COURSE INFORMATON					
Course Title	*Code*	*Semester*	*L+P Hour*	*Credits*	*ECTS*
QUANTUM MECHANICS I	PHYS 521	1	4 + 0	4	10

Prerequisites	-

Language of Instruction	English
Course Level	Graduate
Course Type	Compulsory (Theory Option)
Course Coordinator	Prof. Dr. Avadis Hacinliyan
Instructors	Prof. Dr. Avadis Hacinliyan
Assistants	
Goals	The aim of this course is to teach the physical principles and interpretation of quantum mechanics and the mathematical principles on which they rest. Calculational techniques will also be emphasized.
Content	Principles of wave mechanics, Schroedinger equation, Eigenvalues and eigenstates, angular momentum, matrices in quantum mechanics, Symmetry, Approximation methods, Scattering.

Learning Outcomes	**Teaching Methods**	**Assessment Methods**
1) Introduces the mathematical foundations of quantum mechanics (Differential equations, Vectors and Matrices, Fourier Analysis)	1,2,3	A,B,C
2) Explain the physical principles of quantum mechanics (Classical Mechanics, Correspondance and Uncertainity principles). Introduces scientific and technological applications.	1,2,3	A,B,C
3) Develops skills to apply knowledge of physics and mathematics.	1,2,3	A,B
4) Design and perform experiments(measurement, research setup etc.), develop ability to analyze and interpret experimental results.	1,2,3	A,B
5) Introduces exact and approximate calculation methods.	1,2,3	A,B
6) Develop skill to define formulate and solve physics problems.	1,2,3	A,B
7) Develop skill to apply techniques and devices necessary for physical applications	1,2,3	A,B,C

Teaching Methods:	1: Lecture, 2: Problkem Sets 3: Problem Session
Assessment Methods:	A: Examination B: Homework C: Presentation

COURSE CONTENT		
Week	Topics	**Study Materials**
1	MATHEMATICAL AND PHYSICAL FOUNDATIONS OF QUANTUM MECHANICS	Modern Physics, Math Methods of Physics
2	SCHRÖDINGER WAVE EQUATION, WAVE FUNCTION	Modern Physics,
3	EIGENVALUE AND EIGENVECTORS, EXPANSION POSTULATE, INTERPRETATION AND APPLICATIONS. STRUCTURE OF QUANTUM MECHANICS	Math Methods of Physics Sturm Liouville Theory
4	BOUND AND SCATTERING STATE PROBLEMS IN ONE DIMENSION	Differential Equations, Probability
5	OPERATORS, SYMMETRY AND CONSERVATION LAWS	Classical Mechanics
6	PROBLEMS IN MORE THAN ONE DIMENSION, SEPARATION OF VARIABLES, MANY PARTICLE WAVE FUNCTIONS	Math. Methods in Physics
7	MIDTERM EXAM	
8	MATRIX MECHANICS, ANGULAR MOMENTUM PROBLEM	Linear Algebra
9	PROBLEMS WITH SPHERICAL SYMMETRY. THE HYDROGEN ATOM	Math. Methods in Physics
10	SPİN AND IDENTICAL PARTICLES	Angular Momentum Operators
11	PERTURBATION THEORY	Math. Methods in Physics
12	VARIATIONAL AND OTHER APPROXIMATION METHODS. TIME DEPENDENT PERTURBATION THEORY.	Math. Meth in Physics
13	SCATTERING THEORY	Math. Meth in Physics
14	REVIEW AND MIDTERM EXAMINATION	

RECOMMENDED SOURCES

Textbook	E.Merzbacher Quantum Mechanics (3. Edition). Wiley,1998
Additional Resources	R: Shankar Principles of Quantum Mechanics, (2. Edition) Springer (1994) L.D.Landau and E. M. Liftshitz Quantum Mechanics. Non-relativistic theory (3. Edition) Butterworth Heinemann (1981)

MATERIAL SHARING	
Documents	"Quantum Mechanics Demystified" David McMahan, Schaum's Outline of Theory and Problems of Quantum Mechanics" by Y. Peleg, R. Pnini, E. Zaarur
Assignments	From the textbook
Exams	

ASSESSMENT		
IN-TERM STUDIES	**NUMBER**	**PERCENTAGE**
Mid-terms	2	80
Quizzes	4	10
Assignment	8	10
Total		**100**
CONTRIBUTION OF FINAL EXAMINATION TO OVERALL GRADE		40
CONTRIBUTION OF IN-TERM STUDIES TO OVERALL GRADE		60
Total		**100**

COURSE'S CONTRIBUTION TO PROGRAM

No	Program Learning Outcomes	Contribution				
		1	2	3	4	5
1	Gets a sound base for the main fields of physics such as Classical Mechanics, Quantum Mechanics and Electromagnetism,					X
2	Gets the ability of interpreting, analysing, forming a synthesis and relationships between the main fields of physics and/or other sciences,					X
3	Obtains the education required for the measurements in scientific and technological areas and the contribution of physics in the industrial applications and on the macroscopic scale such as the society,				X	
4	Follows the up-to-date scientific developments, makes the analysis/synthesis for the new ideas and evaluates them,				X	
5	Uses the academic sources, the computer technology and the related devices,		X			

6	Joins the working and research groups, also the scientific meetings, communicates well at the national and international level,		X			
7	Gets the ability of creative and critical thinking, problem solving, researching, producing a new and original work, improving himself/herself in his/her own fields of interest,					X
8	Gains the concepts of ethics and responsibility. Undertakes the responsibility for the solutions to the problems related with his/her field as required for having an intellectual identity.		X			

COURSE CATEGORY	Expertise/Field Courses

ECTS ALLOCATED BASED ON STUDENT WORKLOAD BY THE COURSE DESCRIPTION			
Activities	Quantity	Duration (Hour)	Total Workload (Hour)
Course Duration (Including the exam week: 16x Total course hours)	16	4	64
Hours for off-the-classroom study (Pre-study, practice)	16	5	80
Mid-terms	2	10	20
Quizzes	4	1	4
Ödev	8	3	24
Final examination (with reparatioın)	2	10	20
Total Work Load			252
Total Work Load / 25 (h)			10
ECTS Credit of the Course			10