EENG Electrical Engineering

EENG 5090G Selected Topics in Electrical Engineering  
1-4 Credit Hours. 0-3 Lecture Hours. 0-6 Lab Hours.  
Students in this course will have the opportunity to study selected topics in Electrical Engineering not currently offered by the program. Graduate students will complete advanced research beyond the scope of the undergraduate requirements that demonstrates a higher level of mastery of the subject with additional required deliverables representative of graduate work, as determined by the instructor.  
Prerequisite(s): Permission of Instructor.  
Cross Listing(s): EENG 5090.

EENG 5242G 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, can-i-er syste1ns, 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 5242.

EENG 5243G 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. Graduate students will complete an independent research project which involves a written and oral presentation not required at the undergraduate level.  
Prerequisite(s): EENG 3241 and EENG 3341.  
Cross Listing(s): EENG 5243.

EENG 5341G 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 5341.

EENG 5342G 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 5342.

EENG 5431G 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 5431.

EENG 5432G Programmable Logic Controllers  
0.3 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 3241 or MENG 3521 or Permission of Instructor.  
Cross Listing(s): EENG 5432.

EENG 5532G Wireless Communications  
3 Credit Hours. 3 Lecture Hours. 0 Lab Hours.  
The concepts and techniques of wireless communication systems are covered in this course including propagation channels, communication link analysis, transceivers, signal processing, and multiple access schemes. 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 and EENG 5540 or Permission of Instructor.  
Cross Listing(s): EENG 5532.

EENG 5533G Optical Fiber Communications  
3 Credit Hours. 3 Lecture Hours. 0 Lab Hours.  
This course offers an introduction to the physics of optical fiber communication components and the applications to communication systems. Topics include light and its behavior in the fiber, fiber attenuation, dispersion and nonlinear effects, laser modulation, photo detection and noise, receiver design, bit error rate calculations, and coherent communications. Graduate students will be required to complete an individual research project not required of undergraduate students.  
Prerequisite(s): A minimum grade of “C” in EENG 5540 or Permission of Instructor.  
Cross Listing(s): EENG 5533.
EENG 5535G  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, EENG 3421, ENGR 1732 and ENGR 2341.
Cross Listing(s): EENG 5535.

EENG 5538G  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): ENGR 2332 and EENG 3421 or CSCI 5332 or IT 5434, with a minimum grade of "C".
Cross Listing(s): EENG 5538.

EENG 5540G  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 5540.

EENG 5541G  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 5541.

EENG 5543G  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, and 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 or Permission of Instructor.
Cross Listing(s): EENG 5543.

EENG 5544G  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 laboratory component will provide students with hands-on experience in the utilization of smart-grid technologies and equipment. 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 3337 or permission of instructor.
Cross Listing(s): EENG 5544.

EENG 5891G  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 5891.