

# Electron Theory in Solids (固態電子理論)

Course level: Graduate students

Course goals: Understanding the theory of electron in solid, including electronic properties in nano-scale.

Text Book :

“Solid State Physics for Engineering & Materials Science,” by John McKelvey, Krieger Publishing, ISBN 0-89464-436-X

“Principles of Electronic Materials and Devices,” by S. O. Kasop, McGraw Publishing, 3rd edition, ISBN 007-124458-1

Handouts will be provided

Course Outline

1. Introduction (9/22)
2. Materials Properties and Crystalline Properties (9/22)
3. Classical Free electron in metals (9/29)
4. Classical Physics: Wave properties and behaviors (10/6)
5. Classical Physics: Sound waves, dispersion relation and lattice vibration (10/13)
6. Quantum Mechanics (10/20, 10/27)
7. Statistical Mechanics (11/3)
8. Exam 1 (11/10)
9. Quantum Mechanics for crystals (11/17, 11/24)
10. Semiconductor Materials Properties (12/1, 12/8)
11. PN junction (12/15)
12. Dielectric materials (12/22)
13. Exam 2 (12/29)
14. Final Presentation (1/5)

Grading : Exam 1- 30%, Exam 2- 30%, In class presentation 30%, attendance & contribution to the class 10%.

The presentation has to be relevant to solid-state electronics. Use the knowledge and technique learned from this course for the presentation. The presentation has to be proceeded in English. Evaluation of presentation and report will depend on whether the following items are adequately presented.

Significance, Organization, Depth, Coverage, and Q&A