COURSE NUMBER: Ve320	**COURSE TITLE:** Introduction to Semiconductor Devices
CREDIT: 4	**PREREQUISITES:** Ve215, Vp240 or Vp260
TEXTBOOKS/REQUIRED MATERIAL: "Semiconductor Device Fundamentals", by R. F. Pierret	**PREPARED BY:** Hua Bao **DATE OF PREPARATION:** June 10, 2012 **DATE OF UC APPROVAL:** Oct. 30, 2013
INSTRUCTOR(S): Hua Bao	**SCIENCE/DESIGN:**
CATALOG DESCRIPTION: Introduction to semiconductors in terms of atomic bonding and electron energy bands. Equilibrium statistics of electrons and holes. Carrier dynamics; continuity, drift, and diffusion currents; generation and recombination processes, including important optical processes. Introduction to: PN junctions, metal-semiconductor junctions, light detectors and emitters; bipolar junction transistors, junction and MOSFETs.	**COURSE TOPICS:** 1. Semiconductor Fundamentals 2. PN-junction Diode 3. Schottky Diode 4. Light-emitting Diode and Solar Cells 5. Bipolar Junction Transistors 6. Field Effect Transistors
COURSE STRUCTURE/SCHEDULE: Lecture: 5 lectures per week, 45 minutes each	

COURSE OBJECTIVES [Course Outcomes in brackets]	1. To teach students fundamental concepts in semiconductor physics;[1-4] 2. To teach students the current-voltage relationships of diodes and transistors based on the electronic properties of semiconductors and drift and diffusion transport mechanisms;[5-7] 3. To teach students how to analyze and design diode and transistor devices based on semiconductor doping, semiconductor material properties, and device geometry;[5-7] 4. To prepare students for follow-up courses in the Solid-State and Circuits areas of the EE program.[1-7]
COURSE OUTCOMES [Program Outcomes in brackets]	A student who successfully fulfills the course requirements will have demonstrated: 1. Ability to analyze semiconductor electronic properties based on energy band structure; [a] 2. Ability to compute electron and hole concentrations and Fermi level in semiconductors; [a] 3. Ability to compute spatial and temporal dependence of electron and hole concentration based on diffusion, generation, and recombination processes; [a] 4. Ability to construct energy band diagrams for semiconductor structures and devices; [a] 5. Ability to analyze and design I-V and C-V characteristics of junction diodes; [a] 6. Ability to analyze and design I-V characteristics of BJTs and MOSFETs; [a] 7. Ability to analyze basic amplifier and switching circuits based on transistors. [a]
ASSESSMENT TOOLS [Course Outcomes in brackets]	In-class exercises [1-7] Homework [1-7] Final Exam [1-7]