Nanoelectronics and nanotechnology (奈米電子及奈米技術)

Course level: Graduate students

Course goals: Understanding knowledge of nanoelectronics, and the technology applied to nanodevices.

Pre-requisite : Electron theory in solids (preferred but not mandatory)

Text Book:

A: "Modern Physics for Engineers," Jasprit Singh, John Wiley & Sons, 1999 (ISBN 0-471-33044-2)

B: "Semiconductor Devices: Physics and technology," S. M. Sze, John Wiley & Sons, 2002, 2nd edition. (ISBN 0-471-33372-7)

C: "Nanoelectronics and information technology" Rainer Waser, Wiley-VCH, 2005 (ISBN-13:978-3-527-40542-8, ISBN-10: 3-527-40542-9)

Course Outline

1. Solid-state-electronic properties (2/19) Book A, B
2. Carrier concentration and density of states (2/26) Book A, B
3. Carrier transport (3/5) Book B
4. PN junction (3/12) Book B

Exam 1 (3/19)

5. Field effect transistors (3/26) Book B
6. Schottky barrier, Ohmic contacts, and MESFET (4/2) Book B
7. Bipolar transistors (4/9) Book B
8. Light-emitting-diodes, Laser diodes, Photodetectors (4/16) Book B
9. Solar cells (4/23) Book B
10. Tunneling devices (4/30) Book B

Exam 2 (5/7)

11. Single-electron device (5/14) Book C
12. Carbon nano tube (5/21) Book C
13. Molecular devices (5/28) Book C
14. In class Presentation (6/4)

Grading : Exam 1- 30%, Exam 2- 30%, In class presentation30%, Attendance & contribution to the class 10%.

For the presentation:

Each group is allowed to give a talk in 25 mins and the Q & A in 5 mins. The grade for the presentation (30%) will be assessed by the whole class. English is required for the presentation. Language fluency will not be considered in grading. Instead, whether the speech is well organized, the topic is significant, the review is in depth, the coverage of the content is adequate, and the answers for questions are satisfied, will be considered for evaluation. However, clear expression by the speaker will help the audience to learn easily which may lead to a positive evaluation.