selective (wideband) channels: The impulse response model. Large scale path loss models. Free space attenuation. Error Concealment: Motion-compensated temporal prediction. Maximally smooth recovery. Projection Onto Convex Sets (POCS). Spatial and frequency domain interpolation. Recovery of motion vectors and coding modes.

566 Optical Communications (3)

Semester: F

Discussions of optical fibers; light sources: LED, injection lasers; detectors: PIN, APD; integrated optical devices; bandwidth limitations; mode partition noise; receiver and repeater design; connectors; system performance; fiber networks; and coherent optical communications systems. This course emphasizes photonic devices in optical communications systems.

567 Power Electronics Simulation (3)

Semester: Sp

Experimental analysis of advanced simulation techniques as an essential component of a graduate project.

Prerequisite: Consent of the instructor.

569 RF and Microwave Circuits I (3)

Semester: F

The first course of a two-course sequence in the area of RF and microwave circuit design. The concept of traveling waves on circuits with dimensions comparable to wavelength is introduced. Topics include transmission line equations, voltage reflection coefficient, VSWR, return loss, and insertion loss. RF/microwave coaxial, micro-strip, strip-line, and rectangular wave-guide transmission lines are introduced. The Smith chart, ABCD, Z, Y, and S-parameters are used in the analysis of impedance matching structures and directional couplers. Impedance matching network analysis includes use of lumped

elements, single-section and multi-section quarter-wave transformers, single-stub, and double-stub tuners. Directional coupler analysis includes Wilkinson, branch-line, rat race, and parallel coupled lines. The use of CAD using the commercial software packages Microwave Office and Mathcad are an integral part of homework problem sets and three student design projects.

573 Adaptive Signal Processing (3)

Semester: F

Review of probability theory, and discrete-time wide sense stationary stochastic processes and their statistical characterization. Optimum linear filtering (Wiener filtering, linear prediction, Kalman filtering). Linear finite impulse response (FIR) adaptive filtering (gradient-based adaptation, LMS, recursive least-squares estimation). Blind deconvolution. Nonparametric spectrum estimation. AR, MA, and ARMA parameter estimation. Adaptive AR and ARMA estimation. Topics: Narrowband and wideband beamforming. Channel equalization. Echo cancellation. Adaptive interference suppression for DS-CDMA wireless communications. Neural networks for adaptive signal processing.

574 RF and Microwave Circuits II (3)

Semester: Sp

The second course of a two-course sequence in the area of RF and microwave circuit design. Topics included are RF and microwave resonators, filters (low pass, high pass, band pass, and band reject), detectors, mixers, amplifiers, Friis equation, definition of antenna parameters, propagation, and introduction to microwave systems. Microwave Office and Mathcad are used for CAD and analysis of circuits. The three student projects assigned are a microwave resonator, a filter, and a micro-strip directional coupler.

Prerequisite: EE 569

575 RF/Microwave Laboratory (3)

Semester: F

RF & microwave measurement techniques in the 1 MHz to 18 GHz frequency region are covered. Topics include assembling basic measurement systems, including attenuators, directional couplers, power dividers, terminations, power sensors, solid-state detectors, mixers, noise sources, power meters, noise figure meters, and signal generators; measuring the reflection and transmission coefficients at discrete frequencies; making similar measurements (magnitude only) over a band of frequencies using a swept power measurement system consisting of a spectrum analyzer with tracking generator; vector measurements (magnitude and phase) versus frequency using RF & microwave automatic network analyzers; measurement of a microwave circuit designed in EE 569.

Prerequisites: EE 569 or EE 529

577 Advanced Switching Circuit Theory I (3)

Semester: Sp

Stuck-at fault model, test determination of stuck-at faults, circuit models and properties, machine behavior and composition, machine transformations, state and machine equivalence, incompletely specified machines, algorithmic state machines.

Prerequisite: EE 476 or equivalent.

