

KING FAHD UNIVERSITY OF PETROLEUM AND MINERALS
DEPARTMENT ELECTRICAL ENGINEERING
EE – 306 Electric Energy Engineering

Tentative Course Syllabus 071-2007

Instructor

<i>Name</i>	<i>E-mail</i>	<i>Phone #</i>	<i>Location</i>	<i>Office Hour</i>
Dr. Z. Al-Hamouz	zhamouz@kfupm.edu.sa	2782	59-2074	SW 10:00-10:55 AM

Textbook: **Electromechanical Energy Devices and Power Systems**
By: Zia A. Yamayee, Juan L. Bala, Jr., 1994.

Lecture Schedule

1. **Three Phase Circuits: (4 Lectures)**
Phasor diagram,
Balanced 3-phase circuits,
Delta and Wye connections
Power measurements.
2. **Transformers: (7 Lectures)**
Introduction and construction.
Theory of operation.
Equivalent circuit.
Parameters from No-Load and Short Circuit Tests
Voltage regulation and efficiency.
Auto-transformers and parallel operation of transformers
3 Phase transformers connections and equivalent circuit.
3. **DC Machines: (7 Lectures)**
Introduction and construction
Generation of Unidirectional Voltages
Voltage and Torque equations, and energy losses.
Equivalent circuit of DC generator, and DC generator types.
Voltage-current characteristic and terminal voltage control.
Equivalent circuit of DC motor, and DC motor types.
Speed-Torque Characteristics and Speed Control (field and armature control).
4. **3-Phase Synchronous Machines: (7 Lectures)**
Introduction and Construction.
Generation of a 3-phase voltage and Voltage equation.
Linear Analysis, equivalent circuit and Voltage Regulation.
Power of Cylindrical-Rotor Machine.
Parallel operation of synchronous generators.
Synchronous motor.
Phasor diagram, equivalent circuit and power factor control.
5. **3-Phase Induction Motor: (7 Lectures)**
Introduction and Construction.
Revolving Magnetic Field (skip mathematical analysis).
IM as a transformer.
Equivalent Circuit.
Equivalent Circuit Parameters from Tests.
Computation of IM Performance.
Torque-Speed Characteristic, Starting Torque and Maximum Developed Torque.

Exams

Exam #	Date	Place	Time
1	October 29, 2007	Will be assigned	5-7 PM
2	December 10, 2007	Will be assigned	5-7 PM

Grading Policy	
Quizzes and Attendance	10%
Project and assignments	5%
Two major exams	30%
Lab: attendance, Performance, and reports	12%
Final lab examination	8%
Final comprehensive exam	35%

Homework List

HW#	Topics	Text Section	H.W.
1	Three Phase Balanced Circuits	3..3,3.4	3.19, 3.22, 3.23, 3.25, 3.26, 3.27
2	Transformers	4.5.1-4.5.6	4.14, 4.15, 4.19, 4.21, 4.23, 4.24, 4.29, 4.31, 4.35
3	DC Machines	6.1-6.7	6.3, 6.7, 6.9,6.13,6.18, 6.23,, 6.27, 6.32, 6..36
4	Synchronous Machines	7.1, 7.2, 7.6	7.3, 7.8, 7.10, 7.12, 7.21,7.25, 7.26, 7.33, 7.36
5	Three Phase Induction Motor	8.1-8.4	8.5, 8.11, 8.17,8.20, 8.23, 8.29, 8.33, 8.35

Course objectives:

After successfully completing the course, the students will be able to

- understand basic concepts of energy conversion devices like transformers, generators and motors.
- learn how to start an operate an electrical machine
- learn how electrical machines are constructed
- know how to analyze the performance of an electric machinery
- learn the design principles of both AC and DC devices

Course outcomes

This course supports the following five program outcomes out of eleven required by ABET criterion 3 for accrediting engineering program:

Outcome1: An ability to apply knowledge of mathematics, science, and engineering to the analysis of electromechanical energy conversion devices

Outcome 2: Design and conduct experiments, as well as to analyze and interpret data

Outcome 3: Function on multi-disciplinary team

Outcome 4: An ability to identify, formulate, and solve engineering problems in the area of electromechanical energy conversions .

Outcome 5: Use the techniques, skills, and modern engineering tools necessary for engineering practice.

Prepared by Dr. A.H.Abdur-Rahim, December 5, 2006