ATTACHMENT 5.

T6. COURSE SPECIFICATIONS (CS)

PHYS 652: Quantum Mechanics II

هيئة تقويم التعليم
Education Evaluation Commission

Course Specifications

Institution	Date of Report
King Saud University	09/02/2018
College/Department	Science/ Physics & Astronomy

A. Course Identification and General Information

1. Course title and code: Quantum Mechanics II PHYS 652
2. Credit hours 03
3. Program(s) in which the course is offered.
(If general elective available in many programs indicate this rather than list programs)
Ph.D.
4. Name of faculty member responsible for the course Prof. Md. Harunor Rashid Khan
5. Level/year at which this course is offered Ph.D.
6. Pre-requisites for this course (if any)
7. Co-requisites for this course (if any)
8. Location if not on main campus
9. Mode of Instruction (mark all that apply)

a. Traditional classroom	√	What percentage?	100%
b. Blended (traditional and online)		What percentage?	
c. e-learning		What percentage?	
d. Correspondence		What percentage?	
f. Other		What percentage?	

Comments:

B Objectives

1. What is the main purpose for this course?

In physics, Quantum mechanics is one of the two major sub-fields of mechanics, along with classical mechanics. The theory of relativity describes the behavior of large everyday objects in the world around us. However this theory alone is not enough to describe things at a very small scale. The implications of quantum theory are wide ranging. Quantum mechanics has explained the structure of the atom and the structure of the nucleus. Without knowing the structure of the atom, most of the physics and chemistry that we know today wouldn't have been possible. Quantum theory predicted the existence of antimatter, and explains radioactivity.

The PHYS 652 designed specially to satisfy the above mentioned objectives. Studying this course the students will be able to describe the behavior of particles and other specific sub-topics. Many applications resulting from quantum theory are in use today, and its applications in the future are potentially infinite.

2. Briefly describe any plans for developing and improving the course that are being implemented. (e.g. increased use of IT or web based reference material, changes in content as a result of new research in the field)

C. Course Description (Note: General description in the form used in Bulletin or handbook)

Course Description:

The course covered the details of symmetries and conservation laws, angular momentum and scattering theories. Other related topics are also included. The advanced level topics on these has been included.

1. Topics to be Covered

List of Topics	No. of Weeks	Contact Hours
Introduction to Symmetry in quantum mechanics: Symmetries, conservation laws, and degeneracies.	3	9

Discreet symmetries, parity. Lattice translation, Time –Reversal. Identical particles: Permutation symmetry, Symmetrization postulate, two electron system.	3	9
The Helium atom. Permutation symmetry and Young Tableaux.	2	6
Scattering theory: The Lippmann-Schwinger equation, The Born approximation,	3	9
Optical theorem. Methods of partial waves, Low energy scattering and bound states	2	6
Resonance scattering. Identical particles and scattering, Coulomb scattering.	2	6

2. Course components (total contact hours and credits per semester):

		Lecture	Tutorial	Laboratory/ Studio	Practical	Other:	Total
Contact Hours	Planed	45					45
	Actual	45					45
Credit	Planed	03					03
	Actual	03					03

3. Additional private study/learning hours expected for students per week. ☐

4. Course Learning Outcomes in NQF Domains of Learning and Alignment with Assessment Methods and Teaching Strategy

On the table below are the five NQF Learning Domains, numbered in the left column.

First, insert the suitable and measurable course learning outcomes required in the appropriate learning domains (see suggestions below the table). **Second**, insert supporting teaching strategies that fit and align with the assessment methods and intended learning outcomes. **Third**, insert appropriate assessment methods that accurately measure and evaluate the learning outcome. Each course learning outcomes, assessment method, and teaching strategy ought to reasonably fit and flow together as an integrated learning and teaching process. (Courses are not required to include learning outcomes from each domain.)

	NQF Learning Domains And Course Learning Outcomes	Course Teaching Strategies	Course Assessment Methods
1.0	**Knowledge**		
1.1		In-class discussion	
1.2		In-class problems solving.	
1.3		Pop Quizzes.	
1.4		Homework assignments	
2.0	**Cognitive Skills**		
2.1		Discuss the duties for each chapter and homework assignments	
2.2		Problem solving.	
2.3		Quizzes.	
3.0	**Interpersonal Skills & Responsibility**		
3.1		Conducting group discussions and solving problems.	
3.2		Enhance educational skills.	
3.3		Encourage student attendance by giving bonus marks for attendance and by giving pop quizzes.	
3.4		Learn how to search the internet and use the library.	
4.0	**Communication, Information Technology, Numerical**		
4.1		Encourage group discussions during class and group problems solving.	
4.2			
5.0	**Psychomotor**		
5.1		**Not applicable**	
5.2			

5. Schedule of Assessment Tasks for Students During the Semester

	Assessment task (e.g. essay, test, group project, examination, speech, oral presentation, etc.)	Week Due	Proportion of Total Assessment
1	Mid Term Exam	9	20%
2	Assignment	6	20%
3	Home Work	3	20%

4	Final Examination	0	40%
5			
6			
7			
8			

D. Student Academic Counseling and Support

1. Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice. (include amount of time teaching staff are expected to be available each week)

E Learning Resources

1. List Required Textbooks 1. List Required Textbooks (a) Quantum Mechanics, 3rd Edition by L. I. Schiff (b) Quantum Mechanics, 2nd Edition by E. Merzabacher
2. List Essential References Materials (Journals, Reports, etc.)
3. List Electronic Materials, Web Sites, Facebook, Twitter, etc.
4. Other learning material such as computer-based programs/CD, professional standards or regulations and software.

F. Facilities Required

Indicate requirements for the course including size of classrooms and laboratories (i.e. number of seats in classrooms and laboratories, extent of computer access, etc.)
1. Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)
2. Technology resources (AV, data show, Smart Board, software, etc.)
3. Other resources (specify, e.g. if specific laboratory equipment is required, list requirements or attach list)

G Course Evaluation and Improvement Processes

1. Strategies for Obtaining Student Feedback on Effectiveness of Teaching
2. Other Strategies for Evaluation of Teaching by the Instructor or by the Department
3. Processes for Improvement of Teaching
4. Processes for Verifying Standards of Student Achievement (e.g. check marking by an independent member teaching staff of a sample of student work, periodic exchange and remarking of tests or a sample of assignments with staff at another institution)
5. Describe the planning arrangements for periodically reviewing course effectiveness and planning for improvement.

Name of Course Instructor: Prof. Md. Harunor Rashid Khan

Signature:  Date Specification Completed: 09/02/2018

Program Coordinator: _____

Signature: _____ Date Received: _____