

**ECE217B, Spring 2002**  
**Advanced Semiconductor Devices II**

Graduate Course, 3 units

**Professor & Class Schedule**

Peter Burke

e-mail: pburke@uci.edu

Office: EG 2232

Lect. Mo/We 3:00 – 4:20 pm in CS 219

Office hours 4:30-5:30 pm

website [http://nano.ece.uci.edu/ece\\_217b\\_advanced\\_semiconductor\\_devices.htm](http://nano.ece.uci.edu/ece_217b_advanced_semiconductor_devices.htm)

**Textbook:**

*Fundamentals of III-V Devices: HBTs, MESFETs, and HFETs/HEMTs*

William Liu, Wiley (1999), ISBN 0-471-29700-3

**Grade:**

60% Homework, 40% End-of-term presentation

**Course Outline**

1. Review of basic semiconductor physics and III-V materials
2. Two-terminal devices
3. HBT DC properties
4. HBT high frequency properties
5. FET DC properties
6. FET high frequency properties
7. Noise models
8. Quantum devices: resonant tunneling diodes
9. Nano-scale devices: Landauer-Buttiker formalism, single electron transistors, quantum point contacts, quantum dots, carbon nanotubes

The last topics will be the subject of my new course next year, **ECE 217C: Nanotechnology**

**Also to be covered, as needed by the class:**

1. Electromagnetic wave propagation in infinite media
2. Coaxial and microstrip transmission lines
3. S-parameters, reflections, impedances, gains, and Smith chart

**Reference books:**

\* means on reserve at the science library

**Device physics:**

- \**Physics of Semiconductor Devices*, S.M. Sze, Wiley (1981) ISBN 0-471-05661-8
- \**Modern Semiconductor Device Physics*, S.M. Sze, Wiley (1998) ISBN 0-471-15237-4
- \**High Speed Semiconductor Devices*, S.M. Sze, Wiley (1990) ISBN 0-471-62307-5
- \**Physics of Semiconductor Devices*, Michael Shur, Prentice Hall PTR (1996) ISBN 0-13-666496-2
- \**Solid State Electronic Devices, 5<sup>th</sup> Edition*, Ben G. Streetman (2000), ISBN 0-13-025706-0
- GaAs High-Speed Devices*, C.Y. Chang and Francis Kai, Wiley (1994) ISBN 0-471-85641-X
- \**InP-Based Materials and Devices: Physics and Technology*, Osamu Wada and Hideki Hasegawa, Wiley (1994) ISBN 0-471-18191-9
- SiGe, GaAs, and InP Heterojunction Bipolar Transistors*, Jiann S. Yuan, Wiley (1999), ISBN 0-471-19746-7
- \**Semiconductor Device Fundamentals*, Robert F. Pierret, Addison-Wesley (1995), ISBN 020154393-1
- \**HEMTs and HBTs: Devices, Fabrication, and Circuits*, Fazai Ali and Aditya Gupta, Artech House (1991), ISBN 0-89006-401-6
- InP HBTs: Growth, Processing, and Applications*, B. Jalali and S.J. Pearton, Artech House (1994), ISBN 0-89006-724-4
- \**Semiconductor Physics and Devices: Basic Principles*, Donald A Neamen, McGraw-Hill (1997) ISBN 0-256-24214-3
- \**Low Dimensional Semiconductor Structures: Fundamentals and Device Applications*, Keith Barnham and Dimitri Vvedensky, Cambridge University Press (2001), ISBN 0-521-59103-1.
- Modern GaAs Processing Methods*, Ralph E. Williams, Artech (1990), ISBN 0-89006-343-5, out of print
- Electrical and Thermal Characterization of MESFETs, HEMTs and HBTs*, Robert R H Anholt, Artech House (1994), ISBN 0-89006-749-X
- \**Fundamentals of Semiconductor Theory and Device Physics*, Shyh Wang, Prentice Hall (1989), ISBN 0-13-344409-0 (out of print)
- \**Device Electronics for Integrated Circuits, 2<sup>nd</sup> Edition*, Richard S Muller and Theodore I Kamins, Wiley (1986), ISBN 0-471-88758-7,
- \**Compound Semiconductor Device Physics*, Sandip Tiwari, Academic Press (1991), ISBN 0-12-691740-X (out of print)

**High-frequency (microwave, mm-wave) engineering:**

- \**Microwave Engineering, 2<sup>nd</sup> Edition*, David Pozar, Wiley (1997), ISBN 0-471-17096-8
- Microwave and RF Wireless Systems*, David Pozar, Wiley (2000), ISBN 0-471-32282-2
- \**Foundations for Microstrip Circuit Design, 2<sup>nd</sup> Edition*, T.C. Edwards, Wiley (1991), ISBN 0-471-93062-8. (out of print)
- \**Fields and Waves in Communications Electronics, 3<sup>rd</sup> Edition*, Simon Ramo, John R. Whinnery, Theodore Van Duzer, Wiley (1994) ISBN 0-471-58551-3 (out of print)
- \**Microstrip Lines and Slotlines, 2<sup>nd</sup> Edition*, K.C. Gupta, Ramesh Garg, Inder Bahl, Prakash Bhartia, Artech House (1996), ISBN 0-89006-766-X
- \**Transmission Line Design Handbook*, Brian C. Wadell, Artech House (1991), ISBN 0-89006-436-9
- \**Microwave Transistor Amplifiers: Analysis and Design, 2<sup>nd</sup> Edition*, Guillermo Gonzalez, Prentice Hall (1997), ISBN 0-13-254335-4