

ECE 432/532 – Dynamics of Electromechanical Energy Conversion

Catalog Description: Generalized machine theory. Techniques for dynamic analysis of electromechanical machines: dq representations of machines.

Credits: 4 **Terms Offered:** Spring, in alternate years

Prerequisites: ENGR 331, Co-requisite: ECE 431

Courses that require this as a prerequisite: ECE 534

Structure: Three 50-minute lectures per week

Instructors: Julia Zhang and T. Brekken

Course Content:

- Principles of energy conversion
- Parameter calculation and measurement
- Reference frame theory
- Analysis and control of DC machines
- Analysis and control of induction machines
- Analysis and control of synchronous machines
- Analysis and control of brushless DC drives
- Transfer functions and basic control theory
- Electric machine and drives simulation

Measurable Student Learning Outcomes:

At the completion of the course, students will be able to...

1. **Explain** the advantages and disadvantages of brushed DC machines compared to AC machines (ABET Outcomes A, C, j)
2. **Understand** the principles and methods of transformation from three-phase to two-axis quantities (ABET Outcomes A, c, E, K)
3. **Transform** the quantities of a three-phase induction motor to its two-axis equivalent and develop the electrical and mechanical performance equations for dynamic operation (ABET Outcomes A, c, E, K)
4. **Transform** the quantities of a three-phase synchronous motor or generator into its two-axis equivalent and develop the electrical and mechanical performance equations for dynamic operation (ABET Outcomes A, c, E, K)
5. **Demonstrate** the methods for the two-axis modeling and control of electrical machines (ABET Outcomes A, c, E, K)
6. **Use** high level simulation tools for machine analysis (ABET Outcomes A, c, E, K)

Graduate students must also use high level simulation tools, including GUI interfaces.

Learning Resources:

- Mohan, *Advanced Electric Drives*, MNPERE, 2001

Students with Disabilities:

Accommodations are collaborative efforts between students, faculty and Services for Students with Disabilities (SSD). Students with accommodations approved through SSD are responsible for contacting the faculty member in charge of the course prior to or during the first week of the term to discuss accommodations. Students who believe they are eligible for accommodations but who have not yet obtained approval through SSD should contact SSD immediately at 737-4098.

Link to Statement of Expectations for Student Conduct:

<http://oregonstate.edu/admin/stucon/achon.htm>

Revised: 10/23/07

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