Fundamentals of Semiconductor Devices

EE3329, Spring 2018
University of Texas at El Paso

Instructor:	David Zubia, Ph. D.	Office Hours:
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Course Description:

This course deals with the analysis and design of electronic devices. In order to analyze and design these devices, detailed knowledge of semiconductor physics is needed. Therefore, the course will begin with treatment of semiconductor physics. The second part of the course will focus on applying knowledge of semiconductor physics to electronic devices. Devices that will be covered include diodes, field-effect transistors and bipolar junction transistors. Device physics will be used to relate internal charged-carrier behavior with external terminal characteristics of the devices.

Electronic devices are used in circuits to make complex analog and digital functions such as amplifiers (for audio, high-frequency, wireless, etc) and microprocessors. This course is fundamental to electrical engineering and will benefit persons in all areas of concentration especially solid-state devices and materials, electronics engineering, and computer engineering.

Emphasis is placed on group discussion and individual work, and lectures to clarify points. Reading and homework will be assigned. Knowledge and skill development obtained by working on assignments will be assessed through quizzes and exams. It is through reading, working on assignments and class discussions that most learning will occur. The instructor's role will be to guide you by discussing relevant topics and assigning problems that will require you to go through the mental steps necessary to obtain knowledge and learn problem-solving skills. The instructor's role will also be to assess your progress and give you feedback.

Learning Objectives:

After completion of this course, students should be able to:

1. Apply semiconductor physics to analyze electronic devices including; resistors, capacitors, diodes, field-effect transistors, and bipolar junction transistor.
2. Apply the design process to create and evaluate devices to meet specified requirements.
3. Apply ordinary differential equations to describe behavior of electronic devices under different initial and boundary conditions.

Bloom's Taxonomy of Learning

	1. Remember	2. Understand	3. Apply	4. Analyze	5. Evaluate	6. Create
A. Factual			1			
B. Conceptual		3	1,2,3	1	2	2
C. Procedural			2			2
D. Metacognitive						

Topics Covered:

- Crystal structure
- Energy bands in crystals
- Carrier transport in semiconductors
- p-n junction diodes

- bipolar junction transistors
- field-effect transistors

Textbook:

Semiconductor Devices: Physics and Technology, 3rd Edition, S. M. Sze and M. K. Lee, Wiley, 2012

Evaluation:

	Value
Problems/Exercises	15%
Quizzes	15%
Exam I	20%
Exam II	20%
Final Exam	30% (comprehensive)
Total	100%

Grading and Policies:

A: 90% - 100% B: 80% - <90% C: 70% - <80% D: 60% - <70% F: 0 - <60%
Late course work will not be accepted.
No make-up work will be given.

Prerequisite: PHYS 3325 (or EE 4395 Applied Quantum Mechanics for EE's) and EE 3321 each with grade of "C" or better.

Syllabus Changes: Some of the content in the syllabus is subject to change for improvements or other factors. Any changes will be communicated.

Academic Dishonesty:

Incidents of academic dishonesty will be referred to the Director of Electrical Engineering and the Dean of Students.
http://studentaffairs.utep.edu/Default.aspx?alias=studentaffairs.utep.edu/dos

The descriptions and definitions of academic dishonesty can be found at:
http://admin.utep.edu/hoop Look under Student Affairs and then Chapter one, section 1.3.1.

If you have a disability and need classroom accommodations, please contact The Center for Accommodations and Support Services (CASS) at 747-5148, or by email to cass@utep.edu, or visit their office located in UTEP Union East, Room 106. For additional information, please visit the CASS website at www.sa.utep.edu/cass.