

Physical Electronics

Course Description

A course on semiconductor device physics focused the basics of semiconductor physics and device technology. Course will cover (i) basics of semiconductor physics, (ii) basic devices such as pn junctions, metal-semiconductor junctions, and MOS capacitor, and (iii) devices such as MOSFETs and BJTs. Students will also briefly be introduced to MOSFET fabrication technology basics.

Office Hours: TH 4 pm -5 pm in Powell Hall 632

Course Schedule

- Week 1 – Semiconductor Basics
Readings: Neamen: 3.1, 3.2, 3.3, 3.4, 3.5,3.6
Homework Exercises: 3.1, 3.2, 3.3, 3.4, 3.7, 3.10
- Week 2 – Semiconductor Basics
Readings: Neamen: 4.1,4.2, 4.3
Homework Exercises: 4.3, 4.5, 4.16, 4.17, 4.21, 4.22
- Week 3 – Semiconductor Basics
Readings: Neamen: 4.4, 4.5, 4.6, 5.1, 5.2
Homework Exercises: 4.26,4.27, 4.29, 4.43, 4.47, 5.1, 5.3, 5.6, 5.22, 5.25
- Week 4 – PN Junctions
Readings: Neamen: 6.1, 6.4, 6.5, 7.1, 7.2, 7.3
Homework Exercises: 6.1, 6.3, 6.7, 6.8, 7.1, 7.10, 7.16, 7.18
- Week 5 – PN Junctions/MS Junctions
Readings: Neamen: 7.4, 8.1, 8.2, 9.1, 9.2
Homework Exercises: 7.22, 8.1, 8.8, 9.2, 9.4, 9.15
- Week 5 – MOS Capacitors
Readings: Neamen: 11.1, 11.2
Homework Exercises: 11.1, 11.5, 11.7,11.9, 11.15
- Week 6 – MOSFETs
Readings: Neamen: 11.3, 11.4, 11.5
Homework Exercises: 11.29, 11.32, 11.46, 11.49
- Week 7 – MOSFETs
Readings: Neamen: 12.1, 12.2
Homework Exercises:12.3, 12.4, 12.5, 12.13, 12.14, 12.15
- Week 8 –MOSFETs
Readings: Neamen: 12.3, 12.4, 12.5
Homework Exercises: 12.17, 12.19, 12.20,12.27, 12. 31, 12.38, 12.39
- Week 9 – BJTs
Readings: Neamen: 10.1, 10.2, 10.3
Homework Exercises: 10.1, 10.3, 10.9, 10.12, 10.20, 10.22
- Week 10 – BJTs
Readings: Neamen: 10.4, 10.5, 10.6, 10.7
Homework Exercises: 10.34, 10.37, 10.48, 10.52, 10.56
- Week 11 – JFETs
Readings: Neamen: 13.1, 13.2, 13.3, 13.5
Homework Exercises: 13.1, 13.13, 13.21, 13.26, 13.33, 13.36

- Week 12 – Optical Devices
Readings: Neamen: 14.1, 14.2, 14.3, 14.4, 14.5
Homework Exercises: 14.1, 14.3, 14.9, 14.14, 14.21, 14.23
- Week 13 – Power Devices
Readings: Neamen: 15.1, 15.2, 15.3, 15.4
Homework Exercises: 15.1, 15.9, 15.10, 15.11, 15.16, 15.17
- Week 14 – Review

Prerequisite Knowledge

Students should have taken EE202 and PHYS152.

Evaluation Criteria

Course grades will be based upon the following:

- Homework - 10%
- 2 Midterms – 25%
- Final Exam – 40%

Textbook

Text: Semiconductor Physics and Devices - Basic Principles by Donald Neamen

Statement for Students with Disabilities

Any student requesting academic accommodations based on a disability is required to register with Disability Services and Programs (DSP) each semester. A letter of verification for approved accommodations can be obtained from DSP. Please be sure the letter is delivered to me (or to TA) as early in the semester as possible. DSP is located in STU 301 and is open 8:30 a.m.–5:00 p.m., Monday through Friday. The phone number for DSP is [\(213\) 740-0776](tel:2137400776).

Statement on Academic Integrity

USC seeks to maintain an optimal learning environment. General principles of academic honesty include the concept of respect for the intellectual property of others, the expectation that individual work will be submitted unless otherwise allowed by an instructor, and the obligations both to protect one's own academic work from misuse by others as well as to avoid using another's work as one's own. All students are expected to understand and abide by these principles. *Scampus*, the Student Guidebook, contains the Student Conduct Code in Section 11.00, while the recommended sanctions are located in Appendix A: <http://www.usc.edu/dept/publications/SCAMPUS/gov/>. Students will be referred to the Office of Student Judicial Affairs and Community Standards for further review, should there be any suspicion of academic dishonesty. The Review process can be found at: <http://www.usc.edu/student-affairs/SJACS/>.