

ECE 417/ECE517 – Basic Semiconductor Devices

Catalog Description: Theory and physical principles of bipolar junction and field-effect transistors.

Credits: 4 **Terms Offered:** Winter

Prerequisites: ECE 416

Courses that require this as a prerequisite: None

Structure: Two 80-minute lectures and a 50-minute recitation per week

Instructors: J. F. Wager (primary), A. Jander (secondary)

Course Content:

- Theory and physical principles of bipolar junction transistors
- Theory and physical principles of field-effect transistors
- Modeling and simulation of semiconductor devices using computer aided design/analysis software

Measurable Student Learning Outcomes:

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

1. **Analyze** bipolar junction transistor and MOSFET operation using energy band diagrams. (ABET Outcomes a, e, m)
2. **Understand** the physical origins of the different operating regimes (active, saturation, cutoff, inverse) of a bipolar junction transistor.
3. **Identify** the accumulation, depletion and inversion regimes for a p- or n-type semiconductor in a MOS structure using its C-V characteristics and energy band diagrams.
4. **Understand** the physical origins of the different operating regimes (cutoff, pre-saturation, saturation) of a MOSFET transistor.
5. **Prepare** a report on a project involving the analysis/design of a semiconductor device using computer-aided design tools. (ABET Outcomes a, c, e, g, k, m, p)
6. **ECE 517: Critically review** a journal paper topically related to the course.

Learning Resources:

- *Semiconductor Device Fundamentals*, R.F. Pierret, Addison Wesley, 1996

Evaluation of Student Learning:

- 417: 50% midterm exams (2), 25% final exam, 15% project, 10% homework,
- 517: 40% midterm exams (2), 25% final exam, 15% project, 10% homework, 10% paper review

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 (e.g., cheating policies)

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

Revised: 04/18/11