

Electrical Engineering (EEEN)

EEEN 5303 Advanced Topics in Elec Eng 1-3 SCH (1-3)

One or more advanced topics. May be repeated when topic changes. (Credit may not be obtained in both EEEN 5303 and CSEN 5303 courses if the topic is the same.)

EEEN 5304 Adv Computer Architecture 3 SCH (3-0)

Introduces the design principles of modern computers. The topics include RISC and CISC architectures, interconnection networks, multiprocessors and multicomputer systems, dataflow and systolic arrays, future outlook for architectures and the basics of parallel algorithms. (Credit may not be obtained in both EEEN 5304 and CSEN 5304.)

EEEN 5305 Graduate Research Project 3 SCH (3)

Designed for project option students and requires completion of research project. Prerequisite: departmental approval. May be repeated for a maximum of 6 semester hours.

EEEN 5306 Thesis 3 SCH (1-3)

Designed for thesis option students. The course requires completion of thesis research. Prerequisite: departmental approval. May be repeated for maximum of 6 semester hours.

EEEN 5307 Analysis and Design of Analog Integrated Circuits 3 SCH (3-0)

Bipolar transistor small and large signal models, single and multiple transistor amplifiers, current mirrors, active loads, output stages, operational amplifier with single-ended outputs.

EEEN 5309 Nanofabrication and Nanoscale Devices 3 SCH (3-0)

This course is designed to give students experience in nanofabrication methods such as thin film deposition, etching, implantation, and lithography to manipulate various materials including dielectrics, semiconductors, organics, polymers, metallic materials, and molecular films. In addition, this course will introduce MEMS/NEMS and advanced nanoscale CMOS devices. Prerequisites: graduate standing.

EEEN 5310 Solar Energy: Fundamentals of Photovoltaics 3 SCH (3-0)

In this course, you will learn about traditional solar cell architectures, 1st and 2nd generation solar cells, nanotubes and nanowires-based solar cells, thin-film organic conjugates solar cells, CIGS solar cells, plasmonic effects, and light trapping. Prerequisite: graduate standing.

EEEN 5311 Nonlinear Systems and Deep Learning Control 3 SCH (3-0)

Nonlinear systems and stability, linearization, phase plane analysis, Lyapunov stability, feedback linearization, sliding mode control, reinforcement learning, and deep learning for control.

EEEN 5313 Robust Control 3 SCH (3-0)

Signal and system norms, Structured and unstructured uncertainty, Robustness (stability and performance) analysis of control systems in time and frequency domains, Linear Matrix Inequalities (LMI), Linear Fractional Transformations (LFT), H-2, H-infinity and mu controller designs. Prerequisite: Graduate standing.

EEEN 5316 Semiconductor Fundamentals 3 SCH (3-0)

Quantum Mechanics, energy band theory, carrier statistics, recombination-generation, carrier transport.

EEEN 5317 Adaptive Array Processing 3 SCH (3-0)

Array signal processing fundamentals, beamforming techniques, direction of arrival (DOA) estimation algorithms, adaptive algorithms like LMS and RLS, smart antenna system design, interference suppression methods, applications in wireless communications, and simulation and design of antenna arrays.

EEEN 5321 Digital Computer Design 3 SCH (3-0)

Register operations, arithmetic operations, control of operations, memory systems, methods of input and output. Examples of commercial systems, system design of a general purpose computer.

EEEN 5326 Dynamic Systems I 3 SCH (3-0)

Mathematical analysis of engineering, dynamic systems. Modeling, simulation, transfer functions, state variables, stability of linear systems.

EEEN 5329 Adaptive Control 3 SCH (3-0)

Signal and system norms, Lp functions, adaptive parameter identification and control, stability, Model Reference Adaptive Control (MRAC), multi objective evolutionary/genetic algorithms, adaptive backstepping, and robust adaptive control laws.

EEEN 5330 Rapid Prototyping ASIC Design 3 SCH (3-0)

Principles of electronic system design using Application-Specific Integrated Circuits (ASIC) approach: digital hardware modeling techniques using an HDL, logic simulation, logic synthesis, standard cells, gate arrays, sea of gates, bit serial hardware design methods and analog methods.

EEEN 5331 Digital Signal Processing 3 SCH (3-0)

Digital processing of signals, z-transform, digital filters, discrete and fast Fourier transforms, power spectrum, autocorrelation, cepstrum analysis.

EEEN 5333 Prin of VLSI Circuit Design 3 SCH (3-0)

Principles of design and fabrication of microelectronic circuits via Very Large Scale Integrated circuitry (VLSI), structured design methods for VLSI systems, use of computer-aided design tools, design projects of small to medium scale integrated circuits.

EEEN 5337 Digital Image Processing 3 SCH (3-0)

Introduces the computer vision systems. Topics include edge detection, spatial-domain processing, frequency-domain processing, color processing, texture analysis, shape analysis and making movies from a deck of frames.

