ENGINEERING-ELECTRICAL (EGE)

EGE505. Analytical Techniques I . 3 Credits.

Theory of complex variables, analytics, singularities, and complex integration. Cauchy's and residue theorems. Series expansions, Taylor and Laurent series. Conformal mapping. Laplace, Fourier and Z transforms.

Restrictions:

- Must have the following level: Graduate

EGE506. Analytical Techniques II . 3 Credits.

Linear algebra. State variables applied to continuous and discrete systems. Linear vector spaces. Matrices and matrix transformation. Cayley-Hamilton theorem. Solution to state equations.

Restrictions:

- Must have the following level: Graduate

EGE511. Digital Data and Computer Communication . 3 Credits.

Data transmission. Data encoding. Link control and multiplexing. Network configurations. Packet switching. Computer communications. Protocols and architecture.

Restrictions:

- Must have the following level: Graduate

EGE512. Communication Systems. 3 Credits.

Signal analysis, signal transmission. Digital communication systems. Amplitude modulation; angle modulation.

Restrictions:

- Must have the following level: Graduate
- Must have the following field(s) of study (major, minor or concentration): Electrical Engineering (265)

EGE513. Digital Signal Processing . 3 Credits.

Continuous-time signals and systems. Discrete-time linear systems. State space representation. Discrete Fourier transform. Fast Fourier transform. Digital filter design. Finite wavelength and quantization effects.

Prerequisites:

- EGE 311 with a minimum grade of C-

Restrictions:

- Must have the following level: Graduate

EGE514. Advanced Communications. 3 Credits.

Probability theory and random processes. Behavior of communications systems in presence of noise. Optimum signal detection. Information theory. Error connecting codes.

Prerequisites:

- EGE 312 with a minimum grade of C- or EGE 412 with a minimum grade of C-

Restrictions:

- Must have the following level: Graduate

EGE521. CMOS Analog Circuit Design. 3 Credits.

Analysis and optimized design of analog integrated circuits and systems in CMOS technology. Specific topics include MOS devices, device physics, basic CMOS analog circuit building blocks, single stage amplifiers, differential amplifiers, operational amplifiers, reference sources, distortions and controls, various circuit design techniques, options and trade-offs. Graduate Standing or Permission of the Instructor.

Restrictions:

- Must have the following level: Graduate

EGE522. Advanced Analog Circuits . 3 Credits.

Review of bipolar and MOS transistors. GaAs transistors and circuits. CMOS and BiCMOS amplifiers. Cascade amplifier and its frequency response. Common collector-common emitter cascade and its frequency response. Frequency response of differential amplifiers. Differential amplifier as a wide band amplifier. CMOS and cascade CMOS operational amplifiers. Power MOSFET and class AB power amplifier. Non-linear waveform shaping circuits. Filters, including switched capacitor filters.

Prerequisites:

- EGE 321 with a minimum grade of C-

Restrictions:

- Must have the following level: Graduate

EGE523. Wireless Communications . 3 Credits.

Overview of wireless systems, propagation characteristics of wireless channels, modems for wireless communications, cells and cellular traffic, fading and multiple access techniques.

Restrictions:

- Must have the following level: Graduate

EGE525. Microelectronic Fabrication . 3 Credits.

The physics and technology of various steps required to fabricate complicated integrated circuits are explained. The Si and GaAs materials will be covered. The course will cover microelectromechanical systems (MEMS) fabrication as well.

Restrictions:

- Must have the following level: Graduate

EGE527. Electronic Properties of Materials. 3 Credits.

Introduction to electronic properties of materials through the concepts of classical mechanics and quantum mechanics principles. Topics include fundamentals of quantum mechanics, Shrodinger wave equations, energy bands, free-electron energy, applications of electronic theory upon electrical, thermal, optical and magnetic properties of materials. Graduate Standing or Permission of the Instructor.

EGE532. Computer Arithmetic . 3 Credits.

Deals with algorithms and architectures used for computer arithmetic. Issues that will be addressed include: number systems and representation, redundant and residue systems. Addition/subtraction circuits. Multiplication, division, square route algorithms, cordic arithmetic system. Floating-point arithmetic systems. Implementation issues -- pipelining, low-power, fault- tolerant designs.

