

The University of Texas at Tyler
Department of Electrical Engineering

Course: EENG 5310 Solid state Devices (Elective)

Syllabus

Catalog Description:

Charge transport in semiconductors; standard approaches for diffusion of dopants and lithography; Development of IV models for solar cells, diodes, bipolar junction and field effect transistors.

Prerequisites: EENG 4330 or CI

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

Text(s): Ben Streetman and Banerjee: Solid state Electronics

Additional Material: Access to MATLAB software

Course Coordinator: Ron Pieper

Topics Covered: (paragraph of topics separated by semicolons)

This course serves as an introduction to operation and fabrication of solid state electronic devices. The principles describing charge transport in semiconductors are derived. Standard approaches for diffusion of dopants and lithography will be also be covered. Specific devices discussed include solar cells, diodes, bipolar junction and field effect transistors. 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; solar cells; diodes; bipolar and field effect transistors; lithography

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

1. Examinations / Quizzes
2. Homework
3. Report
4. Computer Programming
5. Project
6. Presentation
7. Course Participation
8. Peer Review

Course Objectives¹: By the end of this course students will be able to:

1. Analyze equilibrium and nonequilibrium semiconductors
2. Predict conductivities, resistivities and sheet resistance of semiconductors
3. Analyze PN and metal semiconductor junctions (diodes)
4. Analyze Bipolar junction and field effect Transistors
5. Work problems involving semiconductor processing techniques

¹Numbers 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. Possess a breadth and depth of knowledge in electrical and computer engineering: Students will possess and be able to apply knowledge and principles at a graduate level in two or more of the following areas utilizing modern engineering tools: electronics, power systems, controls, advanced engineering mathematics, signal processing, communications, real-time systems, computer systems, electromagnetic and power electronics;
2. Possess and demonstrate oral and written communication skills: Students will be adequately prepared for entrance into advanced careers or into a doctoral program through reports, papers, publications or presentations;
3. Demonstrate the capability to perform independent learning and investigation: Students will successfully address electrical or computer engineering problems through independent research activity in coursework or a thesis;

²Numbers 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 Pieper Date: June 3, 2009