ECE 832 High Speed Semiconductor Devices Spring 2012

Prerequisite: ECE730 or ECE432 with instructor permission


Instructor: Patrick Roblin, 292-0998, Room 379 Caldwell Lab

Lecture Schedule: Room: KN 195 (Knowlton Architecture building), MWF 12:30 am

Office Hours: By appointment. Otherwise use e-mail for lecture and homework questions

Course Plan:

1. Introduction to Heterostructure Devices. Semi-Classical Theory, HBT.
2. Quantum Theory of Heterostructures and Quantum Heterostructure Devices (Quantum well, RTD, superlattice)
3. Scattering Processes and Scattering-Assisted Tunneling in Heterostructures Devices and High-Frequency Response of Quantum Devices (RTD, Infrared laser)
4. Charge Control of the Two-Dimensional Electron Gas in HEMT
5. High Electric-Field Transport in Semiconductor Devices
6. Current Voltage Models of the Short-Channel MOSFET, HEMT, SOI and LDMOS
7. MOSFET Wave-Equation. Microwave Modeling and Electrothermal effects.
9. High-Frequency Heterojunction Bipolar Transistors
10. Non-linear RF measurement and modeling. Impact of thermal and electrical memory effect on linearization.

Grading Scheme: HW: 1/3, Take home midterm: 1/3, Take home Final: 1/3

Class Webpage: http://eewww.eng.ohio-state.edu/~roblin/ee832.html

All examinations in this course will be administered in accordance with the ECE Honor System. If you have a question about the ECE Honor System, contact your instructor or a member of the ECE Student Council.
2012 Special Topics:

**Modeling and Measurement of Transistors for RFIC and high-power RF PA**
- GaN HEMTs: physics, modeling and high-power density applications
- Non-linear RF characterization with a Large Signal Network Analyzer
- Impact of self-heating & traps on transistor characteristics
- Pulsed-IV pulsed-RF measurements as a probe of device physics
- Joint LSNA / DLOS measurements of GaN HEMTs
- On-wafer RF measurements, deembedding, Cold FET parasitics extraction
- 1/f noise and cyclostationary effect under large-signal operation