

School of Management, Engineering and Technology  
Department of Electrical Engineering and Renewable Energy  
REE 253: Electromechanical Energy Conversion

Catalogue Description (2009/2010):	AC machines, including single phase, split-phase and three-phase (induction and synchronous machines) motors and generators; introduction to power switching devices, speed control and brushless DC motors. DC machines including shunt, series and compound. Control devices and circuits, including ladder diagrams.
Hours/Credits: (Lecture-Lab-Total)	(2-3-3)
Class Schedule:	Two 50 minute lectures, per week, one term
Lab Schedule:	One three hour lab per week, one term
Prerequisites:	EE 223, Math 252 with grade "C" or better, or permission of the instructor
Required Text:	Chapman, S.J., "Electric Machinery and Power System Fundamentals," McGraw-Hill, 2002, ISBN 0-07-229135-4 Richter, H.P., Schwan, W.C., Hartwell, F.P., "Wiring Simplified," 41st Ed., Park Publishing Inc., ISBN: 0-9719779
Reference Text:	"Fundamentals of Engineering Supplied-Reference Handbook," National Council of Examiners for Engineering and Surveying (NCEES), 8th Ed., 2008 Skvarenina, T.L., DeWitt, W.E., "Electrical Power and Controls," 2nd Edition, Pearson Prentice Hall, 2004, ISBN 0-13-113045-5 "2008 NEC," 1st Ed., Thompson Delmar Learning, ISBN: 0877656231
Course Coordinator:	Robert Bass, Ph.D.
Regular Instructors:	Robert Bass, Frank Rytkonen, James Zipay
Course Objectives - Lecture:	Upon completion of REE 253 Lecture, a student should be able to: <ul style="list-style-type: none"> <li>Describe and apply electromagnetic principles in the operation of AC and DC machines.</li> <li>Understand the various types and classifications of motors and generators.</li> <li>Model various types of AC and DC machines using steady-state, single-phase equivalent circuits.</li> <li>Design, model and analyze systems containing single-, split- and three-phase AC machines.</li> <li>Understand how to improve the power factor of AC machines.</li> <li>Understand and model losses and efficiency of AC and DC machines</li> <li>Design and analyze motor and generator control circuits using ladder diagrams.</li> </ul>
Course Objectives - Lab:	Upon completion of REE 253 Lab, students should be able to: <ul style="list-style-type: none"> <li>Measure voltage, current and torque for various types of electromechanical machines</li> <li>Understand the operation of synchronous and induction motors and generators</li> <li>Understand the operation of split-phase motors</li> <li>Understand the operation of DC motors and generators</li> <li>Make voltage, current, speed and torque measurements to determine the losses and efficiency of motors and generators</li> <li>Design power control circuits for motor and generator systems.</li> <li>Implement an electromechanical system to solve a practical problem.</li> </ul>
Topics Covered:	<ul style="list-style-type: none"> <li>Fundamentals of Motors and Generators</li> <li>Single-, Split-, Three-Phase AC Machines</li> <li>DC Machines</li> </ul>

	<ul style="list-style-type: none"> <li>• Control Circuits</li> </ul>		
Relevant Program Outcomes:	<ul style="list-style-type: none"> <li>(a) an ability to apply knowledge of mathematics, science, and engineering</li> <li>(b) an ability to design and conduct experiments, as well as to analyze and interpret data</li> <li>(c) an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability</li> <li>(d) an ability to function on multi-disciplinary teams</li> <li>(e) an ability to identify, formulate, and solve engineering problems</li> <li>(g) an ability to communicate effectively</li> <li>(k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice</li> <li>(l) an ability to apply the fundamentals of energy conversion and applications</li> </ul>		
Required or Elective:	Required		
Criterion 5:	Engineering Topics		
Prepared By:	Robert Bass, Ph.D.	Updated:	April 22, 2010