Syllabus EE216 (Summer 2013)
Principles and Models of Semiconductor Devices

Instructor: Donguk Nam
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Course Web Page: http://coursework.stanford.edu
(Lecture notes will be posted via this web page)

Lecture Hours: Mon & Weds 2:15pm-3:30pm (NVIDIAAUD)

TA: Andrew Ma (andrewma@stanford.edu)

TA Office Hours: Mon& Tues 4:30pm-6pm (Pac104 for Mon & Pac106 for Weds)

Instructor OH: Weds 4:30pm-5:30pm (Pac104)

Grading Policy:
Homework: 40%
Midterm (July 22): 30%
Final (August 14): 30%
* 5 HWs will be handed out on Weds and due in one week
* Late policy- 1-Day 50%, 2-Day 25%, 3-Day no credit

Useful References
R.F. Pierret, Semiconductor Device Fundamentals, Addison- Wesley
C. Hu, Modern Semiconductor Devices for ICs, Prentice Hall
D.L. Pulfrey, Understanding Modern Transistors and Diodes, Cambridge (online)
R. S. Muller, T. I. Kamins, Device Electronics for Integrated Circuits, Wiley
B. Streetman, Solid State Electronic Devices, Prentice Hall
D. A. Neamen, Semiconductor Physics & Devices, McGrawhill
S. M. Sze, Physics of Semiconductor Devices, Wiley
Course Outline

1. Introduction
   History, technological trends, introduction of state-of-the-art technology

2. Physics of semiconductor in equilibrium
   Crystal structure, band diagram, Fermi-Dirac and Boltzmann statistics

3. Free carrier motion in semiconductors
   Thermal motion, drift, diffusion, mobility, velocity saturation

4. Semiconductor in non-equilibrium
   Generation, recombination, carrier lifetime, quasi-Fermi levels, continuity equation

5. PN junction
   Band diagrams, depletion, I-V characteristics, non-ideality

6. Photonics devices
   Solar cells, LEDs, Lasers

7. Metal-semiconductor junction
   Schottky barriers, ohmic contacts, MSM photodetectors

8. MOS capacitors
   Band diagram, C-V characteristics, charge-coupled devices

9. MOSFET
   Electronic properties of Metal Oxide Semiconductor Field Effect Transistors