580 Biomedical Electronics (3)

Semester: F

Covers the principles and designs of various important biomedical instruments including pacemaker, EEG, ECG, EMG, and ICU equipment and diagnostic imaging devices (such as blood bank monitor), CT, MRI, mammography, ultrasound, endoscope, confocal microscope, and multiphoton non-linear microscope (2-photon fluorescent, SHG and THG). Imaging devices (e.g., CCDs) and medical image processing are also covered. Includes a general introduction to biological systems; emphasizes the structural and functional relationship between various biological compartments.

582 Power Systems Engineering I (3)

Semester: F

Surveys the field of modern energy systems, with the foundation being classical electrical power and related power electronics. Topics include complex power, per unit analysis, transmission line parameters and modeling, compensation, also a study in problems of three phase voltage, current, and impedance, balanced and unbalanced symmetrical components, in multiple connected delta and wye loads. Students will also study alternative energy systems in this course. System design project paper accounts for 50 % of course grade.

583 Power Systems Engineering II (3)

Transmission line characteristics of aerial lines and underground cables and development of their symmetrical component sequence impedances. Also includes steady state performance of systems including methods of network solution.

Prerequisite: EE 582 and consent of the instructor.

584 Power Systems Engineering III (3)

Theory and applications in power system stability, relay and circuit breaker implementations and machine factors such as line unbalance, steady state, constants for use in stability problems, capacitance of machines, etc.

Prerequisite: EE 582, EE 583 and consent of the instructor.

585-586 Graduate Seminar (0, 0)

Graduate Seminar on topics in Electrical Engineering. Registration required of all full-time Graduate students.

588 VLSI Devices (3)

Semester: F

Device fundamentals of CMOS field effect transistors and BiCMOS bipolar transistors. Device parameters and performance factors important for VLSI devices of deep-submicron dimensions. Reviews silicon materials properties, basic physics of p-n junctions and MOS capacitors, and fundamental principles of MOSFET and bipolar transistors. Design and optimization of MOSFET and bipolar devices for VLSI applications. Discusses interdependency and tradeoffs of device parameters pertaining to

circuit performance and manufacturability. Also discusses effects in small-dimension devices: quantization in surface inversion layer in a MOSFET device, heavy-doping effect in the bipolar transistor, etc.

591 Analog Circuits (3)

Semester: F

Focuses on the analysis, design, simulation and mask-level chip layout of integrated analog circuits and systems. Begins with a brief review of MOSFET operation and large and small signal models. Much of the course involves designing and analyzing analog building blocks such as current mirrors, transconductance amplifiers, capacitors, multipliers, current mirrors and D/A and A/D circuits. Simultaneously, the course covers IC design and layout techniques and system analysis. It concludes by looking at sensor applications. Requires a final project consisting of a complete IC layout. Students may have the opportunity to fabricate their final project through MOSIS.

594 Consumer Optoelectronics (3)

Semester: Sp

Introduction of optoelectronic systems. This course is a high design course that emphasizes the interaction of optics, lasers, mechanics, electronics and programming. It encourages students to design an optoelectronic system to replace the functionality of a known electronic system with a strong emphasis on team learning and teaching. The basic operation of photonic devices relevant to practical system design is covered. This course is intended to provide the background for incorporating conventional electrical and software design with optics and photonics. Some specific topics of covered include: fundamental properties of light and lasers; propagation of light; lens systems; semiconductor lasers and detectors; CD technology; Display technology (liquid crystal display); electro-optic modulators; biophotonic applications.

595 High Voltage Engineering (3)

Semester: Sp

Topics include introduction to high-voltage engineering; generation of high voltages (AC, DC, impulse, pulse); measurements of high voltages; destructive and nondestructive insulation test techniques; shielding and grounding; electric shock and safety. Term paper/high-voltage research.

598 Individual Problems (1-6)

For graduate students who need to learn topics not covered in formally offered course. Prior approval by Advisor and Director of Graduate Studies is required.

599 Master's Research (1-6)

For Master of Science candidates working on Thesis and for Master of Engineering candidates working on Project. Approval of the Thesis or Project Advisor is required.

605 Special Topics (3)

Semester: F

Subjects of current interest to graduate students. Particular subject matter and title may vary from year to year.

