ECE 331 – Electromechanical Energy Conversion

Catalog Description: Energy conversion principles for electric motors. Steady-state characteristics and analysis of induction, synchronous and direct current machines.

Credits: 4 **Terms Offered:** Winter

Prerequisites: ENGR 202 or 202H

Courses that require this as a prerequisite: ECE 432

Structure: Three 50-minute lectures and one 3-hour lab per week

Instructors: T. Brekken (primary), Julia Zhang (secondary)

Course Content:

- Magnetic circuits, magnetic materials, permanent magnets, non-linear magnetic circuits,
- single-and-three-phase transformers.
- Balanced wye and delta-connected three-phase circuits with measurements of active and re-active power.
- Principles of electromechanical energy conversion.
- Three-phase induction machines.
- Single-phase induction machines.
- Three-phase synchronous machines: wound rotor and permanent magnet.
- Direct-current machines.
- Regenerative braking.
- Introduction to drives and power electronics in control of electric machines, including switch-mode PWM converters for drives applications.

Measurable Student Learning Outcomes:

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

1. **Analyze** the performance of single- and three-phase transformers (ABET Outcomes A, c, e, k)
2. **Analyze** the performance of three-phase induction motors and generators (ABET Outcomes A, c, e, k)
3. **Analyze** the performance of synchronous motors and generators (ABET Outcomes A, c, e, k)
4. **Analyze** the performance of dc motors and generators (ABET Outcomes A, c, e, k)
5. **Identify** the differences of design, construction and application between induction, synchronous and dc motors (ABET Outcomes A, C, E, j, k)
6. **Analyze** power electronics used in the control of electromechanical machines (ABET Outcomes A, C, E, j, k)

Learning Resources:

- Electric Machines and Drives: A First Course, Ned Mohan, Wiley, 2012
- Electric Machinery Fundamentals, Stephen Chapman, McGraw-Hill

Students with Disabilities:

Accommodations are collaborative efforts between students, faculty and Disability Access Services (DAS). Students with accommodations approved through DAS 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 DAS should contact DAS immediately at 737-4098.

Link to Statement of Expectations for Student Conduct:
http://oregonstate.edu/admin/stucon/achon.htm

Revised: 11/27/07
Revised Students with Disabilities: 2/15/11
Revised: 4/11/13