ELECTRICAL ENGINEERING (EE)

EE 2305. Electric Circuits I. 3 Hours.
This course focuses on the fundamental concepts of engineering with special emphasis on electrical engineering. It includes the concepts of current, voltage, power and engery, Kirchhoff's current and voltage laws, resistance, capacitance, inductance, and series and parallel combinations of circuit elements. Basic techniques such as superposition, mesh current, and node voltage analysis are introduced. Time-domain analysis of first-order circuits RL, RC, and second-order RLC circuits are developed. Prerequisite: MATH 2413.

EE 289. Independent Study. 3 Hours.
This course provides individual instruction. Students may repreat the course when topics vary.

EE 305. Fundamentals of Power Systems. 3 Hours.
Review of magnetic coupling and transformers, per unit calculations, the conditions for balanced operations, and device efficiency. Content relates to motor/generator conventions, machine losses, applicable codes and standards, induction, synchronous, DC and special machines characteristics. Prerequisite: EE 2305 or ENGR 2305.

EE 306. Electric Power and Machinery Lab. 1 Hour.
This lab addresses the basics of electric power components and operation. Topics cover the principles of DC machines, single and three phrase circuits, synchronous generators, power transformers, power factor correction, and electric power analysis. Prerequisite: EE 305 or ENGR 305 or concurrent enrollment.

EE 307. Probability and Random Processes. 3 Hours.
This course introduces students to the fundamental principles of probability and random processes. While helping students to develop their problem-solving skills, the course strives to motivate students with practical applications from various engineering areas that demonstrate the relevance of probability theory to engineering practice. Topics covered in this course include probability theory, discrete and continuous random variables and statistical description, statistical characterization of sequence of random variables, and stationary random processes. Course is cross-listed with ENGR 307 and MATH 357. Credit cannot be granted for both EE 307 and ENGR 307, or EE 307 and MATH 357. Prerequisite: MATH 2414. (It cannot be taken concurrently.).

EE 308. Programmable Logic Controllers. 3 Hours.
Programmable Logic Controller (PLC) types and hardware components, conversion of hard-wired ladder logic to PLC programs, field devices, best practices for PLC systems, and PLC programming including latches, timers, counters, program control, and comparison instructions. Prerequisite: EE 321 or Instructors Permission.

EE 317. Information Theory. 3 Hours.
This course focuses on the quantitative theory of information and its applications to compression as well as reliable communication systems. Topics include mathematical definition and properties of information, source coding theorem, lossless compression of data, optimal lossless coding, noisy communication channels, channel coding theorem, and Gaussian channel. Prerequisite: MATH 357 or EE 307, and MATH 2414.

EE 319. Electric Circuits II (EL). 3 Hours.
This course covers the basics of circuit analysis using the Laplace transform, capacitors and inductors, transient response, RC, RL, and RCL circuits. AC steady-state analysis, sinusoids and phasors will be emphasized. This course integrates the principles of Experiential Learning through a semester-long project of practical electrical designs. Prerequisite: MATH 2414 and ENGR 2305, or instructor permission.

EE 320. Circuit Laboratory. 1 Hour.
This course provides hands on experience with mainstream circuit technology. This shall be accomplished with a set of laboratory experiments that introduce increasingly more complex circuits and techniques. Successful completion of each lab assignment shall 1) require a written report detailing the design solution(s), 2) require the construction of one or more circuits, and 3) require a demonstration that the constructed circuits work properly. Prerequisite: EE 2305 or ENGR 2305 or concurrent enrollment.

EE 321. Digital Logic. 3 Hours.
This course provides a detailed knowledge of Boolean algebra and its application in digital design. It provides an in-depth coverage of combinational logic circuit analysis and minimalization and design techniques. It also covers the basic concepts of sequential circuits including the use of state diagrams and state tables to represent the behavior of sequential circuits. Co-requisite: EE 322. Prerequisite: MATH 2413.

EE 322. Digital Logic Laboratory. 1 Hour.
This laboratory course consists of multiple projects that the students will complete based upon the concepts learned in EE 321. The overall aim of the course is to increase the students' depth of understanding of digital logic design and implementation. Prerequisite: EE 321.

EE 325. Signals and Systems. 3 Hours.
This course is one of the fundamental courses of Electrical Engineering, providing theoretical concepts and mathematical tools used for the design and analysis of continuous-time linear systems, as well as analog signals. Topics covered in this course include linear convolution, impulse response, Fourier series, Fourier transforms, and Laplace transform. Prerequisite: MATH 2414 and ENGR 2305 or EE 2305. Corequisite: EE 326.

