Jordan University of Science and Technology

Faculty of Science & Arts

Physics Department

PHY351 Quantum Mechanics(1)

First Semester 2017-2018

Course Catalog

3 Credit Hours. Jordan University of Science and Technology Department of Physics Course Syllabus Fall 2017/2018 Course Information Course Number: Phys 351 Course Name: Quantum Mechanics 1 Credit Hours: 3 Contact Hours: 10:30-11:30 Sunday, Tuesday and Thirsday E-learning web address: https://elearning.just.edu.jo/ Prerequisites: Phys 251 Modern Physics Required or Elective or Selected Elective Instructor Information Coordinator: Prof. M K Qaseer Instructor: Prof. M K Qaseer Office Hours:11:30-12:30 SUN, Mon 11:30 ? 12:30 Office Location: PH3 L1 Instructors E-mail: qaseer@just.edu.jo Web Page: www.just.edu.jo/~qaseer Course Catalog Course Description: (Give a brief description of the course as it appears in the study plan) General description of wave Mechanics. Time dependent Schrodinger equation with applications, Time independent Schrodinger equation with applications, Linear Vector space in quantum mechanics, Problems in three dimensions, angular momentum and spin. Identical particles. Textbook: Textbook: (title, author, and year) Introduction to Quantum Mechanics, 1995 D. J. Griffiths, Prentice Hall References and Supplement Materials: 1. Quantum Physics, S Gasiorowicz, 3rd Ed., 2. Introductory Quantum Mechanics, R.L. Liboff, Addison Wesley Evaluation First Exam 25 % Second Exam 25 % Homeworks 10 % Final Exam Outcomes of instruction: By the end of the course, students should be able to . 1- Introduction to wave mechanics 2- Derivations of time dependent and time independent Schrodinger equation 3- Solve different problems using the time independent Schrodinger equation 4- Linear vector space and quantum mechanics 5- Solve three dimensional problems. 6- Angular momentum and spin 7- Apply quantum mechanics to the identical particles. Topics to be Covered Week Chapter Topics 1 1 Introductiom 2 2 Chapter 2: Maxwell-Boltzmann Statistics 3+4 3 Chapter 3: Applications of Maxwell-Boltzmann Statistics 5+6 4 Chapter 4: Bose-Einstein Statistics 6+7 5 Chapter 5: Fermi-Dirac Statistics 8 6 Chapter 6: Temperature and Entropy 9 7 Chapter 7: The Thermodynamics of Gases 10 8 Chapter 8: Applications of Statistical Thermodynamics 11-12 9 Chapter 9: The Canonical Ensemble 13-15 10 Chapter 10: The Grand Canonical Ensemble 16 Final Exam WEEK # Chapter TOPIC TO BE COVERED 2 1 Chapter 1: The Wave Function 1.1 The Schrodinger Equation 1.2 The Statistical Interpretation 1.3 Probability, Normalization 1.4 Momentum 1.5 The Uncertainty Principle. 3-6 2 Chapter 2: The Time Independent Schrodinger Equation: 2.1 Stationary States 2.2 The Infinite Square Well 2.3 The Harmonic Oscillator 2.4 The Free Particle 2.5 The Delta-Function Potential 2.6 The Finite Square well 2.7 The Scattering Matrix. 7-9 3 Chapter 3: Formalism: 3.1 Linear Algebra 3.2 Function Spaces 3.3 The Generalized Statistical Interpretation 3.4 The Uncertainty Principle. 10-13 4 Chapter 4: Quantum Mechanics in Three Dimensions 4.1 Schrodinger Equations in Spherical Coordinates 4.2 The Hydrogen Atom 4.3 Angular Momentum 4.4 Spin 14-15 Chapter 5: Identical Particles: 5.1 Two-Particle Systems 16 Final Exam Relationship of the Course to the Mathematics Program Outcomes: Program outcomes a ? k ? Level (L, M, H) (a) an ability to apply knowledge of mathematics, science, and applied sciences ? H (b) an ability to design and conduct experiments, as well as to analyze and interpret data (c) an ability to formulate or design a system, process, or program to meet desired needs (d) an ability to function on multidisciplinary teams (e) an ability to identify and solve applied science problems ? M (f) an understanding of professional and ethical responsibility (g) an ability to communicate effectively (h) the broad education necessary to understand the impact of solutions in a global and societal context (i) a recognition of the need for and an ability to engage in life-long learning (j) a knowledge of contemporary issues (k) an ability to use the techniques, skills, and modern scientific and technical tools necessary for professional practice.

Text Book	
Title	Introduction to Quantum Mechanics
Author(s)	D. J. Griffiths
Edition	3rd Edition
Short Name	1
Other Information	

Course References

Short name	Book name	Author(s)	Edition	Other Information
2	1. Quantum Physics	S Gasiorowicz	3rd Edition	

Instructor	
Name	**Prof. Mohammad-Khair Qaseer**
Office Location	PH4 L-1
Office Hours	Sun : 11:30 - 14:00 Mon : 11:30 - 13:00 Tue : 08:30 - 09:30 Wed : 09:00 - 10:00 Thu : 11:30 - 12:30
Email	qaseer@just.edu.jo

Class Schedule & Room
Section 1: Lecture Time: Sun, Tue, Thu : 10:30 - 11:30 Room: M1304

Prerequisites		
Line Number	**Course Name**	**Prequisite Type**
922510	PHY251 Modern Physics	Prerequisite / Study

Tentative List of Topics Covered		
Weeks	**Topic**	**References**
Weeks 1, 2, 3, 4, 5	Schrodinger equation with different potentials in one dimensions	
Weeks 6, 7, 8, 9	Vector Space and Operators with applications	
Weeks 10, 11, 12, 13, 14	Schrodinger equation with different potentials in three dimensions	
Weeks 15, 16	Review to some problems in Quantum Physics	

Mapping of Course Objectives to Program Student Outcomes[1]	Assessment method
The student should know Schrodinger equation and solve it in one dimension for different potetials [70(a), 30(e)]	Exam1
Knowing the Vector Space and Operators [70(a), 30(e)]	Exam1
Solve Schrodinger equation in three dimensions [70(a), 30(e)]	Exam1

Relationship to Program Student Outcomes (Out of 100%)										
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)
70				30						

Evaluation	
Assessment Tool	**Weight**
Exam1	25%

Date Printed: 2017-11-28