ECE 431/531 – Power Electronics

Catalog Description:  Fundamentals and applications of devices, circuits and controllers used in systems for electronic power processing.

Credits:  4  Terms Offered:  Fall

Prerequisites:  ECE 322, ECE 323, ECE 351

Courses that require this as a prerequisite:  None

Structure:  Two 80-minute lectures and one 3-hour lab per week

Instructors:  A. von Jouanne (primary), T. Brekken (secondary)

Course Content:
- Introduction and principles of electronic power processing
- Power semiconductors - usage, driving, protection, applications, design aspects
- Thermal design
- Analysis and design of rectifier circuits
- Analysis and design of DC-DC converters and off-line power supplies
- Analysis and design of inverter circuits

Measurable Student Learning Outcomes:
At the completion of the course, students will be able to...
1. State current and future applications of power electronics (ABET Outcomes: H, i, J)
2. Identify the characteristics and applications of power semiconductor devices (ABET Outcomes: a, c, j, m)
3. Analyze and design AC-DC rectifier circuits, and recognize the characteristic current and voltage harmonics generated (ABET Outcomes: A, C, e, K, m, n)
4. Analyze and design DC-DC converter circuits for power supply applications, and identify the application of appropriate topologies (ABET Outcomes: A, C, e, K, m, n)
5. Analyze and design DC-AC inverter circuits, and state and apply the fundamentals of Pulse-Width Modulation (PWM) control (ABET Outcomes: A, C, e, K, m, n)
6. Perform laboratory experiments utilizing the above concepts (A, B, o, Q)
7. ECE 531: Analyze, design, evaluate and present on switch mode power supplies and alternatives.

Evaluation of Student Performance:  Midterm (30%), Final (35%), Laboratory (15%), Homework (20%); ECE 531 students’ presentation will be included in their evaluation.

Learning Resources:
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: 2/11/09