EE 326. Signals and Systems Lab. 1 Hour.
This course provides practical concepts and software tools for the design and the analysis of both analog signals and continuous-time linear systems. It is based on exercises via computer simulation using MATLAB. The main aim is to get understanding of frequency and time domain analysis of basic signals and linear time-invariant systems employing linear convolution, impulse response, Fourier transforms, and Laplace transform. Prerequisite: MATH 2413 and EE 2305.

EE 335. Electronics I. 3 Hours.
This course covers the basics of electronic circuit design techniques as well as the operation of bipolar junction and field-effect transistors. The knowledge acquired in this course will provide students with a sufficient depth of understanding to deal with circuit design problems and to be able to understand the operation of new devices as they become available. Prerequisite: EE 2305.

EE 336. Electronics Laboratory. 1 Hour.
This laboratory course consists of multiple projects that the students will complete based upon the concepts learned in EE 335 (Electronics) class. Prerequisite: EE 335 or concurrent enrollment.

EE 340. Computer Architecture. 3 Hours.
This course will focus on the interaction of hardware and software in digital computers. It will discuss basic computer structure, machine instructions, assembly language, CPU organization and design, memory addressing, pipelining, input/output organization and computer arithmetic. Prerequisite: COSC 1315 or ENGR 1201.

EE 345. Introduction to Electromagnetic Theory. 3 Hours.
This is an introductory course in engineering electromagnetics. Emphasis is placed on time-varying topics, such as transmission lines, Maxwell's equations, and plane and guided waves. The basic concepts of electromagnetic fields, including field vectors, and potentials will be covered. Prerequisite: MATH 2415 and EE 319 or PHYS 2326.

EE 365. Microprocessors. 3 Hours.
This course covers the fundamentals of microprocessor/microcontroller architectures, interfacing, instruction sets and resources, and how to apply these to real-world design problems. Memories, timer/counters, serial devices and related devices are emphasized. Prerequisite: EE 321.

EE 390. Ethics in Technology. 3 Hours.
This course examines ethical issues and moral problems that engineers, computer scientists, and information technology professionals face. This course covers issues such as moral and ethical relevance, professional responsibilities, privacy, intellectual property, risks, and liabilities. Students review case studies of ethical conflicts in the work environment and resolve theoretical situations through application of ethical codes.

EE 400. Smart Grid Technologies. 3 Hours.
This course is an introduction to the fundamentals of smart electric power grids, including definition, design criteria, and technology. Smart grid can be defined as the application of information processing and communications to the power grid. This course will provide insight into a smart grid's many aspects such as distributed energy, energy storage, transmission and distribution automation, microgrids, demand response, renewable energy sources, data analytics, and cyber security. Learn how to optimize smart grids so they are cost effective and efficient, how to increase grid reliability, and how to measure performance through data analytics. This course builds an understanding of key smart grid technologies both from a utility and customer perspective. Prerequisite: EE 305 – Fundamentals of Power Systems.

EE 425. Systems and Signals II. 3 Hours.
This course lays the foundation of the knowledge needed to process information digitally using a variety of hardware platforms, and provides theoretical concepts and mathematical tools used for the design and analysis of discrete time linear systems as well as discrete time signals. Topics covered in this course include discrete convolution, discrete time impulse response, Discrete Fourier Transform (DFT), Discrete Time Fouriere Transform (DFTF), and Z-Transform. Prerequisite: EE 325.

EE 429. Basic Communication Theory. 3 Hours.
This course introduces students to the fundamental principles of communication system analysis and design, providing theoretical concepts and mathematical tools used for special analysis, filtering, and transmission of analog signals. Topics covered in this course include modulation theory, effect of noise on analog communications, analog to digital conversion, and digital modulation in Additive White Gaussian Noise (AWGN) baseband channels. EE 325 and EE 307 or ENGR 307.

EE 432. Control Systems. 3 Hours.
This course is a review of the relations among transient responses, systems transfer functions, and methods of specifying system performance. It will include classical and modern feedback control system analysis and design methods, such as transfer functions, state variables, stability, root locus, Bode plot, and computer analysis. Prerequisite: EE 325.

EE 445. Embedded Systems. 3 Hours.
This course covers basic design concepts including serial/parallel communications and bus systems, hardware components and platforms, software organization, embedded and real-time operating systems, interfacing with external environments using sensors and actuators, and communication in embedded systems. This course includes a design project where students will design, implement, and evaluate a prototype embedded system. Corequisite: EE 446. Prerequisite: EE 321 and CS 332.

EE 446. Embedded Systems Lab. 1 Hour.
This laboratory course provided several hands-on experiences on the design of microcontroller-based embedded systems; interfacing from both a hardware and software perspective; and applications. Experiments include relays, stepper motor interfacing, DC motor interfacing with PMW, sensor interfacing, and ADC and DAC interfacing. Corequisite: EE 445. Prerequisite: EE 321 and CS 332.

