

1. ECE 572 (ECE 580A5): Semiconductor Transistors
2. 1 credit: 2-75 minute lecture sessions/week – 5 weeks
3. Carmen Menoni
4. Semiconductor Physics and Devices: Basic Principles. Neamen, D. A. 2011.
5. Course Information
 - a. Quantitative analysis of electric field, carrier and current distributions in MOSFETs and bipolar junction transistors; scaling, non-idealities
 - b. Prerequisites: ECE 331 with a C or higher; ECE 471B or concurrent registration
 - c. Selected Elective: Electrical Engineering; Computer Engineering; Lasers & Optical Engineering
6. Goals for the Course
 - a. Course Learning Objectives
 - i. Describe the modes of operation of the bipolar transistor
 - ii. Analyze the current components of the bipolar transistor
 - iii. Discuss transistor non-idealities
 - iv. Plot energy band diagrams of a MOS capacitor
 - v. Calculate depletion layer thickness of a MOS capacitor
 - vi. Calculate the threshold voltage of a MOS capacitor
 - vii. Describe the MOSFET operation
 - viii. Derive ideal current-voltage relation of the MOSFET
 - ix. Discuss frequency limitation of the MOSFET
 - b. Student Outcomes
 1. An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
7. Topics Covered
 - Operation of the bipolar transistor, minority carrier distribution, common-base current gain
 - Nonideal effects in bipolar transistors, Ebers-Moll equivalent circuit, frequency limitations
 - Energy band diagram of MOS capacitor
 - MOS C-V characteristics. MOSFET operation
 - Frequency limitation of the MOSFET
 - Operation of the JFET