

# 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 (9/14)
2. Classical Free electron in metals (10/05)
3. Classical Physics: Wave properties and behaviors (10/12)
4. Quantum Mechanics/Density of states (10/19)
5. Statistical Mechanics (10/26)
6. Exam 1 (11/02)
7. Quantum Mechanics for crystals (11/09)
8. Semiconductor Materials Properties: Conductivity, Hall effect, and excess carrier (11/16, 11/23)
9. Lab practice: Electrical Measurement: Ohmic contacts/sheet resistance (11/30)
10. PN junction (12/07, 12/14)
11. Lab practice: Electrical measurement: PN diodes (12/21)
12. Exam 2 (12/28)
13. Final Presentation (1/04)

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 to present papers relevant to this topic. The presentation has to be proceeded in English in class within 15 mins including Q&A. Evaluation of the presentation will be conducted by the whole class, and the scores will depend on whether the following items are adequately presented.

Good Significance, Well Organization, Clear presentation, Sufficient Insight/Depth,  
Knowledge learned from the course has been used, and Q&A