هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

T-104
2022

Course Specification

Course Title:	Quantum Mechanics
Course Code:	PHYS 452
Program:	B.Sc. in Physics
Department:	Department of Physics and astronomy
College:	College of Science
Institution:	King Saud University
Version:	2.0.0
Last Revision Date:	Sep 2023

Table of Contents:

A. General information about the course:

Course Identification					
1. Credit hours:	3(3+0+0)				
2. Course type					
a.	University ☐	College ☐	Department☒	Track☐	Others☐
b.	Required ☒	Elective☐			
3. Level/year at which this course is offered:	Seven level / four year.				

4. Course general Description

The wave function, The statistical interpretation of the wave function, operators, expectation values, the uncertainty principle. Time-dependent Schrodinger equation.
Time-independent Schrodinger equation, binding potentials, free potentials, the quantum harmonic oscillator. Hilbert space, Eigenvalue problems, Dirac notation. Quantum mechanics in three dimensions, Hydrogen atom, spin and angular momentum.

5. Pre-requirements for this course (if any): Phys 353

6. Co- requirements for this course (if any): None

7. Course Main Objective(s)

1. To familiarize the student with the concept of the wave function in Quantum Mechanics and its statistical interpretation.
2. The student should understand the concept of quantum operator and the Uncertainty Principle.
3. The student should learn the Time-dependent and –independent Schrodinger equation.
4. The student should understand the formal aspects of quantum mechanics including Dirac notation.
5. The student should how quantum mechanics describes the physical world in three dimensions, including the Hydrogen atom

1. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1.	Traditional classroom	45	100%
2.	E-learning	0	0
3.	Hybrid • Traditional classroom • E-learning	0	0
4.	Distance learning	0	0

2. Contact Hours (based on the academic semester)

No	Activity	Contact Hours
1.	Lectures	45
2.	Laboratory/Studio	0
3.	Field	0
4.	Tutorial	0
5.	Others (specify)	0
	Total	45

B. Course Learning Outcomes (CLOs), Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
1.0	Knowledge and understanding			
1.1	Outline the postulates of QM.	K1	• Give extensive examples during lecture. • Give problem sheets to be discussed during lecture..	• Hold Class discussion, tutorial sessions. • Give quizzes, mid-term exam and final exam.
1.2	Recognize the difference between QM and CM.	K2		
1.3	Explain the stats nature of the wavefunction			
2.0	Skills			
2.1	Analyze QM systems using TISE	S1	• Give extensive examples during lecture • Give problem sheets to be discussed during lecture and labs. • assignments. • Discussions in the classes	• Hold Class discussion, tutorial and lab sessions. • Give quizzes, mid-term exam and final exam.
3.0	Values, autonomy, and responsibility			
3.1	Work in a team and acknowledge others' work.	V1	• assignments. • Homework • Project	Hold Class discussion

C. Course Content

No	List of Topics	Contact Hours
1.	The wavefunction and its statistical interpretation	3
2.	Operators, expectation values, and the uncertainty principle	6
3.	Time Dependent Schrodinger equation and stationary solutions	3
4.	Time Independent Schrodinger equation and binding potentials	6
5.	Time Independent Schrodinger equation and free potentials	6
6.	The quantum harmonic oscillator	3
7	Hilbert Space, Eigenvalue problem, Hermitian operators, and Dirac Notation	6
8.	Schrodinger equation in three dimensions and the Hydrogen atom	6
9.	Spin and angular momentum	9
total	48	

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	First Midterm examination	Approx. 6	20%
2.	Second Midterm examination	Approx. 12	20%
3.	Project and Quizzes	Week 9	20%
4.	Final examination	From 16 to 18	40%

*Assessment Activities (i.e., Written test, oral test, oral presentation, group project, essay, etc.)

E. Learning Resources and Facilities

1. References and Learning Resources

Essential References	Introduction to Quantum Mechanics, David Griffiths, Second Edition, 2016, Cambridge University Press
Supportive References	1) Quantum Mechanics Concepts and Applications, Nouredine Zettilli, Second Edition, 2009, Wiley 2) Quantum Mechanics, B.H. Bransden & C.J. Joachain, Second Edition, 2000, Pearson Education Ltd.
Electronic Materials	None
Other Learning Materials	Internet sites relevant to the course

2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	A classroom which accommodates 25 students.
Technology equipment (projector, smart board, software)	Whiteboard and Smart board
Other equipment (depending on the nature of the specialty)	Not applicable

F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	Students\ Peer Reviewer	Indirect \ direct
Effectiveness of students assessment	Students- Faculty	Direct
Quality of learning resources	students	Indirect
The extent to which CLOs have been achieved	Faculty	Indirect
Other	None	None

Assessor (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify)
Assessment Methods (Direct, Indirect)

G. Specification Approval Data

COUNCIL /COMMITTEE	Physics department council
REFERENCE NO.	10th (2nd term 1445)
DATE	12/07/1445