

## 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 351

**Corequisites:** ECE 323

**Courses that require this as a prerequisite:** None

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

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

Graduate students are required to analyze and design switch mode power supplies.

### Learning Resources:

- Mohan, N., T. Undeland, W. Robbins, *Power Electronics: Converters, Applications, and Design*, John Wiley & Sons, Inc., 2003

### 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: 10/26/07

Revised: 4/14