Department of Electrical Engineering

The Department of Electrical Engineering offers students a hands-on laboratory oriented Bachelor of Science educational experience in Electrical Engineering. The Electrical Engineering curriculum is theoretical, yet hands-on and career oriented. Students gain expertise and practical knowledge in all areas of Electrical Engineering (EE). The Electrical Engineering department has several distinct areas of focus including: Communication Systems, Power Generation and Smart Grids, Fiber Optics, Electromagnetics, Antennas, Control Systems, Network Security, and Sensors. The EE Program is accredited by the Engineering Accreditation Commission of ABET, http://www.abet.org.

Electrical Engineering Majors


Electrical Engineering Concentrations


EENG 3230 Electromagnetic Fields
3 Credit Hours. 3 Lecture Hours. 0 Lab Hours.
A study of electromagnetic fields theory and applications including Coulomb’s law, Gauss’ law, Ampere’s law, Maxwell’s equations, boundary conditions, uniform plane, wave propagation, and transmission line theories applied to engineering in power systems, satellites, and wireless communications.
Prerequisite(s): A minimum grade of “C” in MATH 2243 and ENGR 2334.

EENG 3241 Electric Machines
0.4 Credit Hours. 0.3 Lecture Hours. 0.2 Lab Hours.
The concepts of electric machines and their operation characteristics are covered with emphasis on different types of DC/AC motors and generators including single-phase and three-phase transformers. The course also includes laboratory activities in support of instruction.
Prerequisite(s): A minimum grade of “C” in all of the following: EENG 3230 and prior or concurrent enrollment in EENG 3335.

EENG 3335 Circuit Analysis II
3 Credit Hours. 3 Lecture Hours. 0 Lab Hours.
The course focuses on advanced topics in circuit analysis and design. Topics include Phasor analysis, three-phase systems, AC steady-state power, transformers, transfer functions, Bode plots, passive and active filters, Laplace and Fourier transforms, and two-port networks.
Prerequisite(s): A minimum grade of “C” in ENGR 2334.

EENG 3337 Power Systems Fundamentals
3 Credit Hours. 3 Lecture Hours. 0 Lab Hours.
This course is designed to introduce students to the basic concepts of electric power systems. Single-phase and 3-phase networks, electric power generation, transformers, transmission lines, and power flow analysis including stability and fault analysis are thoroughly covered. Additional topics dealing with conventional energy sources, electricity market, and regulations affecting the power sector are introduced and discussed. Students are expected to perform power flow simulations using Power World Software and/or other professional programming tools for power system studies.
Prerequisite(s): A minimum grade of “C” in EENG 3241 or permission of instructor.

EENG 3340 Microcontrollers
0.4 Credit Hours. 0.3 Lecture Hours. 0.2 Lab Hours.
Fundamental concepts of address, data, and control are covered including microcontroller architecture, memory, peripheral devices, and interfacing. Students will apply programming skills learned to operate different types of microprocessors. The course also includes laboratory activities in support of instruction.
Prerequisite(s): A minimum grade of “C” in ENGR 3233 or Permission of Instructor.

EENG 3341 Microelectronics w/lab
4 Credit Hours. 3 Lecture Hours. 2 Lab Hours.
A study of the characteristics and design of bipolar junction and metal oxide semi-conductor integrated circuit devices with emphasis on commercial and industrial applications including operational amplifiers, digital logic, and solid state memory.
Prerequisite(s): A minimum grade of “C” in EENG 3310 and prior or concurrent enrollment in EENG 3335.

EENG 3420 Linear Systems
2 Credit Hours. 2 Lecture Hours. 0 Lab Hours.
The mathematical foundations and modeling techniques to solve linear systems are covered in this course. Topics include vectors and matrices, eigenvalues and eigenvectors, Fourier series, Fourier transform, Laplace transform, and Z-transform. Several engineering applications in control and communication systems are provided.
Prerequisite(s): A minimum grade of “C” in MATH 3230 and ENGR 2334 or Permission of Instructor.

EENG 3421 Advanced Engineering Analysis
2 Credit Hours. 2 Lecture Hours. 0 Lab Hours.
This course offers introduction to systems and simulation, mathematical and statistical modeling of systems, random numbers, random-variate generation, input modeling, verification and validation of simulation models, analysis of simulation data, comparison and evaluation of alternative system designs, simulation examples of electrical engineering systems.
Prerequisite(s): A minimum grade of “C” in MATH 2243 and ENGR 2334 or Permission of Instructor.

