Catalog Description: Solid-state physics as applied to electronic devices, semiconductor materials, conduction processes in solids, device fabrication, diffusion processes, and semiconductor devices.

Prerequisites: EEL3300, or equivalent (grading C or better). Basic background in semiconductor physics and devices is beneficial, but not absolutely necessary.


Homework: Homework is essential to understand the concepts presented in this course. Students will typically have one or two weeks to complete homework assignments. Assignments will be collected at the beginning of class, and no late homework will be accepted. Solutions will be available online at [www.eng.fsu.edu/~pandrei/Courses/](http://www.eng.fsu.edu/~pandrei/Courses/) after the due date. Students are allowed and encouraged to work together on the homework, but each student must submit an individual solution set. Directly copying a solution from another student or source is not permitted.

Exams: There will be two in-class tests and a final exam. Failure to take the tests/exam will result in a score of zero for that test/exam.

Each graduate student will also be assigned a project in the first 2 weeks of classes. The project consists in writing a 3-page paper about a topic that will be given. The paper should be formatted as close as possible to the IEEE standard, which you can find at: [http://www.eng.fsu.edu/~pandrei/Courses/2005/EE6353/template.doc](http://www.eng.fsu.edu/~pandrei/Courses/2005/EE6353/template.doc) and should contain an Abstract, Introduction, one or more Technical Sections, and Conclusions. When writing the paper, you should not copy full sentences from another article published in the literature. You should try to do a synthesis of the topic that was assigned to you by consulting articles in the literatures related to your topic. The final paper should be submitted to the instructor and should be presented in class during the last week of classes.

Schedule of Exams:
- Project Presentation: Last Week of Classes
- Examination 1: Monday, September 26, 2005
- Examination 2: Monday, October 31, 2005
- Final Examination: To be announced.

Course Objectives:
At the completion of this course the student should be able to:

1. Describe crystal properties and growth of semiconductors.
2. Apply basic quantum mechanics to atomic and semiconductor models.
3. Derive equations of charge transport in semiconductors under normal operating conditions.
4. Determine charge, electric field, potential distributions, and energy band diagrams in pn-junction diodes under normal operating conditions.
5. Apply the charge diffusion equation to pn-junction diodes and bipolar junction transistors, and derive I-V characteristics for diodes and transistors, and small-signal admittance and transient response for diodes.
6. Derive I-V characteristics of field-effect-transistors.
7. Discuss the fundamental applications of photodiodes, solar cells, and light-emitting diodes.
8. List fabrication steps used in production of pn-junction diodes and various types of transistors.
9. Describe the impact of electronics on the technology and contemporary issues in solid-state electronics.

Policy Statements:
- Class attendance is required for all students. College and University rules allow only 3 unexcused absences for this course.
- Homework is due on the announced date and at the beginning of class.
- The general policy is no makeup exams. In the event of an excused absence, you must notify the instructor prior to the exam to discuss proper procedure.
- Cellular phones and beepers must be turned off in the classroom.
- Coming in late or leaving early will be considered as absence of class.
- Students are bound by the honor code of their university. Violations of the honor code will be reported. Penalties include but are not limited to 1) failing grade on the assignment and 2) failing grade for the course.
- Students with disabilities who need academic accommodations should: (1) Register with and provide documentation to the Student Disability Resource Center (SDRC); and (2) Bring a letter to the instructor indicating the need for accommodations and the specific type. This should be done within the first week of classes. This syllabus and other class materials are available in alternative format upon request.

Grading:
- Homework: 5% (bonus points)
- Examination 1: 25% (partial exam)
- Examination 2: 25% (partial exam)
- Final Examination: 35% (comprehensive exam)
- Project: 15% (project presentation)

Grading scale:
- A: >90%, B: 80-90%, C: 65-79%, D: 50-64%, F: <50%
- These breakpoints may be lowered slightly depending on overall class performance.

Prepared by: Petru Andrei Date: August 26, 2005