ECE417/517 NANOELECTRONICS

Winter 2012: Mon/Wed 4.40-6.30pm, FAB40-08

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Course information posted for download at:
http://www.ece.pdx.edu/~jmorris/ece417&517nanoelectronics

Week		Mon Lecture	Wed Lecture	Notes
1	Jan 09/11	1. Intro: Nanotechnol/CMOS	2. Quantum mechanics review	
2	Jan 16/18	No lecture	3. Electron tunneling	
3	Jan 23/25	4. Tunnel diode & RTD	5. TD & RTD circuits	
4	Jan 30/01	6. TD & RTD stability	7. Single elec transistor (SET)	
5	Feb 06/08	8. SET circuits	9. Molecular electronics; SPM	
6	Feb 13/15	10. TBA	11. Carbon nanotubes (CNT)	Test (1-9)
7	Feb 20/22	12. Mesoscopic conduction	13. Thin Film Properties	
8	Feb 27/29	14. Deposition, nucleation, etc	15. Discontinuous thin films	
9	Mar 05/07	16. DTF applications	17. Miscellaneous topics	517 reports
10	Mar 12/14	517 Project presentations	517 Project presentations	
	March 19	Monday 19th 5:30-7:20pm: Test (10-19)		

The course is focused on the operational principles and circuit applications of nanoelectronic devices, especially those based on electron tunneling, i.e. tunnel diodes (TDs), resonant tunnel diodes (RTDs), single electron transistors (SETs), and nanodot arrays, which are also of research interest. Carbon nanotubes (CNTs), graphene, molecular electronics, nanowires, and other topics will also be considered. In addition to the obvious course objective of familiarization with developing technologies, students will learn new circuit analysis techniques. There will be occasional readings, problem assignments, quizzes, and two exams. ECE517 students will do a (literature survey) project on an assigned topic, with a written report due 5pm Friday March 9th, and formal class presentation March 12th or 14th. The second exam on March 19th will include material from these projects. This year the proceedings of IEEE NANO 2011 will be available and used as an added resource.

	ECE417	ECE517
Assignments (and quizzes, etc)	40%	30%
Mid-term: Test #1	30%	25%
Final: Test #2	30%	25%
517 project	XXXX	20%

Students are encouraged to collaborate in preparation for homework problem assignments, and in studying for tests. However, all work finally turned in must be the product of the individual student. Evidence of cheating can result in grade penalties and severe disciplinary action, in accordance with ECE and PSU policies. In this regard, a satisfactory (non-zero) performance on all assignments, tests, and projects is a requirement for course completion. There will be no "make-up" or "extra-credit" assignments or tests. Late assignments will not be accepted. Previously excused absences on test dates and those supported by medical documentation will be handled on an ad hoc basis.

Also offered this term: ECE507 Seminar: Nanotechnology, Tues 12.30 - 13.50, FAB40-07

References:

- Dragoman & Dragoman "Nanoelectronics: Principles & Devices" 2nd ed, Artech House (2009)
- George H. Hanson, "Fundamentals of Nanoelectronics," Pearson/Prentice-Hall (2008)
- Park, Hwang, & Park, "Nanoelectronic Devices," Pan Stanford (2011)
- Rogers, Pennathur, & Adams, "Nanotechnology," 2nd ed, CRC Press (2011)
- Colm Durkan, "Current at the Nanoscale," Imperial College Press (2007)
- J. Hoekstra, "Introduction to Nanoelectronic Single-Electron Circuit Design," Pan Stanford (2010)
- Mahapatra & Ionescu "Hybrid CMOS SET Device & Circuit Design" Artech House (2006)
- Christoph Wasshuber "Computational Single-Electronics" Springer (2001)
- Mark Lundstrom & Jing Guo "Nanoscale Transistors" Springer (2006)
- Schwierz, Wong, & liou, "Nanometer CMOS," Pan Stanford (2010)
- S. Deleonibus, "Electronic Device Architectures for the Nano-CMOS Era," Pan Stanford (2009)
- Mizuta & Tanoue "Physics & Applications of Resonant Tunnelling Diodes" Cambridge (1995)
- Rainer Waser (ed) "Nanoelectronics & Information technology" Wiley-VCH (2003) [2nd ed avail]
- Edward Wolf "Nanophysics & nanotechnology" Wiley-VCH ((2004)
- K.Goser, P. Glosekotter, & J. Dienstuhl "Nanoelectronics & Nanosystems" Springer (2004)
- Bharat Bhushan (Ed) "Springer Handbook of Nanotechnology" Springer (2004)
- Poole & Owens "Introduction to Nanotechnology" Wiley (2003)
- Kelsey, Hamley, & Geoghegan "Nanoscale Science & Technology" Wiley (2005)
- Edward Wolf "Quantum Nanoelectronics" Wiley-VCH (2009)
- Brennan & Brown "Theory of Modern Electronic Semiconductor Devices" Wiley (2002)
- Omar Manasreh "Semiconductor Heterojunctions & Nanostructures" McGraw-Hill (2005)
- Mitin, Kochelap, & Stroscio "Introduction to Nanoelectronics" Cambridge (2008)
- Kryzysztof Iniewski,(ed), "Nanoelectronics," McGraw-Hill (2011)
- Qing Zhang (ed), "Carbon Nanotubes and their Applications," Pan Stanford (2011)
- Saito, Dresselhaus, & Dresselhaus "Physical Properties of Carbon Nanotubes" ICP (1998)
- Forrest L. Carter (ed) "Molecular Electronic Devices" Marcel-Dekker (1982)
- Supriyo Bandyopadhyay & Marc Cahay, "Introduction to Spintronics," CRC Press (2008)
- J. E. Morris (ed), "Nanopackaging," Springer (2008)