ELECTRICAL ENGINEERING (ELECTENG)

ELECTENG 5320 Automatic Controls 4 Credits

This course will explore the modeling of linear dynamic systems via differential equations and transfer functions utilizing input-output representations; analysis of control systems in the time using transfer function methods; study of the classical stability tests, such as the Routh-Hurwitz, and design methods using root-locus plots; and the development of control techniques based on a proportional-integral-derivative (PID) controller. **Components:** Class

Prereqs/Coreqs: P. Instructor Consent

ELECTENG 5410 Introduction to Electrical Machines and Power Systems 4 Credits

The objective of this course is to enhance students' understanding of the fundamental topics in power engineering. At the end of this class, students are expected to tackle problems related to single and three phase power systems, transformers, induction and synchronous machines, transmission lines, and per unit systems. On the non-technical side, the course aims to improve the students' design, communication, andlife-long learning skills. **Components:** Laboratory, Class

ELECTENG 6360 Intelligent Control 4 Credits

This course introduces students to the principles of Artificial Intelligence which includes Expert System, Fuzzy Logic, and Artificial Neural Networks. Project based exercises will be also included to reinforce the topic covered in the course. **Components:** Class

Preregs/Coregs: P. ELECTENG 5320 or Instructor Consent

ELECTENG 6450 Power Systems Analysis and Design 4 Credits

This course aims to enhance students' understanding of the fundamental issues in power system planning and operations. This includes the coverage of technical topics such as power flow with contingency analysis, economic dispatch with optimal power flow, including environmental constraints, and fault analysis with relay coordination. On the non-technical side, the course aims to improve the students' design, communication, and life-long learning skills.

Components: Class Prereqs/Coreqs: P. ELECTENG 5410

ELECTENG 7340 Digital Control Systems 4 Credits

Digital Controller Design in time and frequency domain. State space modeling, controllability, observability, stability, minimal realization, pole placement and observer design.

Components: Class

Prereqs/Coreqs: P. ELECTENG 5320 or Instructor Consent

ELECTENG 7350 Machine Learning Control 4 Credits

This course provides an in-depth exploration of machine learning techniques with a focus on their applications in control engineering. Emphasis is placed on electrical and mechanical engineering applications, including HVAC systems, power electronics, and reinforcement learning. If time permits, the course will also cover large language models and their applications in engineering. Students enrolling in this course should have some proficiency in programming, with Python being preferred.

Components: Class

Prereqs/Coreqs: P. ELECTENG 5320 and ENGRG 5030

ELECTENG 7410 Digital Control of Power Electronic Converters 4 Credits

This course covers topics on the analysis and design of digital controls for power electronic devices in single-phase and three-phase industrial applications as well as commonly utilized power supplies. The course will include such devices as voltage source converters for use in vector-controlled drives. At the end of this class, students are expected to be able to design modern control systems such as vector control on power electronic devices in a digital environment. On the non-technical side, the course aims to improve the students' design, communication, and life-long learning skills, through team and individual projects and presentations.

Components: Class

Prereqs/Coreqs: P. ELECTENG 5320 and ELECTENG 5410

ELECTENG 7420 Smart Grid Distribution System 4 Credits

This course will explore the electric power distribution system, including the distribution system component modeling, power flow analysis method, fundamental operation and control practice, smart grid technology application, and computer simulation and analysis.

Preregs/Coregs: P. ELECTENG 6450

ELECTENG 7900 Thesis & Capstone Preparation 1 Credit

Prepares student for either the Thesis or Capstone experience. Focus is placed on the skills necessary to undertake the Thesis or Capstone work. This includes writing a project proposal that is supported by scholarly literature, preparing a project timeline, budgeting for the proposed project, recognizing project stakeholders, and identifying specific deliverables from the project. Course culminates in a written Thesis/Capstone proposal for committee approval.

Components: Research

Cross Offering: CIVILENG 7900, INDSTENG 7900, MECHENG 7900 Prereqs/Coreqs: P. Full admittance as a degree-seeking graduate student; C: MECHENG 5000

ELECTENG 7910 Thesis & Capstone Extension 1 Credit

Course is a 1-credit extension of a student's thesis research or capstone project design course. Cannot be taken until the maximum six credits of Thesis Research or Capstone Design Project have been completed. Will require approval of the Faculty Advisor and Program Coordinator before permission for this course will be granted and students allowed to register. Will not count toward degree requirements.

Components: Thesis Research

Cross Offering: CIVILENG 7910, INDSTENG 7910, MECHENG 7910

Prereqs/Coreqs: P. (CIVILENG 7990, ELECTENG 7990, INDSTENG 7990, or MECHENG 7990) OR (CIVILENG 7970, ELECTENG 7970, INDSTENG 7970, or MECHENG 7970)

ELECTENG 7970 Capstone Design Project 3 Credits

Students will draw upon and synthesize knowledge and skills learned throughout the program by applying it to an industry-sponsored project. Capstone work (minimum 150 hours) will be completed in partnership with industry and academic mentor/supervisors. A substantive work project deliverable demonstrating summative application of coursework taken in the program will be expected. The project is expected to be completed in the student's last semesters in residence. Three credits can be taken in a single semester. Can be repeated but only a total of six credits can be applied to degree completion. (Contact advisor for prior approval and registration instructions)

Components: Research

Cross Offering: CIVILENG 7970, INDSTENG 7970, MECHENG 7970 Preregs/Coregs: P. CIVILENG 7900, ELECTENG 7900, INDSTENG 7900, or MECHENG 7900

ELECTENG 7990 Thesis Research 3 Credits

Completion and defense of a carefully delineated scholarly work advancing an original point of view as a result of research. The topic chosen must reflect the student's area of emphasis and must be approved by a thesis committee. Three credits taken in a single semester. Can be repeated but only a total of six credits can be applied to degree completion. Thesis work is expected to be completed in the student's last semesters in residence. (Contact advisor for prior approval and registration instructions)

Components: Thesis Research

Cross Offering: CIVILENG 7990, INDSTENG 7990, MECHENG 7990

Prereqs/Coreqs: P. CIVILENG 7900, ELECTENG 7900, INDSTENG 7900, or MECHENG 7900