Course Syllabus

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EEL 5934/4930 Fundamentals of RF and Power Electronic Devices

(MWF 5th period, LAR 239, Fall 2017)

Goals: The course is designed to introduce important semiconductor device technologies for high speed electronics, power electronics and energy harvesting applications. The students are expected to develop fundamental understanding on the device physics of the most important semiconductor devices for these applications, and develop the capability to analyze device characteristics based on fundamental device theories. The students are also expected to appreciate the technological applications of the devices.

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

Prerequisite: The students are expected to have already completed an introductory level device course at the undergraduate level, such as EEE3396c here at UF or any equivalent course at other institutes.

Text

- Class notes and handouts
- "Semiconductor Device Physics and Design," U. Mishra and J. Singh, Springer (for reference)
- Fundamentals of Power Semiconductor Devices (2nd edition), J. Baliga, Springer Sciences, 2008 (for reference, full text downloadable from UF library full text link).
- "Modern Semiconductor Devices for Integrated Circuits," Chemnimg Calvin Hu, Prentice Hall, 2009 (for reference).

Office hours: Monday, 2-4pm, NEB. 551

Topics:

1. Semiconductor material and PN junction
2. PIN power diodes
3. Solar cell for energy harvesting
4. Bipolar Junction Transistor (BJT)
5. Heterojunction bipolar transistor (HBT) for RF electronics
6. MOS capacitor and MOSFET
7. Power MOSFET
8. High Electron Mobility Transistor (HEMT) for RF electronics
9. IGBT for power electronics
10. Exam
11. Lab Sessions: (PIN power diode lab, BJT lab)

Grading:

- 10% Lab Session Report and Homework: Late report or homework results in loss of points.
- 10% in-class quizzes and assignments
- 30% Exam: The exam is based on class notes including oral comments, problems solved in classroom and homework and quiz problems. The students are responsible for the above materials.
- 15% Research paper presentation: Each student will choose a research paper, preferably related to their term project, in the field of memory device technology and present it in class. The presentations will be graded based on 1) the presenter's ability to clearly describe the problem, explain the solution, and evaluate the (experimental or simulation) results, 2) the quality of answers provided to the questions, and 3) the content of the slides.

- 35% Project: It consists of 30% final presentation, and 5% peer review participation.

Final presentation: Half of the final presentation should be overview of the research field for the project, and the other half shall clear identify a problem, perform calculation, modeling, or simulation, and reach YOUR OWN conclusion on the memory device studied in the project.

Attendance Requirements: As this course will have in class quizzes and assignments, consistent attendance is very important. Perfect class attendance is not required, but very consistent participation is expected. It will be tracked through participation in the in-class quizzes and assignments. There is no make-up for in-class quizzes and assignments.

Make-Up Exam Policy: If you have a University-approved excuse and arrange for it in advance, or in case of documented emergency, a make-up exam will be allowed and arrangements can be made for making up missed exam. University attendance policies can be found at: https://catalog.ufl.edu/ugrad/current/regulations/info/attendance.aspx The student must submit a written petition to the instructor two weeks prior to the scheduled exam and the instructor must approve the petition.

Honesty Policy: All students admitted to the University of Florida have signed a statement of academic honesty committing themselves to be honest in all academic work and understanding that failure to comply with this commitment will result in disciplinary action. This statement is a reminder to uphold your obligation as a UF student and to be honest in all work submitted and exams taken in this course and all others.

"...failure to comply with this commitment will result in disciplinary action compliant with the UF Student Honor Code Procedures (http://www.dso.ufl.edu/sccr/procedures/honorcode.php) "

Accommodation for Students with Disabilities: Students Requesting classroom accommodation must first register with the Dean of Students Office. That office will provide the student with documentation that he/she must provide to the course instructor when requesting accommodation.

UF Counseling Services: Resources are available on-campus for students having personal problems or lacking clear career and academic goals. The resources include:

- UF Counseling & Wellness Center, 3190 Radio Rd, 392-1575, psychological and psychiatric services.
- Career Resource Center, Reitz Union, 392-1601, career and job search services.

Software Use: All faculty, staff and student of the University are required and expected to obey the laws and legal agreements governing software use. Failure to do so can lead to monetary damages and/or criminal penalties for the individual violator. Because such violations are also against University policies and rules, disciplinary action will be taken as appropriate. We, the members of the University of Florida community, pledge to uphold ourselves and our peers to the highest standards of honesty and integrity.

Evaluation: Students are expected to provide feedback on the quality of instruction in this course by completing online evaluations at **https://evaluations.ufl.edu**   **(https://evaluations.ufl.edu/)** . Evaluations are typically open during the last two or three weeks of the semester, but students will be given specific times when they are open. Summary results of these assessments are available to students at **https://evaluations.ufl.edu/results/**   **(https://evaluations.ufl.edu/results/)** .

Course Summary:

Date	Details