

Course Syllabus

Course No. & Title: EIN4933/6935 – Electrical Machines and Drives

Term & Meeting Info: Fall 2011, Mondays, 6:00pm – 8:50pm, LAC 1280

Instructor Info: Thomas Howard Blair, P.E., tom_blair@ieee.org

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Catalogue Description

EIN4933/6935– Electrical Machines and Drives. 3 cr (D).

Electric Machines and Drives will include an introduction to the basic theory and applications of motors and generators. The design and application of electric drives used in the starting and control of electric machines will be introduced. Applicable industry standards will be introduced as well. This course will review parts of an electric drive, electric machine, and system application considerations. We will review the theory of operation of induction, synchronous, and DC machines. Equivalent circuits will be reviewed to present simplified analysis methods. Induction and synchronous machine parameters will be presented.

Prerequisite

EEN 3375 (Electromechanical Systems) and {EEL 5250 (Power System Analysis 1) or EEL 4935/6936 (Industrial Power Distribution 1)} or instructor permission.

Co-requisites: None

Courses that require this course as a direct prerequisite: None

Level: UG/Grad

Credits: 3

Class Duration: 165 minutes per week

Textbook And/Or Other Required Material

Electrical Machines, Drives, and Power Systems, 6th Edition by Theodore Wildi, Prentice Hall 2005

Reference (supplemental reading): see references cited in required text.

Course Outcomes:

1. Students will become familiar with physical construction of AC and DC motors and controllers. Students will understand technical terms and definitions and basic application design calculations. Crit. 3(a)(e)(k)(m)
2. Students will become familiar with the proper motor & generator system design and application. Crit. 3(a)(c)(e)(k)(m)
3. Students will become familiar with methods of diagnosing and correcting motor, generator, or electric drive mis-operation or mis-application. Crit. 3(a)(e)(k)(m)
4. Students will become familiar with recognized standards utilized in the application and operation of electrical machines and drives in an industrial environment. Crit. 3(a)(c)(f)(k)(m)
5. Students will prepare and present a project on a properly designed motor and/or generator application and/or design. Crit. 3(a)(c)(e)(g) (k)(m)

Note: For a definition of the components of ABET Criterion 3, please refer to the "Relation of Course to EE Dept. Program Outcomes" section later in this syllabus.

Test & Grading Info: Grading – plus/minus grading will be used.

Homework:	25%	
Midterm:	25%	(open book/open notes)
Project:	25%	
Final:	25%	(open book/open notes)

Test Conflicts due to illness, religious observances, or travel may be rescheduled by contacting the instructor as soon as possible.

Course Syllabus

Topics Covered

M 08/22/2011	Safety for Installation and Use of Electric Motors & Generators (NEMA MG2). Fundamentals of Electricity, Magnetism, Circuits, Mechanics and Heat.
M 08/29/2011	DC Motors & Generators, Efficiency and Heating of Electrical Machines
M 09/05/2011	No School – Labor Day
M 09/12/2011	Three Phase Circuits, Introduction to Three Phase Induction Machines
M 09/19/2011	Selection and Application of Three-Phase Induction Machines, Equivalent Circuit of the Induction Motor
M 09/26/2011	Synchronous Motors & Generators
M 10/03/2011	Midterm Review
M 10/10/2011	Midterm Exam (LAC 1280, 6:00PM – 8:50PM)
M 10/17/2011	Single Phase Motors & Stepper Motors
M 10/24/2011	Tour of Motor Engineering Design and Repair Facility (TAW - 6:30PM – 9:00PM)
M 10/31/2011	Basics of Industrial Motor Control, Programmable Logic Controllers, and Fundamental Elements of Power Electronics
M 11/07/2011	Electronic Control of DC Motors & AC Motors (VFDs, Softstarts, DC Drives, etc)
M 11/14/2011	Tour of Motor Control Manufacturer (Motortronics, 6:30PM – 9:00PM)
M 11/21/2011	Industry Standards for Electronic Machines and Drives
M 11/28/2011	Final Review
M 12/05/2011	Final Exam (LAC 1280, 6:00PM – 8:50PM)

Specialization: This course is useful for the engineer involved in an industrial environment containing electrical machines and drives. This course will provide useful materials to assist the engineer in the proper design, application and use of electric machines and drives in an industrial environment.

Professional Component: Engineering Science – 50% Engineering Design – 50% (Eng Science = math/science required for creative applications; Eng Design = decision making process of devising a system, component or process to meet a desired need). This course is useful for the engineer involved with the planning, design, application and/or operation of electric machines and drives in an industrial environment.

Additional Course Features: This course will include an Electrical Machines and Drives technical project and will require the student to provide a technical report on the engineering design or application chosen. Additionally, this course will include a tour of a motor rewind facility and a tour of an electronic drive manufacturing facility.

Although attendance will not be taken (other than the first day of class, per university policy), attendance and participation is strongly suggested to enhance the learning experience for all students

Academic dishonesty of any kind will not be tolerated. If caught cheating, the guilty parties will be subject to AT LEAST failure of the course, up to and possibly including expulsion from the university. DO NOT CHEAT!!!

Relation of Course to the EE Dept. Program Outcomes:

Program Outcome "a": An ability to apply knowledge of basic math, science and engineering.

Program Outcome "c": An ability to design systems, components, or processes to meet desired needs.

Program Outcome "e": An ability to identify, formulate and solve engineering problems.

Course Syllabus

Program Outcome "f": An understanding of professional and ethical responsibility.

Program Outcome "g": An ability to communicate effectively.

Program Outcome "i": A recognition of the need for, and an ability to engage in lifelong learning.

Program Outcome "k": An ability to use techniques, skills and modern engineering tools necessary for engineering practice.

Program Outcome "m": Knowledge of basic and engineering science necessary to analyze and design complex electrical/electronic hardware/software devices and systems.

Final Exam Info: Monday, 12/05/2011, LAC 1280, 6:00PM – 8:50PM

Additional Course Info: When E-mailing Prof. Blair about this course, please either (1) include "EMD" as the first characters in the subject line, or (2) send the e-mail from Blackboard™ and keep its default subject line "[EELxxx.xxxF11]" at the beginning of your subject line. Thank you! All course materials will be posted on the course web page - thomasblairpe.com/EMD

Taping lectures requires the permission of the instructor. Online students are responsible for designating a proctor for tests, and must inform the instructor of their designation. Notifying the instructor of an inability to attend a class or class related activity is appreciated.

This course will include an Electrical Machines and Drives design or application project and will require the student to provide a technical report on the engineering topic chosen. Additionally, this course will include a tour of an operating motor rewind shop and electronic drive manufacturing facility.

Syllabus Prepared by: Ralph Fehr, Ph.D., P.E. and Thomas H. Blair, P.E.

Date of Approval of Syllabus by Area Subcommittee: