20-EECS-2077	SEMICONDUCTOR DEVICES		
Required/Elective	Required for EE majors		
Catalog Data	20-EECS-2077. Semiconductor Devices. Credits 3. Fundamentals of semiconductor diodes and transistors; static characteristics, biasing, carrier flow and small-signal models. Light emission and detection with semiconductor junctions.		
Prerequisites	Network Analysis, Semiconductor Physics		
Prerequisites by Topic	1. Basic calculus, chemistry, MATLAB, circuits 2. Energy-band diagram and carrier concentrations 3. Fermi level, carrier drift and diffusion		
Textbook	B. Streetman, S. Banerjee, *Solid State Electronic Devices*, Prentice Hall; 6 edition (August 5, 2005).		
References	R. F. Pierret, *Semiconductor Device Fundamentals,* Addison-Wesley, 1996, 2nd Ed. D. A. Neaman, *Semiconductor Physics and Devices: Basic Principles*, McGraw-Hill, 2011, 4th Ed.		
Goals	Students will examine and understand the operation of semiconductor devices and the fundamental processes underlying their operation and design.		
Topics	1. Semiconductor and Band diagrams (1 lecture). 2. Semiconductor Currents (1 lecture) 3. Diodes (4 lectures) 4. Bipolar Junction Transistors (4 lectures) 5. JFET / MESFET / HEMTs (1 lecture) 6. MOSFETS (3 lectures) 7. Optical Semiconductors (1 lecture) 8. Photodiodes and Photovoltaics (1 lecture) 9. LEDs (1 lecture) 10. Organic Semiconductors and Devices (1 lecture) 11. Lasers (1 lecture) 12. CCD and CMOS Imaging Devices (1 lecture)		
Laboratory	None		
Class Schedule	Class meets 2 times per week for 75 minutes.		
ABET Outcomes	a, e, k		
Learning Objectives	Students will: 1. Comprehend the basic electrical and chemical concepts that govern semiconductor junctions with another semiconductor, a metal, or an oxide and a metal. (a) 2. Be able to apply knowledge of junction-based and field-effect transistors. (a) 3. Be able to synthesize transistor function through utilization of a corresponding simple circuit model. (e) 4. Be able to apply MATLAB or other graphical computing tools to plot transistor electrical characteristics. (k)		
Computer Usage	MATLAB for solution of equations and graphical		
Professional Component	Engineering science: 2.4 credits or 80% Engineering design: 0.6 credits or 20%		
Prepared by	Jason Heikenfeld, Ph.D.	**Date**	Jan. 6, 2015
Approved by Undergraduate Council		**Date**	