ELEC 576 Semiconductor Theory for Device Applications
Fall 2005

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Objective: To present the physical background that is essential for both the understanding of modern electronic semiconductor devices and the invention or development of new devices.

Topics:

1. Basic band theory; E-k plots.
2. Densities of states; bulk, 2DEG, quantum wires and dots.
3. Semiconductor statistics; low temperatures, degenerate.
4. Tunneling; heterostructures, S-D limitation to MOS scaling.
5. Scattering; mainly by phonons, mobility.
6. Quasi-ballistic transport; solving BTE.
7. Nanoscale transistors; CNT's, SET's, molecular transistors.

Texts:

Electrons in Periodic Lattices

1. *Electronic properties of solids*, R.H. Bube, QC176.8.E4B6
2. *Solid-State and Semiconductor Physics*, J.P. McKelvey
3. *Physical properties of Semiconductors*, C.M. Wolfe, N. Holonyak and G.E. Stillman, QC611.W74.1989
4. *Advanced Semiconductor Fundamentals*, R.F. Pierret, TK 7871.85.P483

Semiconductor Statistics

5. *Semiconductor statistics*, J.S. Blakemore, QC611.B52

Carrier Transport

6. *Fundamentals of carrier transport*, M.S. Lundstrom, TK7871.85.L86
7. *Quantum Transport: Atom to Transistor*, S. Datta
8. *Quantum Phenomena*, S. Datta, TK 7871.85.D375

Device Physics

9. *Compound Semiconductor Device Physics*, S. Tiwari, QC611.8.C64T59
10. *Physics of Semiconductor Devices*, M. Shur

New Devices

11. *Nanoelectronics*, D.L. Pulfrey, http://www.ece.ubc.ca/%7Epulfrey/nano_beyond_Si_uni.pdf

Mark breakdown:	Assignments	080
	Final Assignment or Presentation	020
		100