EENG 4620 Senior Project I
2 Credit Hours. 1 Lecture Hour. 2 Lab Hours.
This course is the first sequence of a two-semester long capstone project with emphasis on project research, design and development under real engineering constraints. Topics include background and state-of-the-art research of the particular projects, tasks scheduling, project management, and research of ethical, environmental and sustainability issues related to the project. Students are required to work in teams, conduct research and start basic project design under the direction of a faculty advisor.
Prerequisite(s): A minimum grade of “C” in all of the following: EENG 3340 and EENG 3241 and EENG 3341 and prior or concurrent enrollment in EENG 5431.

Cross Listing(s): EENG 4620H.
EENG 4620H Senior Project I (Honors)
2 Credit Hours. 1 Lecture Hour. 2 Lab Hours.
This course is the first sequence of a two-semester long capstone project with emphasis on project research, design and development under real engineering constraints. Topics include background and state-of-the-art research of the particular project, tasks scheduling, project management and research of ethical, environmental and sustainability issues related to the project. Students are required to work in teams, conduct research and start basic project design under the direction of a faculty advisor.
Prerequisite(s): A minimum grade of "C" in all of the following: EENG 3340 and EENG 3241 and EENG 3341 and prior or concurrent enrollment in EENG 5431.
Cross Listing(s): EENG 4620.

EENG 4621 Senior Project II
0,2 Credit Hours. 0,1 Lecture Hours. 0,3 Lab Hours.
In this second sequence of the senior capstone project, students will start the implementation process of their projects including CAE/CAD software development, program writing, printed circuit board fabrication, systems testing, and performance evaluation. Course requirements include weekly progress reports, oral presentations, a comprehensive final report, and a final project demonstration.
Prerequisite(s): A minimum grade of "C" in EENG 4620 and EENG 5540.
Cross Listing(s): EENG 4621H.

EENG 4621H Senior Project II (Honors)
0,2 Credit Hours. 0,1 Lecture Hours. 0,3 Lab Hours.
In this second sequence of the senior capstone project, students will start the implementation process of their projects including CAE/CAD software development, program writing, printed circuit board fabrication, systems testing, and performance evaluation. Course requirements include weekly progress reports, oral presentations, a comprehensive final report, and a final project demonstration.
Prerequisite(s): A minimum grade of "C" in EENG 4620 and EENG 5540.
Cross Listing(s): EENG 4621.

EENG 4890 Directed Study in Electrical Engineering
1-3 Credit Hours. 0 Lecture Hours. 0 Lab Hours.
An individualized study involving research and applications pertaining to Electrical Engineering.
Prerequisite(s): Prior study form as approved by instructor.

EENG 5090 Selected Topics in Electrical Engineering
1-4 Credit Hours. 1-3 Lecture Hours. 0-3 Lab Hours.
Students in this course will have the opportunity to study selected topics in Electrical Engineering not currently offered by the program.
Prerequisite(s): As determined by Instructor.
Cross Listing(s): EENG 5090G.

EENG 5132 Industrial Electronics
0,3 Credit Hours. 0,2 Lecture Hours. 0,2 Lab Hours.
A study of industrial applications of electronic devices including SCR's, triacs, switching circuits, timers, logic control circuits, optical devices, and sensors. The course also includes laboratory activities. Graduate students will complete an additional independent research project that involves a written report with an oral presentation.
Cross Listing(s): EENG 5132G.

EENG 5242 Power Systems Protection
0,4 Credit Hours. 0,3 Lecture Hours. 0,2 Lab Hours.
This course offers a comprehensive study of methods and devices used in power system protection including relay types, responses, pilot wire, carrier systems, transmission lines, transformers, machines protection, and modern trends in protection technology. This course will review the need for protection of power system elements and explore the development and regulations of smarter, more flexible protective systems applied to modern power grids. Students will learn the trade-offs between reliability, selectivity, speed, simplicity, and economy using real world case studies. A hands-on lab project, using state of the art equipment, will also be completed during the course. Graduate students will be required to complete individual advanced level research in an area beyond the scope of the undergraduate requirements that demonstrates a higher level of mastery in the subject matter with additional required deliverables representative of graduate level work, as determined by the instructor.
Prerequisite(s): A minimum grade of "C" in EENG 3337 or Permission of Instructor.
Cross Listing(s): EENG 5242G.

