

ECE 5041: Electric Machines

Course Description

Principles of electromechanical energy conversion; basic structures of electric machines; steady state models and performance analysis; advanced topics on AC machine control.

Prior Course Number: ECE 643 and ECE 743

Transcript Abbreviation: Electric Machines

Grading Plan: Letter Grade

Course Deliveries: Classroom

Course Levels: Undergrad, Graduate

Student Ranks: Junior, Senior, Masters, Doctoral

Course Offerings: Spring

Flex Scheduled Course: Never

Course Frequency: Every Year

Course Length: 14 Week

Credits: 3.0

Repeatable: No

Time Distribution: 3.0 hr Lec

Expected out-of-class hours per week: 6.0

Graded Component: Lecture

Credit by Examination: No

Admission Condition: No

Off Campus: Never

Campus Locations: Columbus

Prerequisites and Co-requisites: Prereq: 3020 (323) and 3040 (341), or Grad standing in Engineering, Biological Sciences, or Math and Physical Sciences.

Exclusions: Not open to students with credit for 743.

Cross-Listings:

Course Rationale: Existing course.

The course is required for this unit's degrees, majors, and/or minors: No

The course is a GEC: No

The course is an elective (for this or other units) or is a service course for other units: Yes

Subject/CIP Code: 14.1001

Subsidy Level: Doctoral Course

Programs

Abbreviation	Description
CpE	Computer Engineering
EE	Electrical Engineering

Course Goals

Apply the knowledge of mathematics and engineering, especially in the areas of electromechanics, electromagnetics, and power engineering.
Analyze electric machines using equivalent circuit and learned in the class.
Interpret data by the use of statistics.
Design a system, component or process, and apply simultaneously electric machine criteria.

Work and write reports together as team members.
Develop an ability to recognize, formulate and solve electromechanical engineering problems.
Use modern simulation and programming tools to solve problems related to contemporary engineering issues, such as electromechanical energy conversion in wind power.
Communicate more efficiently, since computer simulation reports are required; and will practice report writing, programming, plotting and editing skills necessary for engineering practice.

Course Topics

Topic	Lec	Rec	Lab	Cli	IS	Sem	FE	Wor
Introduction to electromechanical energy conversion, principles of electric machines	6.0							
General structure and major components of electric machine; derivation of steady state model of electric machines and other electromechanical devices	6.0							
Steady state performance analysis of electric machine and other electromechanical devices	3.0							
Variable speed control and operation of electric machines	3.0							
Matrix representation of magnetic coupling of windings	3.0							
Dynamic modeling and simulation of AC machines	6.0							
Interface of AC machine with voltage source converters	3.0							
AC machine with power electronics control	3.0							
Torque and speed capability of AC machine drives	3.0							
Vector control of AC machines	6.0							
Special topics on permanent magnetic machines and control	3.0							

Representative Assignments

Computer simulation process and results in report
Homework

Grades

Aspect	Percent
Reports and homework	35%
Quizzes	5%
Exams	60%

Representative Textbooks and Other Course Materials

Title	Author
<i>Electromechanical Motion Devices</i>	PC Krause, Oleg Wasynczuk and Steve Pekark

ABET-EAC Criterion 3 Outcomes

Course Contribution		College Outcome
**	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.

Course Contribution		College Outcome
**	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.

Additional Notes or Comments

Update course description, abbreviation, prereqs and exclusions to match university version.

Added textbook 9/10/12

Remove 643 from exclusions 12/5/12

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