ELEG-447-11: Semiconductors

Semester: Spring 2006
Class Time: Tuesday, Thursday 02:30PM - 03:45PM.
Classroom: Dana 31.
Instructor: Xingguo Xiong (Assistant Professor)
Office: Tech 140.
Office Hours: Monday Wednesday 3:00pm-4:00pm, Thursday 4:00pm-5:00pm.
Phone: 203-576-4760.
Email: xxiong@bridgeport.edu
GA: Patel Bhavin: bhavinp@bridgeport.edu.

Description: This course will introduce the modeling and analysis of semiconductor materials and devices. Topics include semiconductor behavior modeling, PN junction, metal-semiconductor contacts, bipolar transistor, MOSFET, and some semiconductor fabrication technologies, etc.

Textbook: Robert F. Pierret, *Semiconductor Device Fundamentals*, Addison Wesley Longman Publishing Company, ISBN: 0201543931.

Reference: Yuan Taur, Tak H. Ning, Fundamentals of Modern VLSI Devices, Cambridge University Press, ISBN: 0521559596.
Simon M. Sze, Semiconductor Devices: Physics and Technology, 2nd Edition, Wiley, ISBN: 0-471-33372-7.
S. M. Sze, Semiconductor Sensors, John Willey and Sons, 2994.

Goals: This course is designed to introduce to students about the semiconductor physics and device modeling. Upon finishing the course, students will be familiar with the semiconductor modeling, and device behavior analysis. The students will also be familiar with the modeling of the basic semiconductor devices such as bipolar transistors, J-FET and MESFET, MOSFET etc.

Prerequisites: Undergraduate and graduate students with engineering or physics background.

Topics:

1. General information of semiconductor,
2. Carrier modeling, carrier action,
3. Diode introduction.
4. P-N junction Statics, the ideal diode Volt-Ampere characteristic.
5. Deviations from the ideal diode.
6. P-N junction Admittance, switching Response.
7. Metal-Semiconductor contacts.
8. Bipolar junction transistors,
9. Ideal junction transistor, deviations from ideal transistor.
10. MOSFET, non-ideal MOS and modern FET structures.

Grading: The final grade will be 15% on quizzes, 40% on homework/projects, 20% on mid-term exam and 25% on final exam.

Exams There will be two exams: the mid-term exam and the final exam.

Computer Usage: Matlab software will be used for the homework and projects. Matlab tutorials will be given before the homework and projects.

Lab Project: The student will need some software for the mathematical calculation in solving the homework problems.