ABDULLAH GÜL UNIVERSITY
GRADUATE SCHOOL OF ENGINEERING & SCIENCE
ELECTRICAL AND COMPUTER ENGINEERING PROGRAM
COURSE DESCRIPTION AND SYLLABUS

Course Title	Code	Semester	T+L Hours	Credit	ECTS
SEMICONDUCTOR DEVICE FUNDAMENTALS	ECE-585	FALL-SPRING	3 + 0	3	10

Prerequisite Courses	General Physics-Materials Science and Electrical Engineering Background

Type	Selective
Language	English
Coordinator	Assist. Prof. Evren Mutlugun
Instructor	Assist. Prof. Evren Mutlugun
Adjunt	none
Aim	- Understanding the basic physical processes that are involved in the semiconductor devices. - Using the conceptual understanding of the semiconductor physics, providing students the fundamental physical and electronic properties of semiconductor materials and devices
Learning Outcomes	• discussing the fundamental semiconductor physics phenomena • explaining the operation principles of semiconductor devices • using the conceptual understanding of the semiconductor physics, designing semiconductor devices to address the desired parameters
Course Content	• Crystal structure-atoms and electrons • Energy bands and charge carriers in semiconductors • Optical absorption, luminescence, carrier lifetime and diffusion • Junctions • Field effect transistors • Bipolar junction transistors • Photodiodes • Solar cells • Light emitting diodes • Lasers

WEEKLY TOPICS AND PRELIMINARY STUDY

Week	Topic	Preliminary Study
1	Crystal structure-atoms and electrons	The relevant articles from the literature
2	Crystal structure-atoms and electrons	The relevant articles from the literature
3	Energy bands and charge carriers in semiconductors	The relevant articles from the literature
4	Energy bands and charge carriers in semiconductors	The relevant articles from the literature
5	Optical absorption, luminescence, carrier lifetime and diffusion	The relevant articles from the literature
6	Optical absorption, luminescence, carrier lifetime and diffusion	The relevant articles from the literature
7	Junctions	The relevant articles from the literature
8	Midterm	The relevant articles from the literature
9	Field effect transistors- Bipolar junction transistors	The relevant articles from the literature
10	Photodiodes	The relevant articles from the literature
11	Solar cells	The relevant articles from the literature

12	Light Emitting Diodes	The relevant articles from the literature
13	Light Emitting Diodes	The relevant articles from the literature
14	Solar Cells	The relevant articles from the literature
15	Lasers	The relevant articles from the literature
16	Final Exam	

SOURCES	
Lecture Notes	Lecture slides
Other Sources	**Course Textbook:** See additional materials **Additional Materials:** 1. Solid State Electronic Devices, Streetman, 7th Edition, PEARSON 2. Semiconductor Devices: Physics and Technology, Sze, 3rd Edition, WILEY 3. Semiconductor Devices: An introduction, Singh, Mc Graw Hill

COURSE MATERIALS SHARING	
Documents	Lecture notes, slides
Homeworks	Students will be given one homework biweekly
Exams	1 Midterm and 1 Final Exam

EVALUATION SYSTEM		
SEMESTER STUDY	**NUMBER**	**CONTRIBUTION**
Midterm	1	20
Homework	7	35
Quiz	7	15
SUB-TOTAL		70
Contribution of Semester Study		70
Contribution of Final Exam	1	30
TOTAL		100

Course Category	
Sciences and Mathematics	60%
Engineering	40%
Social Sciences	0%

RELATIONSHIPS BETWEEN LEARNING OUTCOMES AND PROGRAM QUALIFICATIONS							
No	Program Qualifications	Contribution Level				
		1	2	3	4	5
1	Accessing knowledge, evaluating and interpreting information by doing scientific research in the field of Electrical and Computer Engineering					**X**
2	Ability to use science and engineering knowledge for development of new methods in Electrical and Computer Engineering					**X**
3	To be able to understand and analyze materials by using basic knowledge on Electrical and Computer Engineering					**X**
4	Design and implement analytical, modeling and experimental research					**X**
5	Solve and interpret the problems encountered in experimental research					**X**
6	Considering scientific and ethical values during the collection and interpretation of data			**X**		
7	Integrating knowledge of different disciplines with the help of scientific methods, and completion and implementation of scientific knowledge using data				**X**	
8	To gain leadership ability and responsibility in disciplinary and interdisciplinary team works				**X**	
9	To be able to contribute to the solution of social, scientific and ethical problems				**X**	

	encountered in the field of Electrical and Computer Engineering					
10	To be able to define, interpret and create new information about the interactions between various discipline of Electrical and Computer Engineering				**x**	

*Increasing from 1 to 5.

ECTS / WORK LOAD TABLE			
Activities	Number	Duration (Hours)	Total Work Load
Course Length (includes exam weeks: 16x total course hours)	16	3	48
Out-of-class Study Time (Pre-study, practice)	16	4	64
Internet search, library work, literature search	16	4	64
Presentation	7	3	21
Homework	16	4	64
Midterm	1	20	20
Final Exam	1	25	25
Total Work Load			306
Total Work Load / 30			306/30
Course ECTS Credit			10