

ELECTRICAL ENGINEERING (EEEN)

EEEN 3310 Electromagnetic Theory

3 Semester Credit Hours (3 Lecture Hours)

An introduction to the theory of static and dynamic electromagnetic fields with a focus on engineering applications. Principles will be illustrated with applications in various areas. Topics include computational electromagnetics, transmission lines, antennas, electromagnetic interference, and signal propagation in high speed circuits.

Prerequisite: PHYS 2426, MATH 2415, 3315 and EEEN 3315.

EEEN 3315 Electrical Circuits II

3 Semester Credit Hours (3 Lecture Hours)

AC circuit analysis principles: AC generation, periodic functions, complex numbers, phasors, impedance and admittance, network theorems, power, frequency response, filters, transformers, and balanced three-phase systems; and use of analysis software.

Prerequisite: (ENGR 2305) or (ENGR 2460).

EEEN 3320 Introduction to Communication Theory and Systems

3 Semester Credit Hours (3 Lecture Hours)

Frequency domain and time domain response of linear systems; analog modulation methods including amplitude modulation, frequency modulation and phase modulation; signal and noise modeling using probabilistic descriptions; narrowband random processes and the performance of analog modulation techniques in the presence of noise; design of communication links.

Prerequisite: (ENGR 2305 and 2105 or ENGR 2460) and MATH 3345.

EEEN 3330 Control Systems I

3 Semester Credit Hours (3 Lecture Hours)

Introduction to control systems; open and feedback; Laplace transform and frequency response; control valves; electric motors; P, PI, and PID modes of control; analog and digital controllers Process characteristics; analysis of control systems; gain and phase margin; stability.

Prerequisite: (ENGR 2305 or 2460) and MATH 3311.

EEEN 3345 Electronic Devices and Circuits

3 Semester Credit Hours (3 Lecture Hours)

The applications of electronic devices, including linear and non-linear Op-Amp circuits, oscillators, wave-shaping circuits, active filters, rectifiers, voltage regulators, and power supplies; industrial electronics. Offered Fall and Spring.

Prerequisite: EEEN 3315.

EEEN 3350 Electronic Systems Design

3 Semester Credit Hours (3 Lecture Hours)

Principles of engineering design of electronic circuits and systems; time and frequency responses; network analysis; systems specifications; evaluation, testing, and verification; use of electronic design automation tools. Offered Fall and Spring.

Prerequisite: (ENGR 2305 or 2460) and (ENGR 2306 and EEEN 3315).

EEEN 3418 Microprocessors and Microcontrollers

4 Semester Credit Hours (3 Lecture Hours, 3 Lab Hours)

Introduction to microprocessor/microcontroller architecture, assembly language programming, and interfacing. Topics include computer organization, addressing modes, instruction set, interrupts, timing, memory, and interfacing.

Prerequisite: COSC 1320 and (ENGR 2306 and 2106).

Co-requisite: SMTE 0099.

EEEN 4310 Signal Processing

3 Semester Credit Hours (3 Lecture Hours)

Discrete time signals & systems, z-transform, discrete Fourier transform, flow graph and matrix representation of digital filters, digital filter design techniques and computation of the fast Fourier transform (FFT). MATLAB software package is heavily utilized in this course.

Prerequisite: (EEEN 3320) and (EEEN 3330).

EEEN 4330 Introduction to Plasma Engineering and Applications

3 Semester Credit Hours (3 Lecture Hours)

Physical, electrical, chemical properties of plasmas; differences in properties of thermal and non-thermal plasmas, direct and alternating current plasma sources, inductive and capacitive coupled plasma sources, diagnostics and applications of plasmas.

Prerequisite: (ENGR 3322 and 2460 or ENGR 2305 or PHYS 2426).

EEEN 4331 Power Transmission and Distribution

3 Semester Credit Hours (3 Lecture Hours)

This course covers principles of power transmission and distribution. Topics include unbalanced distribution; point to point measurements, operation control of systems; power systems; transmission lines; fault analysis; line modeling and unit analysis. Offered Fall or Spring.

Prerequisite: EEEN 3315.

EEEN 4332 Power Protection Systems

3 Semester Credit Hours (3 Lecture Hours)

Course topics include safety, reliability and availability in power systems; breaker operation; relay operation and relay circuit design; fault tolerance; cost analysis; control systems and system surveillance. Offered in Fall.

Prerequisite: EEEN 3315.

EEEN 4333 Machine Vision and Image Processing

3 Semester Credit Hours (3 Lecture Hours)

Introduces students to automated vision systems and components, camera models, testing and measurement, and fundamentals of image processing. Topics include image analysis and processing in binary, gray scale and color images in spatial- and frequency-domain. Texture and shape analysis, hyperspectral imaging, other transforms, and filters are discussed and applied.

Prerequisite: (COSC 1320 or 1435) and (ENGR 2460 or 2305) and MATH 2414 and EEEN 4310.

EEEN 4334 Control Systems II

3 Semester Credit Hours (3 Lecture Hours, 1 Lab Hour)

Model identification and parameter estimation (least-square identification of an auto-regressive model; nonparametric identification in the time domain; and nonparametric identification in the frequency domain); Robust Control (Nyquist-plots, small-gain, and passivity); Optimal control (LQR/LQG for state-space systems and time-optimal controller for the positioning of a mass using force actuation); Nonlinear control (Lyapunov's stability method; feedback linearization controller for a fully actuated 2nd order mechanical system; backstepping for triangular nonlinear systems; actuator limitations); writing and presenting reports and analysis.

Prerequisite: (EEEN 3330 or ENTC 4446).

EEEN 4345 Sensors and Systems

3 Semester Credit Hours (3 Lecture Hours)

(3:0) This course introduces sensors and sensing systems, and the acquisition, processing, and interpretation of signals obtained with selected sensors and systems. The course will also cover sensing modalities, signal transmission and reception. Measurement and uncertainty in sensors and systems will be discussed as applied to signal noise and interference. Filtering and estimation will be introduced. Sensing systems for vision, monitoring, and control applications will be surveyed. Sensor interfacing, signal conditioning and transforms will be applied. Other topics include multidimensional signal and image processing, object tracking, multisensor data fusion, applications in environmental monitoring, remote sensing and surveillance. Offered in alternating Fall semesters.

Prerequisite: (MATH 2414 and ENGR 2460).

EEEN 4396 Directed Independent Study

1-3 Semester Credit Hours

(1-3) Requires a formal proposal of study to be completed in advance of registration, approval of supervising faculty and department chairperson.

EEEN 4453 Mechatronics

4 Semester Credit Hours (3 Lecture Hours, 2 Lab Hours)

This course introduces a multidisciplinary field that combines electrical engineering, mechanical engineering, control systems and computer science. It presents key aspects in the design of systems, devices and products and it aims at the analysis of the behavior and control of the systems. Topics covered in this course bring together different areas of technology involving actuation systems, computer-aided design, sensors, signal conditioning, data acquisition, and programming. Course includes lab sessions related to acquiring experience with electronics, computer-aided design, programming, and control systems.