ABDULLAH GÜL UNIVERSITY
GRADUATE SCHOOL OF ENGINEERING & SCIENCE
MATERIALS SCIENCE AND MECHANICAL ENGINEERING PROGRAM
COURSE DESCRIPTION AND SYLLABUS

Course Title	Code	Semester	T+L Hours	Credit	ECTS
Solid State Physics	AMN 521	FALL-SPRING	3	3	10

Prerequisite Courses	Knowledge of quantum physics/modern physics preferred

Type	Elective
Language	English
Coordinator	Murat Durandurdu
Instructor	Murat Durandurdu
Adjunt	none
Aim	To have knowledge about the atomic structures of solids and to explain their physical and electrical properties using quantum theory.
Learning Outcomes	To recognize different crystal structures and to understand basic crystallography To Understand Brillouin zones, recprocal space, To Understand the types of bonding in Solids To Understand phonons and to find the dispersion releation for one-dimensional lattice To learn the relationship between phonons and thermal capacity and different thermal properties To have knowledge about free electron model To know periodic potentials and Bloch functions To understand energy bands, forbidden energy range and semiconductors To Fermi surface
Course Content	Crystal structures, Symmetries, Direction and Planes, Bragg Diffraction, Reciprocal Lattice, Brillouin Zones, Bondings, Lattice Vibrations: Phonons, Thermal Properties, Einstein Model, Debye Model, Hall Effect, Free Electron model, Fermi Gas, Semiconductors, Fermi Surfaces

WEEKLY TOPICS AND PRELIMINARY STUDY

Week	Topic	Preliminary Study
1	Atomic structure, Rutherford Model, Hydrogen Bohr Model; Hydrogen Atom spectra	The relevant articles from the literature
2	Introduction to quantum mechanics, De Broglie, Heisenberg and Schrödinger Equation, Quantum numbers of many electron systems	The relevant articles from the literature
3	Crystal Structures	The relevant articles from the literature
4	Crystal Structures	The relevant articles from the literature
5	Reciprocal Lattice	The relevant articles from the literature
6	Bonding in Solids	The relevant articles from the literature
7	Midterm	The relevant articles from the literature
8	Phonons I -Crystal oscillations	The relevant articles from the literature
9	Phonons I- Crystal oscillations/ Phonons II Crystal oscillations	The relevant articles from the literature
10	Phonons II- Crystal oscillations	The relevant articles from the literature
11	Free Electron Model	The relevant articles from the literature

12	Energy Bands	The relevant articles from the literature
13	Semiconductors	The relevant articles from the literature
14	Semiconductors	
15	Metals and Fermi Surfaces	
16	Final	

SOURCES	
Lecture Notes	Lecture notes and presentations
Other Sources	Concepts of Modern Physics, A. Beiser. Elementary Solid State Physics, M.Ali OMAR Introduction to Solid State Physics, C. KITTEL

COURSE MATERIALS SHARING	
Documents	Lectures notes are shared on the internet
Homeworks	Students will be given one homework each week
Exams	Midterm and Final

EVALUATION SYSTEM		
SEMESTER STUDY	**NUMBER**	**CONTRIBUTION**
Homework	1	30 %
Final Project		
Quiz	10	30 %
SUB-TOTAL	11	60 %
Contribution of Semester Study		
Contribution of Final Exam	1	40 %
TOTAL	12	100 %

Course Category	
Sciences and Mathematics	50%
Engineering	50%
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 Materials Science and Mechanical Engineering				x		
2	Ability to use science and engineering knowledge for development of new methods in Materials Science and Mechanical Engineering			x			
3	To be able to understand and analyze materials by using basic knowledge on Materials Science and Mechanical Engineering				x		
4	Design and implement analytical, modeling and experimental research			x			
5	Solve and interpret the problems encountered in experimental research						
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 encountered in the field of Materials Science and Mechanical Engineering		x				
10	To be able to define, interpret and create new information about the interactions between various discipline of Materials Science and Mechanical 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 weeks	3	48
Out-of-class Study Time (Pre-study, practice)	15 weeks	3	45
Reading	15 weeks	3	45
Internet search, library work, literature search	15 weeks	2	30
Presentation			
Homework	10 weeks	14	140
Midterm	1	3	3
Final Exam	1	4	4
Total Work Load			315
Total Work Load / 30			10,5
Course ECTS Credit			10