

ECE610

Energy Conversion

Objective: To provide a basic background in static and electromechanical energy conversion devices; intended for students with interests in the control of electrical and electromechanical systems with applications to electric energy systems.

Description: Electric machines are a technology of choice in many modern energy conversion applications, including propulsion for hybrid-electric vehicles, wind energy generation, and flywheel energy storage systems. Interest in machines is steadily increasing due in large part to the flexibility of controls offered by modern computers and power electronic devices. In this course, the tools required for analysis and design of electromechanical energy conversion are developed. Upon completion of the course, a student's engineering toolbox should contain 1) an understanding of the basic principles of static and electromechanical energy conversion, 2) knowledge of the use of reference frame theory applied to the analysis of rotating devices, 3) an understanding of the steady-state and dynamic characteristics of induction, permanent magnet synchronous, and wound rotor synchronous machines, and 4) basics of DC-AC power conversion circuits and their use in the control of electric machinery.

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Text: **Analysis of Electric Machinery and Drive Systems** – P.C. Krause, O. Wasynczuk, S.D. Sudhoff, S. D. Pekarek

Prerequisite: Undergraduate machines course or graduate standing

Course Info: <http://www.itap.purdue.edu/learning/tools/blackboard/>

Approximate Syllabus:

Weeks, Content

2	Electromechanical Energy Conversion Principles
1.5	Magnetomotive force and distributed windings in AC Machinery
1.5	Reference Frame Theory
2	Permanent Magnet Machines
2.5	Wound-Rotor Synchronous Machines
2	Symmetric Induction Machines
2.5	AC-DC Converters and Drives
1	Exams

Homeworks: Assignments will be provided periodically throughout the semester (posted online on blackboard). Due dates will be posted with the homeworks. Some of the assignments will require the use of Matlab. Homework turned in late will not be accepted.

Exams: Two one-hour exams and one final exam. Exam 1 will be Tuesday September 26th, 2017. Exam 2 will be Thursday November 2, 2017. Final exam date TBD. Exam dates are known well ahead and fixed – please adjust work schedules accordingly.

Grades: Homework average will be computed and scaled to a value 0-50. Exam 1 and Exam 2 will each be scaled to a value 0-100. The final will be scaled to a value 0-200. Sum of the scaled homework and exam scores will be used to determine the course grade.

Academic Dishonesty Policy: All homeworks and exams are to be an individual's own work. Cheating on any of these will lead to an 'F' for the course.

Please Note: In the event of a major campus emergency, course requirements, deadlines, and grading percentages are subject to changes that may be necessitated by a revised semester calendar or other circumstances. Any changes will be posted on the course website. Please review the course website and ensure you can obtain information when you are off campus.

Also, please review emergency preparedness plans that are provided at http://www.purdue.edu/emergency_preparedness/.