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
Quantum Mechanics for Engineers	AMN 555	FALL-SPRING	3 + 2	3	10

Prerequisite Courses	

Type	Elective
Language	English
Coordinator	Murat Durandurdu
Instructor	Murat Durandurdu
Adjunt	none
Aim	The aim of this course is to introduce the concepts and techniques of the Quantum Mechanics, which have gained much importance in many scientific and engineering fields (materials science, nanotechnology and electronic devices). This course covers the basic principles of the Quantum Mechanics: wave properties, uncertainty principles, Schrödinger equation and operators and their basic applications such as one dimensional problems, central field problems, harmonic oscillator, angular momentum and perturbation theory.
Learning Outcomes	1.Schröndinger equation and its applications 2. Motion of the wave packet 3. Harmonic oscillator 4. Angular momentum 5.Central potentials 6. Hydrogen atom 7. Approximation methods
Course Content	Wave properties, Uncertainty principles, Schrödinger equation, Operators, One - dimensional problems, Central field problems, Harmonic oscillator, Angular momentum, Perturbation theory

WEEKLY TOPICS AND PRELIMINARY STUDY

Week	Topic	Preliminary Study
1	Introduction, Atomic structure, Rutherford model, Hydrogen Bohr model; Hydrogen Atom spectra	The relevant articles from the literature
2	Schröndinger Equation	The relevant articles from the literature
3	Solution of Schröndinger equations in one dimension	The relevant articles from the literature
4	Solution of Schröndinger equations in one dimension	The relevant articles from the literature
5	Operators (Linear operators, Hermitian operators, operator expected value)	The relevant articles from the literature
6	One Dimensional Harmonic Oscillator	The relevant articles from the literature
7	One Dimensional Harmonic Oscillator	The relevant articles from the literature
8	Midterm	The relevant articles from the literature
9	Angular momentum	The relevant articles from the literature
10	Central Potential	The relevant articles from the literature
11	Hydrogen Atom	The relevant articles from the literature

12	Hydrogen Atom	The relevant articles from the literature
13	Perturbation Theory	The relevant articles from the literature
14	Perturbation Theory	
15	Time-dependent Perturbation Theory	
16	Final	

SOURCES	
Lecture Notes	Lecture notes and presentations
Other Sources	Quantum Mechanics by Bruce Cameron Quantum Mechanics for Scientists and Engineers by David A. B. Miller Quantum Mechanics by Eugen Merzbacher, Introductory Quantum Mechanics by Richard L. Liboff, Quantum Mechanics by Amit Goswami,

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

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		x
2	Ability to use science and engineering knowledge for development of new methods in Materials Science and Mechanical Engineering		x			x
3	To be able to understand and analyze materials by using basic knowledge on Materials Science and Mechanical Engineering				x	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 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	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)	16 weeks	3	45
Reading		3	45
Internet search, library work, literature search	16 weeks	2	30
Presentation	3 weeks		
Homework	13 weeks	14	140
Midterm		3	3
Final Exam		4	4
Total Work Load			315
Total Work Load / 30			10,5
Course ECTS Credit			10