



ESOGÜ Electrical-Electronics Engineering Department

COURSE CODE: 151227451-151247451 **COURSE TITLE:** Semiconductor Devices

Semester	Weekly Hours		COURSE			
	Theoretical	Practical	Credits	ECTS	Type	Language
7	3	0	3	5	Compulsory () Elective (x)	Turkish () English (x)
Write the credit (for non-credit courses weekly hours) below (If necessary distribute the credits.).						
Math and Basic Science		Electrical Engineering [mark (√) if there is high design content]		General Education	Humanities	
		3 ()				
Assessment		THEORETICAL-PRACTICAL COURSES			LABORATORY COURSES	
		Type	Number	%	Activity Type	Number %
Midterm		Midterm	1	60	Quiz	
		Quiz			Lab performance	
		Homework			Report	
		Project			Oral exam	
		Other (.....)			Other (.....)	
Final		Written	1	40		
Makeup exam (Oral/Written)		Written				
Prerequisites		Electronics I				
Brief content of the course		Semiconducting materials, crystal structure in solids, quantum mechanics, intrinsic semiconductor, doped semiconductor, carrier densities under thermal equilibrium, drift and diffusion currents, continuity equation, currents in a PN junction, BJT structure and currents, MOS structure, MOSFET structure, Optical devices.				
Objectives of the course		Providing the background for the transistors and integrated circuits, Better knowledge on the selection and use of semiconductor devices, Awareness on the limitations of transistors,				
Contribution of the course towards professional education		Knowledge inner workings of the semiconductor devices that are used as switches or amplifiers Confidence in selecting semiconductor devices in circuit design.				
Outcomes of the course		Students who complete this course successfully will understand the operation principles and limitations of the semiconductor devices. They will be able to calculate the current gain of a bipolar transistor for a given structure and bias condition.				
Textbook of the course		D. A. Neamen, <i>Semiconductor Physics and Devices</i> , Irwin, 1992				
Other reference books		1. Sze, <i>Physics of Semiconductor Devices</i> Wiley, 2006 2. Streetman, <i>Solid State Electronic Devices</i> , Prentice Hall, 1997				
Required material for the course		An electronic calculator will be used in exams.				

WEEKLY PLAN OF THE COURSE	
Week	Topics
1	Introduction: Semiconductor materials
2	Crystal structure of solids
3	Quantum Mechanics and Energy bands
4	Carriers and densities
5	Drift and diffusion currents; continuity equation
6	PN junction
7	PN junction currents
8	Midterm
9	Midterm
10	BJT structure
11	MOS structure
12	MOSFET
13	LED, Laser, Solar Cells
14	Course Review
15,16	Final

NO	OUTCOMES OF THE PROGRAMME	4	3	2	1
1	Adequate knowledge of mathematics, science and Electrical and Electronic Engineering; ability to practice theoretical and practical knowledge of these areas into modeling and solving complex problems of Electrical and Electronic Engineering		X		
2	Ability to identify complex engineering problems in Electrical and Electronic Engineering and related fields, for this purpose having skills to formulate, select and apply appropriate methods.		X		
3	Having skills to apply modern design methods to design a complex system, process, equipment or product that should work under realistic conditions and constraints and satisfy specific requirements concerning the Electrical and Electronic Engineering.			X	
4	Having skills to develop, select and apply modern techniques and tools needed to analyze and solve complex applications in Electrical and Electronic Engineering, skills to use information technology effectively.		X		
5	Skills to design and conduct tests, collect data, analyze results, and interpret data for the experimental investigation of complex problems in Electrical and Electronic Engineering			X	
6	Ability to function effectively as an individual and as a member of teams within the discipline and in multidiscipline areas.				X
7	Communicating effectively in oral and written form both in Turkish and English. Effective report writing and understanding written reports, preparing design and manufacturing reports, making effective presentations, skills to give and receive clear and concise instructions.				X
8	Awareness of the necessity of lifelong learning, access to information, monitoring developments in science and technology and the ability to self-renewing				X
9	Understanding of professional and ethical responsibility				X
10	Information on project management, change management and risk management practices, awareness on entrepreneurship and innovation, knowledge on sustainable development.				X
11	Information about universal and societal effects of engineering applications on health, safety and environment; awareness of the legal consequences of engineering solutions.				X

Scale for assessing the contribution of the course to the program outcomes:

4: High 3: Medium 2: Low 1:None

Name of Instructor(s): Prof. Dr. Hasan Hüseyin Erkaya

Signature(s):

Date: March 11, 2016