EEEN 5338 Digital and DSP Based Control 3 SCH (3-0)

Classical and modern control analysis and design methods and techniques. Topics include discrete control system analysis, sampled data systems, discrete equivalents of continuous systems, design using transform techniques, design using state-space methods and the real-time control of dynamic systems using digital computers and micro-controllers.

EEEN 5339 Embedded System Design 3 SCH (3-0)

Embedded system architecture and programming. Role of microprocessors, FPGAs, and PLCs; input/output; analog and digital interfacing; sensor networks and peripherals in hardware integration. (Credit may not be obtained for this course and for MHEN 5373).

EEEN 5340 Speech Processing 3 SCH (3-0)

Fundamentals of digital signal processing, waveform coding, speech spectrum, voice coders, linear predictive coding, speech recognition, adaptive noise cancellation and multirate signal processing.

EEEN 5341 Advanced Integrated Circuits 3 SCH (3-0)

Advanced concepts of circuit design for digital /analog (mixed signal) Very Large Scale Integrated Circuitry (VLSI) components in state-of-the-art Complementary Metal Oxide Semiconductor (CMOS) technologies. Emphasis is on the design and optimization of high-speed (high performance devices), high density (heterogeneous systems on a chip), low-power (portable applications) and analog (mixed-signa) integrated circuits. Prerequisites: Undergraduate degree in engineering or physical sciences.

EEEN 5342 Wireless Communications 3 SCH (3-0)

This course introduces fundamental concepts and technologies in the area of wireless communication systems such as wireless applications, modulation techniques, wireless channel models, digital communication over wireless channels, multiple access techniques, and wireless standards.

EEEN 5350 Neural Networks Application 3 SCH (3-0)

Includes a review of network architectures, perceptron, linear networks, back-propagation and radial basis networks. A real-time laboratory experience in seeing the application of neural networks. Prerequisite: graduate standing in Computer Science. Prerequisite: graduate standing in Electrical Engineering. (Credit may not be obtained in both EEEN 5350 and CSEN 5350.)

EEEN 5371 Mechatronic Systems 3 SCH (3-0)

Mechanical Processes and Components; Electrical Systems and Sensors; Actuators; PLCs; Data Acquisition; Machine Vision; Noise, Analysis and Design Considerations. Credit may not be obtained in both EEEN 5371 and MHEN 5371.

EEEN 5401 Advanced Probs in Elec Eng 1-4 SCH (1-4)

Individual or group research on advanced problems conducted under the supervision of a faculty member. Maximum credit 8 semester hours.

EEEN 6303 Spec Tops in Elec Engineering 3 SCH (3-0)

Courses offered under this Special Topics denomination concentrate on themes not present in the current EECS curriculum, or can also be offered to strengthen and provide further depth of study in important areas of electrical engineering. Topics vary to reflect new developments and interests on emerging areas of electrical engineering. May be repeated when topic changes.

EEEN 6306 Prop/Dissertation Research 9 SCH (0-0-9)

Students undertaking dissertation research towards fulfilling doctoral dissertation proposal and dissertation requirements are required to register for this course.

EEEN 6310 Intell. Control Optimization 3 SCH (3-0)

Artificial intelligence, Biomimicry, Fuzzy Logic, Neural Networks, Deep Learning, General Algorithms, and Expert Systems for Intelligent Control Systems and Optimization. Prerequisite: Graduate Standing

EEEN 6311 Nonlinear Systems 3 SCH (3-0)

Nonlinear systems and stability, linearization, phase plane analysis, describing functions, Lyapunov stability, feedback linearization, singular perturbations, model reduction, chaos control and sliding mode control. Prerequisite: Graduate Standing

EEEN 6383 Robust System Theory 3 SCH (3-0)

Signal and system norms, Structured and unstructured uncertainty, Robustness (stability and performance) analysis in time and frequency domains, Convex Optimization (Linear Matrix Inequalities (LMI), Semi-definite programming), Linear Fractional Transformations (LFT), H2 and H ∞ and μ controller designs, Youla parametrization, Linear parameter varying (PV) systems. Prerequisite: A Linear Systems Analysis Course.

EEEN 6385 Adaptive Array Systems 3 SCH (3-0)

Antenna Parameters, Terminology, Antenna Arrays, Spatial Filtering, Adaptive Antenna Arrays, Mutual Coupling & Correlation, Narrowband Array Systems (Beam Steering, Grating Lobes, Amplitude Weights), Adaptive Arrays (Spatial Covariance Matrix, Multi-beam Arrays, Scanning Arrays, Switched Beam Beamformers, Fully Adaptive Beamformers, Fourier Method, Capon's Minimum Variance, The MUSIC Algorithm, ESPRIT, Maximum Likelihood Techniques, Spatial Smoothing.