606 Special Topics (3)

Semester: F

Subjects of current interest to graduate students. Particular subject matter and title may vary from year to year.

614 Smart Antennas (3)

Semester: F

The widely used term "smart antennas" refers to the intelligent manipulation of signals received by an array of antenna elements. Array processing of this form can raise the SNR of signals of interest, null-out or suppress interferers, identify the number of active signals and their direction-of-arrival and track the signal sources as they move in space. Due to these fundamental capabilities, array processing is expected to play a core role in future mobile communication systems. EE 614 is a graduate level course designed to cover the underlying principles and the present state-of-the-art of smart antennas and array processing algorithms. While it is intended to keep EE 614 somewhat self-sufficient, basic working knowledge of communications systems, probability theory and signal processing is assumed. The main topics of interest are deterministic beamforming, mean-square optimum beamforming, adaptive beamforming and direction-of-arrival estimation. Applications are sought in the context of space-time processing for wireless communications with emphasis on code-division-multiple-access (CDMA) systems. Homework assignments may require use of Matlab (or equivalent) for computer analysis and simulation studies.

631 Detection and Estimation I (3)

Semester: F

Simple hypothesis testing, composite hypothesis testing. Detection of known signals in white noise and colored noise. Detection of signals with unknown parameters. Estimation of random parameters. Bayes estimates, maximum likelihood estimates, linear mean square estimation. Estimation of stationary random processes. Weiner filter. Estimation of nonstationary random processes. Kalman filter.

Prerequisite: EE 531 or consent of the instructor.

632 Detection and Estimation II (3)

Signals with unwanted parameters. Detection of Gaussian signals in Gaussian noise. Demodulation and waveform estimation. Radar-sonar problems. Detection/parameter estimation of slowly fluctuating point targets. Doppler-spread/ Range-spread/ Doubly-spread targets.

Prerequisite: EE 631 or consent of the instructor.

634 Principle of Information Theory and Coding (3)

Information Theory is a systematic effort to capture and quantify the concept of information. Since Shannon's original paper, the field of information theory has grown and matured considerably. While Shannon's work was motivated by communications

theory problems, this course treats information theory as a field of its own with applications to communications theory, signal/image processing, data compression, data networks, computer science, and statistics. We begin with information measures, the asymptotic equipartition property, and entropy rates. We study the problem of data compression and we present solutions in the form of Huffman and Shannon-Fano coding. The concept of channel capacity and The Channel Coding Theorem come next, together with techniques for channel coding and decoding in the form of parity-check, general cyclic, BCH, convolutional codes, and threshold decoding. We examine the white and colored Gaussian channel in detail. Spectral estimation, the law of large numbers, hypothesis testing, and the Cramer-Rao bound are considered from an information theoretic point of view. We conclude with rate distortion theory and network information theory for multiple access channels.

636 Defects in Semiconductors (3)

The course will begin with a discussion of crystal lattices, types of defects and epitaxial growth. Device fabrication will be reviewed as will various recombination mechanisms. Spectroscopic techniques will include deep level transient spectroscopy, thermally activated recombination current spectroscopy, and noise. Radiation effects will be included.

Prerequisite: EE 555 or equivalent.

641 Special Topics

695 Advanced High Voltage Engineering / Power Electronics (3)

Semester: Sp

The field of high-voltage power electronics engineering is increasingly developing new and novel techniques for electrical energy generation, storage, and transfer, particularly for load requirements demanding repetitive transfer of high-intensity pulses of energy. This course will develop in detail the elements of the present technology base, moving then to delineate current engineering techniques in switching, power conditioning, energy storage, and measurements for repetitively pulsed systems. Issues determining reliability, availability, and maintainability of such systems will be analyzed in depth. Present and potential modeling techniques for predicting system performance will be introduced and related to long-term electromechanical, thermal, and radiation life-time determining processes. Students are required to prepare a term paper and/or execute a suitable experiment.

Prerequisite: EE 595 and consent of the instructor.

699 Ph. D. Dissertation (1-12)

For Doctor of Philosophy candidates. Approval of the Dissertation Advisor is required.