EENG 5243 Power Electronics
0,4 Credit Hours. 0,3 Lecture Hours. 0,2 Lab Hours.
A coverage of the concepts of power electronics and converters including the use of thyristors, triacs, timers, logic control circuits, optical devices, and sensors. The course also includes laboratory activities in support of instruction.
Prerequisite(s): A minimum grade of "C" in EENG 3241 and EENG 3341.
Cross Listing(s): EENG 5243G. Cross Listing(s): EENG 5243G.

EENG 5341 Robotic Systems Design
0,4 Credit Hours. 0,3 Lecture Hours. 0,2 Lab Hours.
The basic elements of robotics are introduced with emphasis on mobile robots and applications. Topics include coordinate transformations, sensors, path planning, kinematics, effectors, and control. Students will work in teams to design and build increasingly complex robotic systems. The course also includes laboratory activities in support of instruction. Graduate students will complete an independent research project which involves a written and oral presentation not required at the undergraduate level.
Prerequisite(s): A minimum grade of "C" in EENG 3340 or MENG 3521 or Permission of Instructor.
Cross Listing(s): EENG 5341G.

EENG 5342 Computer Systems Design
0,4 Credit Hours. 0,3 Lecture Hours. 0,2 Lab Hours.
Digital computers with emphasis on design and simulation are covered including instruction set design, processor implementation, pipelining, cache design, memory hierarchy, and input/output. The course also includes laboratory activities in support of instruction. Graduate students will complete an independent research project which involves a written and oral presentation not required at the undergraduate level.
Prerequisite(s): A minimum grade of "C" in EENG 3340 or Permission of Instructor.
Cross Listing(s): EENG 5342G.

EENG 5431 Control Systems
3 Credit Hours. 2 Lecture Hours. 2 Lab Hours.
Introduction to classical control theory and applications is presented with emphasis on feedback and its properties including the concept of stability, stability margins, and the different tools that can be used to analyze the system properties. Students will develop a working knowledge of the basic elements of linear control techniques. The course also includes laboratory activities in support of instruction. Graduate students will complete an independent research project which involves a written and oral presentation not required at the undergraduate level.
Prerequisite(s): A minimum grade of "C" in EENG 3420 or Permission of Instructor.
Cross Listing(s): EENG 5431G.
EENG 5432  Programmable Logic Controllers
3 Credit Hours.  0,2 Lecture Hours.  0,2 Lab Hours.
Topics covered include sequential programmable logic controllers (PLC’s) with emphasis on ladder diagrams, input/output devices, networking, and programming design through advanced functions. The course also includes laboratory activities in support of instruction. Graduate students will complete an independent research project which involves a written and oral presentation not required at the undergraduate level.
Prerequisite(s): A minimum grade of "C" in EENG 3230 or MENG 3521 or Permission of Instructor.
Cross Listing(s): EENG 5432G.

EENG 5533  Smart Antennas
3 Credit Hours.  3 Lecture Hours.  0 Lab Hours.
A theoretical and practical understanding of fundamentals of smart antennas including beamforming, single antennas, array antennas, phased arrays, adaptive techniques, angle-of-arrival estimation, digital beamforming, fixed beam arrays, channel characteristics, random processes, propagation and electromagnetics. Graduate students will be required to complete individual advanced level research in an area beyond the scope of the undergraduate requirements that demonstrates a higher level of mastery in the subject matter with additional required deliverables representative of graduate level work, as determined by the instructor.
Prerequisite(s): A minimum grade of "C" in EENG 3230 or MENG 3521 or permission of Instructor.
Cross Listing(s): EENG 5535G.

