The University of Texas at Tyler
Department of Electrical Engineering

Course: EENG 4330 – Solid State Devices (Elective)

Syllabus

Catalog Description:

Introduction to the operation and fabrication of solid state electronic devices. The principles describing charge transport in semiconductors are derived. Also covered are standard fabrication methods for diffusion, oxidation, and lithography; Includes the development of the electrical models for diodes, bipolar junction transistors and field effect transistors.

Prerequisites: EENG 3303, EENG 4309

Credits: (3 hours lecture, 0 hours laboratory per week)

Text(s): Ben Streetman and Sanjay Banerjee: Solid state Electronic Devices, 6th Edition, Prentices Hall, 2006

Additional Material: MATLAB Software, Class Notes

Course Coordinator: Ron J. Pieper

Topics Covered: (paragraph of topics separated by semicolons)

Crystal structures; origin of band-gap and direct indirect band gaps; Fermi-Dirac probability occupation functions; carrier concentrations; temperature effects for mobility, conductivity, resistivity, and sheet resistance; drift and diffusion currents; diodes; bipolar and field effect transistors; fabrication

Evaluation Methods: (only items in dark print apply):

1. Examinations (80%)
2. Homework//Quiz (10%)
3. Report (typical 5%)
4. Computer Programming (typical 10%)
5. Project
6. Presentation
7. Course Participation
8. Peer Review

Course Objectives[1]: By the end of this course students will be able to:

1. Compare equilibrium and non-equilibrium semiconductors[1,2,4]
2. Predict conductivities, resistivities and sheet resistance of semiconductors[1,2]
3. Explain common semiconductor fabrication techniques[1]
4. Solve problems which characterize PN junctions and Schottky diodes [1,,2,4]
5. Compute semiconductor transistors parameters (e.g. threshold voltage) [1,2]
6. Generate and implement computer algorithms using mathematical analysis software (MATLAB) to predict behavior of semiconductor devices. [4]

[1] *Numbers in brackets refer to method(s) used to evaluate the course objective.*

Relationship to Program Outcomes (only items in dark print apply)[2]: This course supports the following Electrical Engineering Program Outcomes, which state that our students will:

1. have the ability to apply knowledge of the fundamentals of mathematics, science, and engineering
2. have the ability to use modern engineering tools and techniques in the practice of electrical engineering;
3. have the ability to analyze electrical circuits, devices, and systems;
4. have the ability to design electrical circuits, devices, and systems to meet application requirements;
5. have the ability to design and conduct experiments, and analyze and interpret experimental results;
6. have the ability to identify, formulate, and solve problems in the practice of electrical engineering using appropriate theoretical and experimental methods;
7. have effective written, visual, and oral communication skills;
8. possess an educational background to understand the global context in which engineering is practiced, including:
   a. knowledge of contemporary issues related to science and engineering;
   b. the impact of engineering on society;
   c. the role of ethics in the practice of engineering;
9. have the ability to contribute effectively as members of multi-disciplinary engineering teams;
10. have a recognition of the need for and ability to pursue continued learning throughout their professional careers.

[2]*Numbers in brackets refer to course objective(s) that address the Program Outcome.*

Contribution to Meeting Professional Component: (in semester hours)

Mathematics and Basic Sciences:	1	hours
Engineering Sciences and Design:	2	hours
General Education Component:		hours

Prepared By: Ron J. Pieper Date: May 26 2010