ELEC 424 — Solid-State Devices – Summer I 2015

Section 81 MW 5:15-8:00 PM Room: GRIMS 322

Instructor: Dr. John W. Peeples, Grimsley Hall Room 323, 843-953-4893, peeplesj@citadel.edu

Office Hours: Monday and Wednesday, 4:00 - 5:00 PM
Additional hours available by appointment

Required Material: Solid State Electronic Devices, Sixth Edition
Ben Streetman and Sanjay Banerjee, Prentice Hall 2006

Prerequisites: MATH 234, PHYS 222/272, ELEC 306

CATALOG DESCRIPTION Basic principles governing the operation of solid-state devices are developed from fundamental concepts. P-N junction theory is developed and applied to the analysis of devices such as bipolar transistors, solar cells, detectors and photo devices. The theory of field-effect devices is developed.

COURSE OBJECTIVE The student will be introduced to the theory of quantized energy levels and energy bands in solids. The basic concepts of carrier concentration and carrier transport in solids will be covered. These concepts will be leveraged in the understanding of P-N junction behavior and applied to the analysis of operation of solid-state devices such as photodiodes, solar cells, lasers, bipolar and field-effect transistors.

ATTENDANCE AND PARTICIPATION Attendance is required. Should it be necessary to miss a class for any reason the student will, unless circumstances preclude it, notify the professor in advance and will be responsible for any material missed. Assigned tests are mandatory. Unless authorized to the contrary by the professor, such tests take precedence over all other duties or activities. Absence in excess of 20% of the class meetings will result in a failing grade for the course.

ACADEMIC INTEGRITY Cheating in any form will be fully prosecuted.

POP QUIZZES Short (15 minutes) unannounced quizzes may be given throughout the semester. If you miss an in class quiz you will receive a zero for that quiz. No makeup quizzes will be given.

HOMEWORK Homework will be turned in at the close of the final class meeting for each week. Late homework will not be accepted and will be given a zero grade. Neatness (legibility) will count!

GRADING

(a) Homework Assignments/Pop Quizzes	20 %
(b) Research Project	15 %
(c) Test #1 and Test #2	(Worst) 15 %
	(Best) 20 %
(d) Final Exam	30 %

WEBSITE The course website can be accessed from **http://ece.citadel.edu/peeples/**. It will contain a current copy of this syllabus, homework assignments, homework and test solutions, helpful resources and/other materials the professor deems appropriate.

EMAIL Email will be used from time to time to distribute information to students. Your email address needs to be on file with the registrar to insure that you are included in the automatically generated email list for the class.

SPECIAL ACCOMMODATIONS Students currently documented or anticipate being documented as Learning Disabled (LD), as having Attention Deficit Disorder (ADD), or with another condition for which may require special accommodation must provide written documentation of the condition and of the accommodation needed to Dr. Peeples during the first week of the term. Notification after the fact, or at the beginning of an exam cannot be accepted.

CELL PHONE POLICY Unless specified otherwise, personal electronic devices such as cell phones, PDAs, tablets and laptop computers must be turned off or placed in silent mode, and stowed out of sight during class. Cell phones or any other electronic communication devices are strictly prohibited during testing. They must be put away, not on the student's person during the entire test period. Failure to comply *will result in a test score of zero*.

COURSE OUTLINE Slight changes in this schedule are not only possible, but likely.

THE OFFICIAL COPY OF THIS SYLLABUS IS THE ONE POSTED AT ANY GIVEN TIME ON THE INSTRUCTOR'S COURSE WEBSITE

Week	Class Dates	Topic	Reading
1	5/11	Introduction and Course Overview *Silicon Run I, The Front End*	ITRS SR glossaries
1	5/13	Photolithography, Masks and Process Flow *Silicon Run II, The Back End*	Chapter 1 Chapter 1 Notes
2	5/18	Semiconductor Materials, Crystal Properties & Growth	Chapter 2
2	5/20	Atoms & electrons, energy bands, charge carriers	
3	5/25	*Memorial Day – no classes*	Chapter 3
3	5/27	Carrier concentrations, Fermi level, Drift E & H fields	
4	6/1	Drift and resistance, Mobility, Hall effect	Chapter 5
4	6/3	*Test #1,* P-N junction, electronic behavior, Diodes	
5	6/8	P-N Junctions	Chapter 6
5	6/10	Diodes	
6	6/15	Schottky Barriers, MOSFETS	Chapter 8
6	6/17	*Test #2,* Optoelectronic Devices, *Research Brief*	
7	6/22	*Research Paper Presentations*	
7	6/24	*Final Exam*	

Homework and research assignments will be announced.