

ECE 3200 Introduction to Semiconductor Physics

Instructor: Prof. Heayoung Yoon
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TA: TBA

Class:

- Monday, Wednesday, Friday 2:00 pm ~ 2:50 pm
- Location: TAB
- Format: *In-person (attendance is required.)*

Instructor's Office Hours:

- TBA
- Other times scheduled by appointment via email
- [Mainly focused on lecture materials & understanding concepts](#)

TA's Office Hours:

- TBA
- TBA (HW review session)
- [Mainly focused on HW problems](#)

Textbook: Principles of Semiconductor Devices (Second Edition; Required)
Sima Dimitrijevic, Oxford University Press, 2012

Prerequisites: Full major status in ECE, Permission code

Course Objective:

This introductory course will provide the background needed to understand the physics and technology of semiconductor electronic devices. By the end of the course, all students will understand:

- Crystal structure of silicon
- Introductory quantum mechanics and energy band structure
- Carrier transport in classical semiconductors
- Basics of P-N junction and metal-semiconductor junction
- Simple theory of metal-semiconductor junction, Si-MOSFET operations
- Brief overview of device fabrication processes

Homework Assignments:

There will be regularly assigned homework problems, usually one per week. All homework must be turned at the beginning of the class of the assigned due date. It is your responsibility to present your work in a clear and logical way and with answers clearly marked. Homework solutions will be posted on the course website for approximately one week following the due date.

Late homework will be accepted **ONLY** in extraordinary circumstances and by specific arrangement with the instructor. **A written email that describes the particular situation (24 hours before the deadline) and supporting documents are required.**

Your emails will be answered within 24 hours during business days (Monday ~ Friday).
HW-related questions will be primarily answered by TA.

Exams:

There will be in-class quizzes, midterm, and final exam. All exams will be comprehensive, covering all materials in the assigned portion of the textbook. The exams will cover the material during the lecture as well as in reading and homework assignments.

- Quizzes (Fridays; about 7 quizzes)
- Exam 1: TBA
- Exam 2: TBA

Registering for this class (in-person; not online) means that students have committed to participate during class time. If you have a conflict with a scheduled quiz/exam, you should notify the instructor in advance (at least 48 hours, excluding medical emergencies). A written email that describes the specific situation **and supporting documents are required.**

Students acknowledge that make-up exam hours include 8 am ~ 9 am and 5 pm ~ 6 pm, depending on the instructor/TA schedule. The format of the make-up exam includes real-time oral exam. Students have the right to take or not to take the make-up quiz/exam.

Grading Policy:

The course grade will be distributed as follows:

- Homework: 20 %
- Quizzes: 20 %
- Exam 1: 25 %
- Exam 2: 35 %

Students have ultimate responsibility for their learning and must decide what actions to take to maximize progress and efficiency. Class attendance, participation in class

discussion, reading the text in advance of class lectures, homework effort, independent and group study, and use of office hours may be viewed by the instructor as an indication of a student's effort in learning the class materials.

Bonus grade: 3 % (posted on Canvas) + 2 % (instructor).

Note: This course is structured to enable students to attain the best possible grades based on their performance without relying on bonus points.

Email Response Policy:

Owing to everyone's limited time/schedule, email questions will be answered within 24 hours during business hours (Monday ~ Friday; 9 am ~ 5 pm). If you send an email for a question between Friday 5 pm and Sunday, it will be answered by Tuesday 9 am.

Grading Policy:

A: ≥ 93 %, A-: ≥ 90 %

B+: ≥ 87 %, B: ≥ 83 %, B-: ≥ 80 %

C+: ≥ 77 %, C: ≥ 73 %, C-: ≥ 70 %

D+: ≥ 67 %, D: ≥ 63 %, D-: ≥ 60 %

E: ≤ 67 %

* The grading will NOT be curved. We apply this grading scheme to all students (no exceptions for senior students). Students earn their grades based on their efforts.

Course Outline

Week	Topics	Book Chapter
1	Crystal Structure	Ch 1. The Atomic-Bond Model
2	Crystal/Energy Band model	Ch 1/Ch 2. The Energy-Band Model
3	Energy Band Model	Ch 2. The Energy-Band Model
4	Drift / Diffusion	Ch 3. Drift
5	Drift / Diffusion	Ch 4. Diffusion
6	Generation	Ch 5. Generation and Recombination
7	Recombination	Ch 5. Generation and Recombination
8	Exam 1; tentative	
9	P-N Junction	Ch 6. P-N Junction
10	P-N Junction	Ch 6. P-N Junction
11	P-N Junction	Ch 6. P-N Junction
12	Metal-Semiconductor Junction	Ch 7. Metal-Semiconductor Contact
13	MOSCAP	Ch 7. Metal-Semiconductor Contact
14	MOSFET	Ch 8. MOSFET
15	Special Topics	TBA
16	Final Exam	

- ✓ Seven Quizzes (tentative) on Fridays
- ✓ Exam 1: TBA
- ✓ Exam 2: TBA