EE 447. Electronics II. 3 Hours.
This course covers the basic design and analysis of Electronic circuits for analog and digital applications, including oscillators, analog filters, power amplifiers, and CMOS design. Frequency response and Bode's rules are emphasized. Prerequisite: EE 335.

EE 455. Digital Circuit Testing and Testability. 3 Hours.
The complexity of digital circuits placed on IC (Integrated Circuit) chips has significant impact on the cost of testing such chips. Testing is performed to ensure that function/performance have not been altered during fabrication. This course introduces current testing techniques for digital circuits and design strategies used to enhance their testability. Prerequisite: EE 321.

EE 465. Very-Large-Scale Integrated (VLSI) Design. 3 Hours.
This course will cover basic theory and techniques of digital FLSA (Very-Large-Scale Integrated) circuit and system design in CMOS technology. It will discuss the bottom-up as well as the top-down design approach. It will prepare students to design and analyze digital circuits and show them how these circuits are implemented on a VLSI chip. Prerequisite: EE 321.

EE 469. Wireless Communications. 3 Hours.
This course introduces students to the fundamental principles of wireless communication system analysis and design, providing theoretical concepts and mathematical tools used for transmission of analog signals. Prerequisite: EE 325.

EE 470. Digital Design Using Very High Speed Integrated Circuit Hardware Description Language (VHDL). 3 Hours.
This course instructs the students in the use of VHDL (Very High Speed Integrated Circuit Hardware Description Language) for describing the behavior of digital systems. It will also teach students the use of the VHDL language for representation of digital signals, use of IEEE standard logic package/library, design of arithmetic, combinational, and synchronous sequential circuits. Prerequisite: EE 321.

EE 473. Power Systems. 3 Hours.
This course introduces students to the fundamental principles of long-distance transmission of electric power with emphasis on admittance and impedance modeling of components and systems, and power flow studies and calculations. Prerequisite: EE 319 or concurrent enrollment.

EE 474. Power Systems Analysis and Control. 3 Hours.
The course covers electric power systems analysis, operation, and control. Students will learn how to model power systems components such as transmission lines, transformers, generators, and loads. Additional topics include economic dispatch, power flow, and fault analysis. Smart grids and renewable energy are introduced. Prerequisite: EE 305 and MATH 2318 or Instructors Permission.

EE 475. Capstone Design Project in Electrical Engineering. 4 Hours.
The aim of the capstone project for seniors in Electrical Engineering is to familiarize them with the process of designing electronic circuits and systems as practiced in industry. This course requires students to develop a project based on the knowledge and skills acquired in earlier coursework and integrate their technical knowledge through practical design efforts. The work is performed as a team in accordance with ABET requirements. Each team is comprised of two to three students. Prerequisite: EE 319, EE 321, EE 322, EE 325, EE 326, EE 335, EE 340, EE 390, and EE 470.

EE 489. Independent Study. 1-3 Hours.
This course provides individual instruction. Students may repeat the course when topics vary.

EE 490. EE Senior Design I. 3 Hours.
This course is taken by seniors as the first part of the senior design experience in the semester before EE 491. Projects may involve the design of a device, circuit system, process, or algorithm and topics covered may include the design process, project planning and management, and project costs, and includes aspects of ethics in engineering design, safety, environmental considerations, economic constraints, liability, manufacturing, and marketing. Projects are carried out using a team-based approach and selection and analysis of a design project to be continued in EE 491 is carried out. Written progress reports, a proposal, a final report, and oral presentations are required. Taken in last 30 hours. Cross-listed with CS 490 and MGT 490. Credit can only be awarded for one course. Open only to Electrical Engineering majors.

EE 491. EE Senior Design II. 3 Hours.
Projects involving the design of a device, circuit system, process, or algorithm that have started in the previous semester will be completed. Team solution to an engineering design problem as formulated and initiated in EE 490 will continue to take place. Written progress reports, a final report, design manuals, and oral presentations are required. Cross-listed with CS 491 and MGT 491. Credit can only be awarded for one course. Prerequisite: EE 490; open only to Electrical Engineering majors.

EE 497. Special Topics. 3 Hours.
Instructors will provide an organized class designed to cover areas of specific interest. Students may repeat the course when topics vary.

EE 499. Independent Research. 1-6 Hours.
Independent research in Electrical Engineering conducted by a student under the guidance of a faculty member of his or her choice. The student is required to maintain a research journal and submit a project report by the end of the semester and potentially make an oral presentation on the project. SCH and hours are by arrangement and, with a change in content, this course may be repeated for credit. Prerequisite: Consent of instructor.

EE 599. Independent Research. 1-6 Hours.
Independent research in Electrical Engineering conducted by a student under the guidance of a faculty member of his or her choice. Credits and hours are by arrangement and, with a change in content, this course may be repeated for credit. Prerequisite: Consent of instructor.