EE 330/330L - ENERGY SYSTEMS

CATALOG DESCRIPTION:

(3-1) 4 credits. Prerequisite: EE 221. Production, transmission, and utilization of energy in systems with major electrical subsystems, with particular emphasis on electromagnetic and electromechanical systems and devices.

TEXT BOOK:

S. J. Chapman, *Electric Machinery Fundamentals*, 5th Edition, McGraw-Hill Higher Education, 2012, ISBN 978-0-07-352954-7.

COORDINATOR:

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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 machines, e.g., characteristics and operational behavior. Another goal of this course is to enhance interest in the power area and is to create foundation for students to take follow-on courses.

CLASS SCHEDULE:

Lecture: 3 hour per week
Laboratory: 2 hours per week (1 credit hour)

TOPICS:

1. Three-phase Circuit and Power Fundamentals
2. Magnetic Circuits
3. Transformers
4. AC Machine Fundamentals
5. Synchronous Machines
6. Induction Motors
7. DC Machine Fundamentals
8. DC Motors and Generators

COMPUTER USAGE:

Students use MATLAB for calculations and graphs.

LABORATORY:

A one credit hour laboratory EE 330L accompanies this course. This is closed laboratory because of the safety issues. The laboratory may also include visit(s) to local power industry and talk(s) by professional engineer(s) on contemporary issues. In general, the laboratories will cover the following topics:

1. Three-Phase Loads
2. Single-Phase Transformer
3. Three-Phase Transformers

4. Synchronous Generator
5. Three-Phase Induction Motor
6. DC Machines

OUTCOMES:

Upon completion of this course, students should demonstrate the ability to:

1. Analyze three-phase balanced circuits using single-phase equivalent circuits.
2. Use power triangle concept to analyze loads and for power factor correction.
3. Analyze or design simple magnetic circuits for electric machinery applications.
4. Perform open-circuit, short circuit, and load tests on single-phase transformers to develop equivalent circuit models.
5. Analyze or design transformer circuits to find or achieve currents, voltages, and powers as well as key performance parameters, e.g., voltage regulation and efficiency.
6. Understand principles and uses of three-phase transformer connections to achieve desired currents, voltages, and powers.
7. Understand basic principles of AC machines.
8. Understand basic principles of synchronous generator and motor operation.
9. Perform open circuit, short circuit, and load tests on synchronous generators to develop equivalent circuit models and measure key performance parameters, e.g., voltage regulation and efficiency.
10. Analyze or design synchronous generator circuits to find or achieve currents, voltages, and powers as well as key performance parameters, e.g., voltage regulation and efficiency.
11. Perform the no-load, blocked-rotor, and DC tests on induction motors to develop equivalent circuit models.
12. Analyze or design induction motors to find or achieve currents, voltages, and powers as well as key performance parameters, e.g., speed, torque, and efficiency.
13. Understand basic principles of DC machines.
14. Perform laboratory tests on DC machines to develop equivalent circuit models.
15. Analyze or design DC motors to find or achieve currents, voltages, and powers as well as key performance parameters, e.g., speed, torque, and efficiency.

RELATION OF COURSE TO PROGRAM OBJECTIVES:

These course outcomes fulfill the following 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														
ABET Objectives		**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
	(a)	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
	(b)				4					4		4			4	
	(c)	3	4	4		4	3				4		4			4
	(d)				3					3		3				3
	(e)	3	3	3	3	3	3			3	3	3	3		3	3
	(f)				1					1		1			1	
	(g)				2					2		2			2	
	(h)															
	(i)															
	(j)															
	(k)				4					4		4				4

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