

ECE 7842: Advanced Topics in Electric Machines

Course Description

Advanced topics of electric machines, beginning with dynamic modeling and principles of vector control and evolving into new design and control of electric machines for advanced traction motors and renewable energy generator systems.

Prior Course Number: 743, 744, 845

Transcript Abbreviation: Adv Top Elec Mach

Grading Plan: Letter Grade

Course Deliveries: Classroom

Course Levels: Graduate

Student Ranks: Masters, Doctoral

Course Offerings: Autumn

Flex Scheduled Course: Never

Course Frequency: Even Years

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: 5541 (643) and 5551 (650).

Exclusions: Not open to students with credit for 743, 744, or 845.

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

Course Goals

State-of-the-art electric machine and control methods will be introduced
Dynamic modeling and simulation skills will be enhanced
Practical design guidelines will be utilized in multiple week projects

Course Topics

Topic	Lec	Rec	Lab	Cli	IS	Sem	FE	Wor
Winding functions and dynamic modeling of AC machines	6.0							
D-Q transformation and reference frame theory	3.0							
Vector control and field orientation principles	3.0							

Topic	Lec	Rec	Lab	Cli	IS	Sem	FE	Wor
Variable speed operation and energy efficiency	3.0							
Application example: electric traction motors for electrical and hybrid electrical vehicles	3.0							
Application example: electric generators for wind turbine applications	3.0							
Multiple-week project	21.0							

Representative Assignments

Review of current literature on various topics related to course content; present a summary to class.
Multi-week projects related to various aspects of electric machine analysis, control and design.

Grades

Aspect	Percent
Mid semester exam	25%
Final exam	25%
Homework	15%
Multi-week projects.	35%

Representative Textbooks and Other Course Materials

Title	Author
<i>Class notes that will be uploaded into CARMEN</i>	
<i>Current publications and industry standards in technical journals such as IEEE</i>	

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.
***	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

Updated abbreviation, prereqs, exclusions, goals and topics to conform to university format 3/29/12

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