QUANTUM MECHANICS

1	Course Title:	QUANTUM MECHANICS	
2	Course Code:	FZK3009	
3	Type of Course:	Compulsory	
4	Level of Course:	First Cycle	
5	Year of Study:	3	
6	Semester:	5	
7	ECTS Credits Allocated:	6.00	
8	Theoretical (hour/week):	5.00	
9	Practice (hour/week):	0.00	
10	Laboratory (hour/week):	0	
11	Prerequisites:	Maths, Physical Mathematics, Mechanics, Electric, Optics and Waves	
12	Language:	Turkish	
13	Mode of Delivery:	Face to face	
14	Course Coordinator:	Doç. Dr. MÜRŞİDE ŞAFAK HACIİSMAİLOĞLU	
15	Course Lecturers:	Doç. Dr. Mürşide ŞAFAK HACIİSMAİLOĞLU	
16	Contact information of the Course Coordinator:	Doç. Dr. Mürşide HACIİSMAİLOĞLU, msafak@uludag.edu.tr, (0224) 2941697, Fen Edebiyat Fakültesi, Fizik Bölümü 16059 Görükle Kampüsü Bursa	
17	Website:		
18	Objective of the Course:	To provide students with a basic knowledge of the concepts and applications of quantum mechanics. This course is part one of a two semester course focused on a rigorous exposition to the principles of Quantum mechanics. The Dirac bra-ket formalism will be introduced and used throughout to present the principles of Quantum Mechanics in a general context. We will discuss anyalytic solutions to the Schr¨odinger equation for a variety of potentials in one, two and three dimensions. The role of symmetries as the underlying principle of Quantum Mechanics will be emphasized throughout the course. The use of symmetry principles and operators methods will be discussed	
19	Contribution of the Course to Professional Development:	Application of the principles of quantum mechanics to unfamiliar problems. To be able to understand easly high technology such as nanotechnology and have leading-ideas to develop hightechnology	
20	Learning Outcomes:		
		1	Gains the idea of quantum physics and can compare it with classical physics.
		2	Knows quantum mechanical concepts such as wave-particle duality, wave function, operator, commutativity and their importance.
		3	Must be able to establish and solve quantum equations of motion according to the physical states of quantum particles.
		4	Learn how to obtain physical information about particles (such as energy, momentum, and position) using wave functions and operators.

	5	Understands how quantum physics directs and affects technological developments, realizes that today's technology is rapidly advancing towards quantum technology, and has the ability to research the principles and methods of transferring quantum physics to technology.
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21	Course Content:
	Course Content:

Week	Theoretical	Practice
1	Why Quantum Physics?; Viewpoints of classical and quantum physics.	
2	Early Quantum Theory; Emergence and development of quantum physics, light and material waves	
3	Wave Mechanics: Wave function and its properties, Probability	
4	Wave packets, Obtaining physical information from wave function	
5	Quantum Equation of Motion: Time	
6	Steady States: Time-Independent Schrödinger equation, Physical and	
7	Applications of Time-Independent Schrödinger Equation (Constant potentials);	
8	Applications of the Time-Independent Schrödinger Equation (Variable potentials);	
9	Operators in Quantum Mechanics, Algebraic	
10	Properties of operators, Commutativity, Hermitianity	
12	Possibilities of obtaining physical information from measurement results, compatibility relations between classical and quantum physics	
13	Single Electron Atoms: (Application of Schrödinger Theory), Solutions of Schrödinger equation in spherical coordinates, obtaining wave functions and energy eigenvalues. Quantum states of electrons	
14	Angular Momentum, Orbital and Spin Angular Momentum, Matrix Representations, Eigenvalues ??and Eigenvectors, Pauli Spin Matrices	

Activites	Number	Duration (hour)	Total Work Load (hour)
Theoretical	14	5.00	70.00
Practicals/Labs	0	0.00	0.00
Self study and preperation	14	5.00	70.00
Homeworks	10	3.00	30.00
Projects	0	0.00	0.00
Field Studies	0	0.00	0.00
Midterm Exams	1	2.00	2.00
Others	0	0.00	0.00
Final Exams	1	2.00	2.00
Total Work Load			174.00
Total work load/ 30 hr			5.80
ECTS Credit of the Course			6.00

22	Textbooks, References and/or Other Materials:	1. Prof. Dr. Mürsel ALPER Ders Notları (2020) 2. Bekir Karaoğlu, Kuantum Mekaniğine Giriş 3. Tekin Dereli ve Abdullah Verçin, ODTÜ, Geliştirme Vakfı Yayıncılık ve İletiştim A.Ş. Ankara (1998
23	Assesment	

TERM LEARNING ACTIVITIES	**NUMBER**	**WEIGHT**
Midterm Exam	1	40.00
Quiz	0	0.00
Home work-project	0	0.00
Final Exam	1	60.00
Total	2	100.00
Contribution of Term (Year) Learning Activities to Success Grade		40.00
Contribution of Final Exam to Success Grade		60.00
Total		100.00
Measurement and Evaluation Techniques Used in the Course		The system of relative evaluation is applied.

24 ECTS / WORK LOAD TABLE

25 CONTRIBUTION OF LEARNING OUTCOMES TO PROGRAMME QUALIFICATIONS

	PQ1	**PQ2**	**PQ3**	**PQ4**	**PQ5**	**PQ6**	**PQ7**	**PQ8**	**PQ9**	**PQ10**	**PQ11**	**PQ12**	**PQ13**	**PQ14**	**PQ15**	**PQ16**
ÖK1	5	4	4	4	3	0	0	0	4	0	0	0	0	0	0	0
ÖK2	4	5	3	4	4	0	0	0	0	0	0	0	0	0	0	0
ÖK3	5	4	4	3	3	0	0	0	0	0	0	0	0	0	0	0
ÖK4	4	4	5	3	3	0	0	0	0	0	0	0	0	0	0	0
ÖK5	5	4	2	2	4	0	0	0	0	0	0	0	0	0	0	0

LO: Learning Objectives PQ: Program Qualifications

Contribution Level:	**1 very low**	**2 low**	**3 Medium**	**4 High**	**5 Very High**