

CALIFORNIA INSTITUTE OF TECHNOLOGY
Applied Physics 183ab
Physics of Semiconductors and Semiconductor Devices
Fall-Winter 2007-2008

Description:

9 units (3-0-6); first, second terms. Principles of semiconductor electronic structure, carrier transport properties, and optoelectronic properties relevant to semiconductor device physics. Fundamental performance aspects of basic and advanced semiconductor electronic and optoelectronic devices. Topics include energy band theory, carrier generation and recombination mechanisms, quasi-Fermi levels, carrier drift and diffusion transport, quantum transport. Lectures will consist of two parts: i) exposition of device physics fundamentals and ii) “complements” to fundamental issues in the form of focused topically-oriented sketches of real-world semiconductor physics science issues, devices and technologies .

Prerequisites:

Although there are no formal prerequisites, familiarity with quantum mechanics at the level of Physics 125 will be quite helpful. Statistical physics will also be helpful.

Lectures:

Tuesdays and Thursdays, 9-10:30 am in 104 Watson

Texts: First two are required and the others are recommended:

1. Basic Semiconductor Physics, Chihiro Hamaguchi, Springer Verlag, ISBN: 3-540-41639-0, 2001.
2. Physics of Semiconductor Devices, 3rd Edition, S.M. Sze and Kwok K. Ng, John Wiley and Sons, New York, ISBN: 13-978-0-471-14323-9, 2007.
3. Semiconductor Material and Device Characterization, D.K. Schroder (editor), Wiley, New York, ISBN: 13-978-0-471-73906-7, 2006.
4. Semiconductor Device Fundamentals, Robert F. Pierret, Addison-Wesley, ISBN: 0-201-54393-1, 1996.

Staff:

Faculty: Harry A. Atwater, 246 Watson, x-2197, haa@caltech.edu

Teaching Assistants:

Brendan Kayes, 248 Watson, x-2380, brendan@caltech.edu,

Melissa Archer, 252 Watson, x-3657 griggs@caltech.edu

Evaluations:

Homeworks (~1-2 problems/week)	45pts.
Mid-Term Exam	25 pts.

Final Exam	30 pts.
Total:	100 pts.

Evaluation Policies:

1. Exams will be 2 hours in length and will be issued and due at specific times.
2. Homework problems will be issued frequently; homework problems issued on Tuesdays will be due on the following Fridays, and homework problems issued on Thursdays will be due on the following Mondays.
3. 'Limited' collaboration for homeworks: you can share anything that can be communicated with spoken words, but cannot share written notes or solutions.
4. Late homeworks will be graded according to the following time dependence, in days, where $t = 0$ is the due date: $h(t) = h(0)\exp(-t/7)$.