EENG 5538  Cybersecurity for Networked Electrical and Electronics Systems
3 Credit Hours.  3 Lecture Hours.  0 Lab Hours.
This course is designed to introduce emerging topics related to cybersecurity for networked electrical & electronics systems and cyber-physical systems. The course will provide theoretical understanding and practical basis of cybersecurity for networked systems including Shannon's secrecy system, information-theoretic security, wiretap channels, cyber-attacks on electrical and electronics systems (smart power grid, embedded systems, connected electric vehicles, space communications, etc.), general cybersecurity models, jamming and anti-jamming, broadcast/interference channels cooperative secrecy, interference and broadcast channel with confidential messages, cooperative secrecy, and security limits of Gaussian and wireless channels. Graduate students will be required to complete individual advanced level research in an area beyond the scope of the undergraduate requirements that demonstrates a higher level of mastery in the subject matter with additional required deliverables representative of graduate level work, as determined by the instructor.
Prerequisite(s): A minimum grade of "C" in all of the following: ENGR 3232 and EENG 3421 or CSCI 5332 or IT 5434 or permission of instructor.
Cross Listing(s): EENG 5538G.

EENG 5540  Communication Systems
0.4 Credit Hours.  0.3 Lecture Hours.  0.2 Lab Hours.
The theory and principles of communication systems are presented in this course. Topics covered include AM and FM modulations, transmission and reception, noise and random processes, pulse modulation, and digital transmission techniques. Laboratory emphasizes modeling and simulation using MATLAB programming. Graduate students will complete an independent research project which involves a written and oral presentation not required at the undergraduate level.
Prerequisite(s): A minimum grade of "C" in all of the following: EENG 3421 and prior or concurrent enrollment in EENG 3420 or permission of instructor.
Cross Listing(s): EENG 5540G.

EENG 5541  Digital Communications
0.4 Credit Hours.  0.3 Lecture Hours.  0.2 Lab Hours.
Theory and applications of digital communications systems are covered. Topics include ASK, FSK, DPSK, QAM, signaling over AWGN, band-limited and fading channels, inter-symbol interference, and error-correction codes. The course also includes laboratory activities in support of instruction. Graduate students will complete an independent research project which involves a written and oral presentation not required at the undergraduate level.
Prerequisite(s): A minimum grade of "C" in EENG 5540 or permission of Instructor.
Cross Listing(s): EENG 5541G.

EENG 5543  Antennas
4 Credit Hours.  3 Lecture Hours.  2 Lab Hours.
This course introduces basic concepts of dipoles and monopoles, solution to radiation problems, antenna parameters, different types of antennas, antenna aperture/array theory, radio wave propagation, impact of antenna performance in communication links. The course also includes laboratory activities in support of instruction. Graduate students will be required to complete additional assignments and a culminating research project commensurate with graduate level work that is not required of undergraduate students.
Prerequisite(s): A minimum grade of "C" in EENG 3230.
Cross Listing(s): EENG 5543G.
EENG 5544 Smart Grids Technology Fundamentals
4 Credit Hours. 3 Lecture Hours. 2 Lab Hours.
This smart-grid technology fundamentals course is designed to introduce new topics related to distributed generation, micro-grids, renewable energy sources, and smart homes applications. Topics covered include design, modeling, control, and analysis to provide a working knowledge of smart-grid systems. Concepts dealing with computational intelligence, decision support systems, smart metering, optimization, and renewable energy sources will be presented. The automation and computational techniques used to ensure smart-grids will also be introduced and discussed. The laboratory component will provide students with hands-on experience in the utilization of smart-grid technologies and equipment. This course will provide solutions to real-world energy problems and an understanding of the impact of smart-grids in many applications. Graduate students will be required to complete individual advanced level research in an area beyond the scope of the undergraduate requirements that demonstrates a higher level of mastery in the subject matter with additional required deliverables representative of graduate level work, as determined by the instructor.
Prerequisite(s): A minimum grade of "C" and prior or concurrent enrollment in EENG 3241.
Cross Listing(s): EENG 5544G.

EENG 5891 Special Problems in Electrical Engineering
1-3 Credit Hours. 1-3 Lecture Hours. 0-2 Lab Hours.
This course provides for specialized study in the area of Electrical Engineering not currently offered by the program. Graduate students will complete an independent research project which involves a written and oral presentation not required at the undergraduate level.
Prerequisite(s): As determined by Instructor.
Cross Listing(s): EENG 5891G.

TEET 3890 Directed Independent Study
1-4 Credit Hours. 1-4 Lecture Hours. 0 Lab Hours.
An individualized study involving research and applications pertaining to Electrical Engineering Technology.

TEET 4890 Special Problems in EET
1-3 Credit Hours. 0 Lecture Hours. 0 Lab Hours.
Individual and specialized study in areas of electrical engineering technology not otherwise covered in the student's program.