Restrictions:

- Must have the following level: Graduate

EGE533. Introduction to Parallel Computing . 3 Credits.

Paradigms of parallel computer systems, memory system implementation, idealized versus practical parallel computer models, parallel algorithms, algorithmic complexity, survey of commercial parallel machines.

Restrictions:

- Must have the following level: Graduate

EGE534. Fault-Tolerant Design of Digital Systems . 3 Credits.

Faults and their manifestations. Reliability, availability and maintainability analysis. System evaluation and performance reliability tradeoffs. Hardware, software, code and time redundancy techniques. Fault-tolerant communication in distributed systems. Real-time fault tolerance. Case study of fault-tolerant systems.

Restrictions:

- Must have the following level: Graduate

EGE535. Low Power VLSI Design . 3 Credits.

Deals with the design of digital systems for low power dissipation. Issues that will be addressed include CMOS power dissipation, analysis and design tools used for low power digital circuits, design methodologies for low power CMOS circuits, low power memory system designs and a discussion on future challenges in low power digital design. Builds on the VLSI design course previously covered by students in Electrical Engineering/Computer Engineering/Computer Science areas. Students are expected to have a background in circuit theory, electronics, digital logic fundamentals, and probability theory fundamentals. These courses are all covered under core courses in the undergraduate program.

Restrictions:

- Must have the following level: Graduate

EGE536. Computer Architecture. 3 Credits.

Computer architecture and hardware system organization are examined. Topics include performance issues, CPU organization and instruction set implementation, performance enhancement through pipelining, memory organizations, input/output structure, and an introduction to parallel architectures.

Prerequisites:

- EGC 330

EGE537. VLSI Design. 3 Credits.

Introduction to MOS devices and circuits (N-MOS and CMOS), MOS transistor theory, integrated circuit processing technology and design rules (N-MOS and CMOS), circuit characterization and performance estimation, logic design, interfacing, design tools, testability analysis, and discussion of chip design projects.

Prerequisites:

- (EGE 230 with a minimum grade of C- or EGE 220 with a minimum grade of C- and EGE 320 with a minimum grade of C-

EGE541. Transmission Line Theory. 3 Credits.

Analysis and design of short, medium and long transmission lines. Bundled conductors, skin effect, proximity effect and geometric mean distance. Ferranti effect. Standing waves and traveling waves.

Restrictions:

- Must have the following level: Graduate
- Must have the following field(s) of study (major, minor or concentration): Electrical Engineering (265)

EGE542. Numerical Methods in Engineering . 3 Credits.

Review of electromagnetic theory and analytical methods. Time domain and frequency domain finite difference methods. Moment methods application to radiation and scattering problems.

Restrictions:

- Must have the following level: Graduate

EGE543. Antennas and Wave Propagation . 3 Credits.

Wire antennas and arrays. Aperature antennas and arrays. Solutions of antennas by the moment method. Antenna synthesis and optimization.

Restrictions:

- Must have the following level: Graduate

EGE544. Microwave Circuits . 3 Credits.

Review of transmission lines, waveguides, impedance matching and scattering parameters. Microwave resonators, power dividers, directional couplers, and hybrids, microwave litters, microwave defectors, mixers, amplifiers, and oscillators.

Restrictions:

- Must have the following level: Graduate

EGE545. Satellite Communication . 3 Credits.

Satellite orbits and their effect on communication systems. Design of communication satellites and their sub systems. Communication link analysis. Modulation. Multiplexing. Multiple access. Encoding and error correction. Atmospheric propagation effects.

Restrictions:

- Must have the following level: Graduate

EGE548. Software Defined Networks. 3 Credits.

Broadband and Carrier Ethernet Networks and technologies. Role of SDN in defining architecture of the next generation of networks. Determination of conformance criteria for networks standards and protocols to support industry solutions and applications.

Restrictions:

- Must have the following level: Graduate
- Must have the following field(s) of study (major, minor or concentration): Electrical Engineering (265)

EGE550. Electromechanical Energy Conversion. 3 Credits.

