ECE 3212 Electric Machines and Drives

Credits and contact hours: 4 Credits (Two 75-minute class periods, one two-hour laboratory period)

Instructor: Prof. Ali Bazzi
- E-mail Address: bazzi@uconn.edu
- Office Hours: Wednesday 9:30 a.m. to 11:00 a.m. in ITE 331, or by appointment.

Specific Course Information:
- *Catalog Description*: Fundamental operation, equivalent circuit models, physical structure, and control of electric machinery; basic power electronic drives, three-phase systems, magnetic circuit equivalents, and basic electro-mechanics, transformers, basic rotating machines; different electric machines including, switched reluctance machines, stepper motors, three-phase synchronous machines, induction or asynchronous machines, and DC machines. Basic electronic drives for each machine type along with their open-loop control strategies. Weekly laboratory experiments accompany the lectures to demonstrate most of these concepts.
- *Prerequisite*: ECE 3201.
- *Required, elective, or selected elective:* Selected elective (EE).

Textbook
- *Required:* Stephen Chapman, *Electric Machinery Fundamentals*, McGraw-Hill, 5th edition
- *Required:* ECE 3212 Lab Manual
- *Optional:* A. E. Fitzgerald, C. Kingsley Jr., and S. Umans, *Electric Machinery*, McGraw-Hill, 6th, edition.

Specific Goals for the Course:
- *Specific Outcomes of Instruction*: Students will be able to to identify electric machine types, describe the electromagnetics and other science behind their operation, analyze their behavior, and mathematically model their circuits.

- *EAC Criterion 3 Student Outcomes addressed by the course*:

  (1) an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
  Students learn to identify electric machine types, understand the electromagnetics and other science behind their operation, analyze their behavior, and mathematically model their circuits.

  (2) an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors
  n/a

  (3) an ability to communicate effectively with a range of audiences
  Students write a technical report on a specific project topic that is related to electric machines and drives, and present their project findings to their peers.

  (4) an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider

the impact of engineering solutions in global, economic, environmental, and societal contexts
n/a

(5) an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives
Students build leadership and collaborative team work by doing team-based laboratory activities and establish goals, plan tasks, and meet objectives by doing a final team project.

(6) an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions
Students learn to conduct experiments by following step-by-step given lab sessions. Students learn to analyze and interpret data by comparing the experimental results and theoretical derived results.

(7) an ability to acquire and apply new knowledge as needed, using appropriate learning strategies.
Students learn to use MATLAB/Simulink.

Topics covered

- Review of three-phase systems
- Magnetic devices
- Transformers
- Electric motors and generators
- Electric motor drives and control basics
- Project reports and oral presentations
- Electrical/Computer design and modeling
- Prototyping and system evaluation