EEL 4351 Electron Device Fundamentals,
(Spring, 2005, 3rd Period, MWF, Che 316)

Goals: (1) To develop an in-depth understanding of device physics, (2) to apply it to advanced semiconductor devices, (3) to develop essential background for nanotechnology, and (4) to gain experience on supervised, peer-reviewed projects

Instructor: Dr. Jing Guo (NEB 551, guoj@ufl.edu)

Prerequisite: EEL3396

Text: “Modern Physics for Engineers,” Jasprit Singh, John Wiley & Sons, 1999 (Chap. 2-6)


Office hours: Tues. and Thurs., 3:30-5:00pm (NEB551)

Topics:

Part I. Modern Physics for Engineers

1. Wave behavior of particles (2 weeks)
2. Particles in periodic potentials (2 weeks)
3. Particles in attractive potentials (2 weeks)
4. Tunneling of particles (2 weeks)
5. Review and exam (1 week)

Part II. Introduction to Nanoelectronics

1. Nanoscale silicon transistors (1 week)
2. Other nanoelectronic transistors (2 week)
3. Project presentations on nanoelectronics (2 weeks)

Grading:

1. 5% homework (to be graded by a grader). Late homework or failure of submission results in loss of points.
2. 50% exam. A midterm exam will be held on the week of March 21st, which covers part I of the course.
3. 45% final project. 40% will be based on the instructor’s your peers’ evaluation of your project, and 5% will be based on your comments to your peers’ projects.
4. The overall class average will determine the B-B+ breakpoint. The A range will start one standard deviation above this point, the C+ range one standard deviation below.
**Project:**

1. Small teams with 2-3 students/team will be formed to perform a project.
2. Submit in the week of Feb. 21 a final project topic with a rough indication of what you would like to contribute.
3. Submit in the week of Mar. 7 a one-page report that identifies 3-5 major experts/groups in this area.
4. Each team will give a 25 min presentation during the last 2 weeks of the class (20 min presentation+ 5min Q&A).
5. Review your peers’ project presentation.
6. The following topics are suggested by the instructor, and you are also welcome to pick up your own topic. The major reference is the November 2003 issue of the Proceedings of the IEEE (electronic UF library), which is devoted to nanoelectronics.
   - Nanoscale silicon transistors
   - Carbon nanotube transistors
   - Molecular transistors
   - Cellular automation
   - Limits of digital computation
   - Nanobiotechnology
   - Nano electro-mechanical systems
   - Single electron devices and circuits