EE 330/330L - ENERGY SYSTEMS

CATALOG DESCRIPTION:
(3-1) 4 credits. Prerequisite: EE 212. Production, transmission, and utilization of energy in systems with major electrical subsystems, with particular emphasis on electromagnetic and electromechanical systems and devices.

TEXT BOOK:

COORDINATOR:
Thomas P. Montoya, Assistant Professor of Electrical & Computer Engineering

GOALS:
This is a required course for EE majors. The primary goal of this course is to provide students with a basic understanding of electrical machine, its characteristics and operational behavior. Another goal of this course is to enhance interest in power area and is to create foundation for students to take follow-on courses.

CLASS SCHEDULE:
Lecture: 3 hour per week
Laboratory: Lab both simulation & actual laboratory (1 credit hour)

TOPICS:
1. Three-phase Fundamentals
2. Magnetic Circuits
3. Transformers
4. DC Machines
5. DC Generators
6. Induction Motors
7. Synchronous Generators
8. Synchronous Motors

COMPUTER USAGE:
Students use MATLAB calculations.

LABORATORY:
A one credit hour laboratory EE 330L accompanies this course. This is closed laboratory because of the safety issues with electricity & electrical machines. The laboratory may also include visit(s) to local power industry and talk(s) by professional engineer(s) on contemporary issues. The following laboratories are performed:

1. Measurements on a balanced three-phase load.
2. Determining equivalent circuit parameters of a single-phase transformer by open circuit & short circuit tests.
3. Determination of performance characteristics of a DC generator.
4. Load characteristics of DC shunt & series motor.
6. Synchronous generator operation.

OUTCOMES:
Upon completion of this course, students should demonstrate the ability to:
1. Analyze three-phase balanced circuit using single-phase equivalent
2. Use of phasor diagram to represent voltage & current of a circuit
3. Use of power triangle concept to analyze power factor correction
4. Analyze linear and non-linear simple magnetic circuits for power applications
5. Perform open-circuit, short circuit & load test on single-phase transformer
6. Perform calculations on transformer voltage regulation & efficiency
7. Uses of three-phase transformer connection to achieve desired power & voltage
8. Understand principles of DC machines
9. Calculations of DC machine characteristics
10. Understanding of rotating magnetic fields and how an Induction Machine works
11. Perform the no-load, blocked-rotor, and DC test on induction motor
12. Calculations of Induction Machine performance characteristics
13. Understand the basic Synchronous generator and motor behavior
14. Describe the conditions needed to connect AC generator to Utility grid
15. Effect of field excitation and V-curve of a synchronous motor

RELATION OF COURSE TO PROGRAM OBJECTIVES:
(a) an ability to apply knowledge of mathematics, science, and engineering
(b) an ability to design and conduct experiments, as well as to analyze and interpret data
(c) an ability to design a system, component, or process to meet desired needs
(d) an ability to function on multi-disciplinary teams
(e) an ability to identify, formulate, and solve engineering problems
(f) an understanding of professional and ethical responsibility
(g) an ability to communicate effectively
(h) the broad education necessary to understand the impact of engineering solutions in a global and societal context
(i) a recognition of the need for, and an ability to engage in life-long learning
(j) a knowledge of contemporary issues
(k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.
The following table indicates the relative strengths of each course outcome in addressing the program objectives listed above (on a scale of 1 to 4 where 4 indicates a strong emphasis.

**Course Outcomes**

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**CONTRIBUTION OF COURSE TO PROFESSIONAL COMPONENT:**

Course content address approximately 75% engineering science and 25% engineering design.

**Prepared by:** Dr. Abul R. Hasan

Dr. Thomas P. Montoya revised 1-24-2008