Course Syllabus

Course No. & Title:  
EEL 3375 – Electromechanical Systems

Term & Meeting Info:  
Fall 2007, MW 2:00-3:15, CHE 303

Instructor Info:  
Ralph Fehr, Ph.D., P.E., fehr@eng.usf.edu, Office: ENC 2502
Phone: (813) 974-1121, Fax: (813) 974-5250, Department Office Phone: (813) 974-6293
Office Hours: M 11:00-12:00, R 2:00-3:00, or by appointment
Website:  http://web.tampabay.rr.com/usfpower/fehr.htm

Catalog Description:  
Analysis of electromechanical device performance: transformers, transducers, DC motors and generators, AC motors and alternators.

Semesters Offered:  
Every semester

Prerequisites:  
EGN 3373 with a minimum grade of “B”

Corequisites:  
none

Courses that require this course as a direct prerequisite: technical electives in the Power area

Level:  
UG

Credits:  
3

Class Duration:  
75 minutes, twice a week

Text Info:  
Instructor Notes, available 9/24 at ProCopy.

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

Course Outcomes:

1. Students learn about development of today’s power system infrastructure. Crit. 3(h)
2. Students write a peer-reviewed essay on a historical power industry topic. Crit. 3(g)(h)
3. Students learn analysis techniques of polyphase systems. Crit. 3(a)(e)(l)(m)
4. Students learn fundamentals of electromechanics. Crit. 3(a)(e)(l)(m)
5. Students learn fundamentals of magnetic circuits. Crit. 3(a)(e)(l)(m)
6. Students learn theory of transformer operation and applications. Crit. 3(a)(e)(l)(m)
7. Students learn principles and applications of DC and AC motors and generators. Crit. 3(a)(e)(l)(m)
8. Students are exposed to educational and career opportunities in the power industry. Crit. 3(i)

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:  20%
Midterm:  20% each (2 total)
Essay:  15%
Final:  25%

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

- **M 08/27/07** Course Introduction, History of Power Systems
- **W 08/29/07** Future of Power Systems, One-Line Diagrams, Phasor Arithmetic
- **M 09/03/07** NO CLASS – LABOR DAY
- **W 09/05/07** Magnetic Circuits and Transformers: Magnetic Fields and Magnetic Circuits
- **M 09/10/07** Magnetic Circuits and Transformers: Magnetic Circuits, Inductance, Mutual Inductance
- **W 09/12/07** Magnetic Circuits and Transformers: Magnetic Materials, Ideal Transformers
- **M 09/17/07** Magnetic Circuits and Transformers: Ideal Transformers, Real Transformers
- **W 09/19/07** Magnetic Circuits and Transformers: Real Transformers
- **M 09/24/07** Exam #1
- **W 09/26/07** DC Machines: Overview of Motors
- **M 10/01/07** DC Machines: Principles of DC Machines
- **W 10/03/07** DC Machines: Rotating DC Machines
- **M 10/08/07** DC Machines: Separately-Excited DC Machines, Shunt-Connected Machines
- **W 10/10/07** DC Machines: Series-Connected Machines
- **M 10/15/07** DC Machines: Compound Machines
- **W 10/17/07** DC Machines: Speed Control of DC Motors
- **M 10/22/07** AC Machines: Principles of AC Machines
- **W 10/24/07** AC Machines: Synchronous Machines
- **M 10/29/07** AC Machines: Three-Phase Induction Machines
- **W 10/31/07** AC Machines: Equivalent Circuit and Performance Calculations for Induction Motors
- **M 11/05/07** AC Machines: Single-Phase Induction Motors
- **W 11/07/07** AC Machines: Stepper Motors, Brushless DC Motors, Universal Motors
- **M 11/12/07** NO CLASS – VETERAN’S DAY
- **W 11/14/07** AC Machines: Speed Control of AC Motors
- **M 11/19/07** Exam #2
- **W 11/21/07** Three-Phase Systems: The Per-Unit System
- **M 11/26/07** Three-Phase Systems: The Per-Unit System
- **W 11/28/07** Three-Phase Systems: Wye-Connected Systems, Delta-Connected Systems
- **M 12/03/07** Three-Phase Systems: Basic Three-Phase Calculations
- **W 12/05/07** Three-Phase Systems: Basic Three-Phase Calculations
- **Final Exam (Wed. Dec. 12, 3:30-5:30)**

Specialization: This course provides the essential background in electromagnetics necessary to understand the principles behind the operation of electric machines.

Professional Component: Engineering Science - 90%   Engineering Design - 10%
(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)

Additional Course Features: This course will require a peer-reviewed essay.

An optional field trip to a motor rewind facility will be offered.
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 EE Dept. Program Outcomes:

Program Outcome “a”: An ability to apply knowledge of basic math, science and engineering.
Program Outcome “e”: An ability to identify, formulate and solve engineering problems.
Program Outcome “g”: An ability to communicate effectively.
Program Outcome “h”: The broad education necessary to understand the impact of engineering solutions in a global and societal context.
Program Outcome “i”: A recognition of the need for, and an ability to engage in lifelong learning.
Program Outcome “l”: Knowledge of probability & statistics and advanced mathematics (e.g., calculus, DE, linear algebra, complex variables & discrete mathematics).
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: Wed. Dec. 12, 3:30-5:30

Additional Course Info: When E-mailing Dr. Fehr about this course, please either (1) include “3375:” as the first characters in the subject line, or (2) send the E-mail from Blackboard™ and keep its default subject line “[EGN3375.001F07]” at the beginning of your subject line. Thank you!

Taping lectures requires the permission of the instructor.

Syllabus Prepared by: Ralph Fehr, Ph.D., P.E.

Date of Approval of Syllabus by Area Subcommittee: Spring 2007