Cleveland State University
Department of Electrical and Computer Engineering

EEC 361 Electromechanical Energy Conversion
Fall Semester 2006

Catalog Description: **EEC 361 Electromechanical Energy Conversion** (4-0-4). *Prerequisite*: EEC 311. Energy storage and conversion, force and emf production, coupled circuit analysis of systems with both electrical and mechanical inputs. Applications to electric motors and generators and other electromechanical transducers.

Textbook: *Electric Machinery Fundamentals*, Stephen Chapman, McGraw-Hill, 3rd ed., ISBN 0-07-011950-3, 1999.

Coordinator**:** Dr. A. V. Stankovic, Assistant Professor of Electrical and Computer Engineering.

Course Objectives: To develop the ability to understand electro-mechanical energy conversion principles and three-phase systems, dc, induction, and synchronous machines.

Expected Outcome: Upon completion of this course, students should be able to:

1. Understand the principles of Electromechanical Energy conversion.
2. Understand the operation of transformers.
3. Understand the steady-state operation of AC and DC machines.

Fulfills the Following Electrical Engineering Program Objectives and Outcomes:

Objectives:

1) practice electrical engineering in power electronics, and power systems.

Outcomes:

(a) an ability to apply knowledge of mathematics, science, and engineering to general electrical engineering and, in particular, to power electronics, and power systems.

Contribution of Course to Meeting the Professional Component:

Math & Basic Science: 2 credits; Engineering Topics: 2 credits; General Education: 0 credits

Prerequisite by Topic**:**

1. Steady State Power Analysis.
2.Three-phase Steady State AC Circuits.
3**.** Mutual Inductance.

Week	Topics:	Reading
1 (Aug 28-Sep 1)	Review of basic single-phase circuits	EEC311
2 (Sep 4-8)	**Labor Day Holiday September 4** Review of basic three-phase circuits	EEC 311
3 (Sep 11-15)	Rotational Motion, Newton's Law The Magnetic Field; Ampere's Law; Magnetic Circuits.	1.1-1.4
4 (Sep 18-Sept 22)	Faraday's Law. Production of Induced Force on a Wire. The Linear DC Machine	1.4-1.8
5 (Sep 25- Oct 29)	**Quiz Test #1** Transformers; The Ideal Transformer	2.1-2.3
6 (Oct 2-Oct 6)	Transformers; Real Single-Phase Transformer	2.4-2.5
7 (Oct 9 –13)	AC Machinery Fundamentals; Rotating Magnetic Field, MMF And Flux Distribution	4.1-4.3
8 (Oct 16-20)	**Columbus Day Holiday – October 9** AC Machinery Fundamentals; Induced Voltage and Torque	4.4-4.9

Week	Topics:	Reading
9 (Oct 23-27)	**Midterm Test #2**	
10 (Oct 30- Nov 3)	Synchronous Generators; The Speed of Rotation, Internal Generated Voltage	5.1-5.3
11 (Nov 8-12)	Synchronous Generators; Equivalent Circuit, Phasor Diagram, Power And Torque.	5.4-5.8
12 (Nov 13-17)	Synchronous Motors; Basic Principles of Motor Operation. LAB demonstrations.	6.1-6.2
13 (Nov 20-24)	**Quiz Test #3** Induction Motors; Basic Concepts, Equivalent circuit **Thanksgiving Holiday**	7.1-7.3
14 (Nov 27- Dec1)	Induction Motors; Power, Torque, Torque-Speed Characteristics	7.4-7.6
15 (Dec 4-Dec8)	DC Machinery Fundamentals	8.1-8.3

Grading:	**25% - Quizzes** **30% - Midterm Exam** **40% - Final Exam** **5% - Homework**
Homework:	**Has to be turned in on time.**
Computer Usage:	Software: MATLAB
Estimated ABET Category	Engineering Topics: 4 credits or 100%
Laboratory Projects:	None
Prepared by**:**	Dr. A. V. Stankovic Date**:** 08 10 06

There will be no make up quizzes, mid-term and final exams unless a student turns in a written excuse from a physician or an employer.