ELE 340: ELECTRICAL POWER SYSTEMS (required)

Credit: 4 hours.

Catalog Description: Study of the fundamentals of magnetic circuits and Faraday’s law to create electrical or mechanical energy. Study of transformers, mutual inductance, 3-phase power systems, induction motors, synchronous machines, and DC machines, with emphasis on the applications in engineering practice. Lecture, discussion three periods per week; laboratory, problem session two periods per week.

Prerequisites: ELE 210 with a grade of C or better and PHYS 251A.

Textbooks(s) and/or Other Required Materials: Fitzgerald, Kingsley, and Umans, Electric Machinery, McGraw Hill 2002. R. A. DeCarlo and P. M. Lin, Linear circuit Analysis, Oxford University Press, 2001 or other circuits text. Electrodynamics Laboratory Material (from WEB or Library).

Topics Covered:

- Power Systems, AC Circuits
- Average and Reactive Power
- Three-Phase Power, Magnetic Systems
- Mutual Inductance, Ideal Transformers
- Torque and Flux
- Commutator Machines
- Induction Machines
- Power Electronics
- Phasors, Instantaneous AC Power
- Three-Phase Circuits
- Coupled Magnetic Circuits
- Practical Transformers
- Basic Machines
- Induction Machines Basics
- Synch. Machines

Class/Laboratory Schedule:

- Lecture: 3 hours/week
- Lab: 2 hours/week

Course Objectives and Relationship to Program Outcomes:

1. To learn the fundamentals of ac circuit analysis and ac power calculations. (Outcome A, E, K)
2. To be able to understand and analyze the fundamental operation of electromagnetic machinery. (Outcome A, E, C)
3. To give the students an appreciation that there are more advanced concepts to be learned in electric power conversion and electric machinery. (Outcome I)
4. To give the students an opportunity to experimentally measure ac voltages, currents, and power and to observe the behavior of electromagnetic machinery. (Outcome B, C, E, K)
5. To give the students the experience of working together as a team for laboratory and homework assignments (Outcome D, F)

1. To have the students learn proper techniques in recording and displaying laboratory data. (Outcome B, G, K)
This course will instruct the student on transmission and conversion of electrical power. The student will learn about AC power calculations and three-phase power systems. Magnetic systems will be developed for use in power systems. Ideal and non-ideal transformers will be discussed. Steady state models of common electric machines will be developed. Important characteristics of these machines will be investigated. Electronic methods for converting power will be introduced.

Coverage (and level) of ABET Outcomes: A (3), B (3), C (2), D (2), E (3), F (1), G (1), I (1) and K (3).

Contribution of Course to meeting the Professional Component:
Engineering Topics: 100%

Date: June 2004.