Electrical Engineering Materials and Devices (55:072)
(Required: Electrical Engineering Track)

Catalog Description:
Fundamentals of semiconductor physics and devices; principles of the p-n junction diode, bipolar transistor and field effect transistor

Pre(co)requisites:
029:082 [P] and 055:041 [P]

Textbook:
Donald Neaman, "Introduction to Semiconductor Devices," McGraw-Hill, 2005

References:
B. Streetman, "Solid State Electronic Devices"
Karl E. Lonngren, Sava V. Savov, and Randy J. Jost, SciTech Publishing, "Fundamentals of Electromagnetics with MATLAB," Second Edition

Topics (Classes):
1. Schrödinger equation & Boltzmann equation (5 classes)
2. Crystal structure & silicon (7 classes)
3. PN and Schottky junctions (5 classes)
4. MOS capacitor (3 classes)
5. MOSFET (7 classes)
6. Examinations (2 classes)

Laboratory Projects:
None

Class/Laboratory Schedule:
Three 50-minute lectures per week

Writing Assignments and Oral Presentations:
Students are required to do an oral presentation, with PowerPoint, on a contemporary issue relevant to the subject of the course.

Design Component:
None

Contribution to the Requirements of Criterion 5:
Engineering topics: 3 s.h.

Course Goals: Basis for Assessment and Mapping onto Outcomes

Course Goal	Basis For Goal Assessment	Supports ABET Outcomes
1. Students should develop a working knowledge of the physics underlying all semiconductor devices	Homework, exam questions	a(●), e(●), k(●)
2. Students should develop an understanding of the physical principles behind the PN junction and the Schottky barrier diode	Homework, exam questions	a(●), e(●), k(●)
3. Students should develop an understanding of the operation of both junction and metal/insulator/semiconductor field effect transistors	Homework, exam questions	a(●), e(●), k(●)
4. Students should be introduced to device design	Homework, exam questions	a(●), c(○), e(●), k(●)

◦ denote moderate contribution to the outcome; • denote substantial contribution to the outcome

Performance Criteria:
Instructor completes a Course Outcome Rating (COR) that quantitatively evaluates student performance for each course goal-related outcome using a standard scale (4.0 = outstanding ability; 3.0 = good ability; 2.0 = adequate ability; 1.0 = poor ability; 0.0 = no ability). Instructor chooses appropriate graded course artifacts (homework questions, exam questions, etc) for each outcome rating. COR scores below 2.5 are indicative of problems with meeting course goals/outcomes and COR scores below 2.0 indicate failure to adequately meet course goals/outcomes.

Prepared By:
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