Fundamentals of energy conversion including electric circuits and magnetic circuits. Ideal transformers will be introduced first, and real transformer construction and equivalent circuit will be presented. The equivalent circuit will be solved to determine the transformer efficiency and voltage regulation. Single phase and three phase induction machine construction, equivalent circuit and its analysis under load will be performed to determine motor load characteristics and efficiency. Single phase and three phase synchronous machine construction, excitation, and load characteristics will be studied in detail, and machine transient characteristics will be covered briefly.

Restrictions:

- Must have the following level: Graduate

EGE551. Real Time Systems. 3 Credits.

Practical experience of real-time operating systems (RTOS) and real-time debuggung as applied to real-time embedded systems. Design and implementation of real-time embedded systems: controller, data storage, data acquisition, and communication using a commercially available RTOS.

Restrictions:

- Must have the following level: Graduate
- Must have the following field(s) of study (major, minor or concentration): Electrical Engineering (265)

EGE552. Electric power Systems. 3 Credits.

Energy courses, transmission line parameters, transmission lines modeling, power flow analysis, voltage frequency control, and power system protection.

Restrictions:

- Must have the following field(s) of study (major, minor or concentration): Electrical Engineering (265)

EGE561. Adaptive Control . 3 Credits.

Basic concept of adaptive control. Real time parameter estimation. Model reference adaptive systems. Self-tuning regulators stability. Auto tuning. Gain scheduling. Perspectives on neural networks.

Prerequisites:

- EGE 317 with a minimum grade of C- or EGE 417 with a minimum grade of C-

Restrictions:

- Must have the following level: Graduate

EGE562. Optimal Control . 3 Credits.

Review of matrix algebra, gradients and series. Introduction to optimization problems. Static optimization. Dynamic optimization. Maximum principle - Hamiltonian. Linear regulator and associated topics. Output feedback problems.

Prerequisites:

- EGE 316 with a minimum grade of C- or EGE 416 with a minimum grade of C-

Restrictions:

- Must have the following level: Graduate

EGE564. Non-Linear Control . 3 Credits.

Phase plane analysis. Lyapunov analysis. Advanced stability theory. Describing function analysis. Feedback linearization design. Sliding control design.

Prerequisites:

- EGE 316 with a minimum grade of C- or EGE 416 with a minimum grade of C-

Restrictions:

- Must have the following level: Graduate

EGE570. Fiber Optics. 3 Credits.

Restrictions:

- Must have the following level: Graduate

EGE572. Engineering Management. 3 Credits.

Prepares engineering students for a career in management. Through class discussions, group projects, role playing, and guest speakers, students find out what a management role will entail. Students learn how to go from being a practicing engineer to being an engineering manager.

EGE575. Heterostructure Devices. 3 Credits.

EGE580. Power Electronics. 3 Credits.

Restrictions:

- Must have the following level: Graduate

EGE590. Thesis in Electrical Engineering . 3-6 Credits.

Research, writing and defense of a thesis under the guidance of the major professor. Required form available in the Records and Registration Office. Required each semester after thesis research project is begun.

Restrictions:

- Must have the following level: Graduate

EGE593. Engineering Selected Topic. 3-12 Credits.

Selected topics courses are regularly scheduled courses that focus on a particular topic of interest. Descriptions are printed in the Schedule of Classes each semester. Selected topics courses may be used as elective credit and may be repeated for credit, provided that the topic of the course changes.

Restrictions:

- Must have the following level: Graduate

EGE594. Fieldwork Engineering. 1-12 Credits.

Restrictions:

- Must have the following level: Graduate

EGE595. Indep Study Elec Engineering. 1-12 Credits.

Restrictions:

- Must have the following level: Graduate

EGE599. Comprehensive Exam Workshop. 0 Credits.

Non-credit workshop for students who wish to devote the semester immediately following the completion of their coursework to prepare for the comprehensive exam.

Restrictions:

- Must have the following level: Graduate
- Must have the following field(s) of study (major, minor or concentration): Electrical Engineering (265)

EGE790. Thesis Engineering. 1-12 Credits.

EGE795. Indep Study Elec Engineering. 0 Credits.

Restrictions:

- Must have the following level: Graduate

EGE799. Continued Registration. 1 Credit.

Restrictions:

- Must have the following level: Graduate