



FORMAN CHRISTIAN COLLEGE (A Chartered University)
PHYS 462/ MATH 411: Quantum Mechanics II (3 credit hours)
Course Outline for Online/face to face Teaching
Spring 2022

Instructor Information	
Name	Dr. Fareeha Hameed
Email	fareehahameed@fccollege.edu.pk
Skype Name	hameedfareeha
Online Advising	Appointments by Email/SMS/WhatsApp For E-mail, include “PHYS 462/Math 411 – Quantum Mechanics II” in the subject line
Online Classes	Will be held on Zoom, Tuesdays and Thursdays 12:30 – 13:45 hr. and recordings will be uploaded to Moodle
Course Material/ Announcements	Will be uploaded on Moodle
Course Information	
Course Objectives	In this course, the emphasis is on learning both by solving application problems, and conceptual discussions. The intended audience are students majoring in Physics or Mathematics. Prior training in Physical science and/or Mathematics is assumed (indicated in the prerequisites), and an effort will be made to achieve a qualitative and, as possible, a quantitative understanding of the systems studied. This will be obtained by direct problem solving and relevant analysis, by learning advanced principles specifically including those reached as a result of advanced mathematical tools. The revolutionary ideas and concepts of Quantum Mechanics will be presented.
Learning Outcomes:	On Successful completion of this course the student will be able to: <ul style="list-style-type: none">• Demonstrate knowledge of the revolutionary concepts of Quantum Mechanics• Develop independent problem solving skills• Apply the concepts to different problems/applications
Text Books & Reference Material	<ul style="list-style-type: none">• Introductory Quantum Mechanics, Richard L. Liboff, 4th Edition, Addison Wesley, 2003• Introduction to Quantum Mechanics, Third Edition, Griffiths and Schroeter, Cambridge University Press, 2018• Quantum Physics, Stephen Gasiorowicz, Third Edition, John Wiley & Sons, 2003• Quantum Mechanics: An Introduction, Walter Greiner, Fourth Edition, Springer-Verlag Berlin Heidelberg 2001• Quantum Mechanics, John. L. Powell and Bernd Crasemann, (Addison Wesley reprinted 1998)• Online lectures (links will be given on Moodle)

<p>Course Requirements & Important things to know</p>	<ul style="list-style-type: none"> • All examinations, tests and assignments shall be cumulative, i.e. may or may not contain material from previous assignments and tests. • <u>Technology Use:</u> The Moodle platform will be used for making announcements, sharing material, submission of assignments, and conducting quizzes, Exams, etc. Zoom will be used for online classes. Notifications will be sent on your official emails • Students are required to watch/listen to online lectures and do relevant readings. They are also required to watch online videos as instructed. • <u>Due Dates:</u> <ul style="list-style-type: none"> ○ All assignments are to be submitted by 4:00 p.m. on the due date. ○ Late activities will not be graded, unless previous accommodations have been made. In case of any other limitations (internet), inform prior to the deadline. Avoid submitting at the last moment. Make prior arrangements to avoid any technological problems ○ There are no make-up exams. • <u>Academic Honesty:</u> <ul style="list-style-type: none"> ○ All work that you submit in this course must be your own. ○ Unauthorized group efforts are considered academic dishonesty. ○ You may discuss homework (Assignments, Lab Exams) in a general way with others, but you may not consult anyone else's written work. ○ You are guilty of academic dishonesty if you examine another's solution, allow (actively or passively) another student to examine your solution, or you copy from the Internet without complete understanding of what you have done. University policy of plagiarism will be applicable in the case. ○ All cases no matter how trivial they are will be reported to Academic Integrity Committee (AIC) of FCCU. Cheating or violation of academic integrity in any exam will cause F grade. ○ <u>Ethics:</u> Ethics violations on exams, quizzes, assignments or any other course activities will be reported to the AIC (Academic Integrity Committee) and action will be taken according to AIP (Academic Integrity Policy) of FCC. 		
<p>Assessment Criteria</p>	<p>Assignments</p>	<p>20%</p>	
	<p>Class Participation</p>	<p>10%</p>	
	<p>Paper</p>	<p>20%</p>	
	<p>Presentation</p>	<p>25%</p>	
	<p>Viva Exam (oral/written)</p>	<p>25%</p>	

Assessment	<ul style="list-style-type: none"> ○ <u>Assignments:</u> Students will be notified about it on Moodle and will be required to submit them by the deadline. Students may be asked to give a viva for the assignment via Zoom. ○ <u>Paper</u> Each student will select a topic relevant to the course. The topic will be approved by the instructor. ○ <u>Presentation</u> <ul style="list-style-type: none"> ○ Each student will give a presentation for about 15 minutes. After this presentation there will be detailed questions and answers session on Zoom. ○ The student will also submit the presentation recording for grading. ○ <u>Final viva exam:</u> Students will be notified about it on Moodle and will be required to submit them by the deadline. Students may be asked to give a viva for the assignment via Zoom. ● <u>Assessment Schedule will be announced in Zoom class and posted on Moodle and notification sent by email</u> 			
Course Content	This course deals with historical origination of quantum theory; foundation of wave Mechanics, Schrödinger wave equation and its solution for free particles. Angular momentum in Cartesian and spherical coordinates, study of the hydrogen atom, Zeeman effect and Pauli spin matrices. Time dependent and time independent perturbation theory.			
Lesson Plan	Week No.	Topics	Assessments and Activities	
	1 st Week	Angular momentum	Reading and practice HW	
	2nd Week	Angular momentum in spherical coordinates	Reading and practice HW	
	3rd Week	Problems in 3 dimensions	HW Problems	
	4th Week	Hydrogen atom	1st assignment	
	5th Week	Zeeman Effect	Reading and practice HW	
	6th Week	Matrix representation of operators	2 nd assignment	
	7th and 8th Week	Problem solving	Practice HW	
	9th Week	Pauli's exclusion principle and Pauli's spin matrices	HW Problems	
	10th Week	Problem solving	Reading and practice HW	
	11th Week	Perturbation Theory	HW problems	
	12th Week	Time dependent Perturbation theory	Paper and Presentation	
	13th Week	Time Independent Perturbation	Practice HW	
	14th Week	Revision	Viva exam (Oral/written)	
Grading Scale	Grade	Quality Point	Numerical Value	Meaning

	A	4.00	93-100	Superior	
	A-	3.70	90-92		
	B+	3.30	87-89		
	B	3.00	83-86	Good	
	B-	2.70	80-82		
	C+	2.30	77-79		
	C	2.00	73-76	Satisfactory	
	C-	1.70	70-72		
	D+	1.30	67-69		
	D	1.00	60-66	Pass	
	F	0.00	59 or below	Fail	

Disclaimer

Considering the situation of the COVID-19 pandemic, the course instructor reserves the right to modify the above plan as need be during the course of the class; however, it won't be done impetuously. Any changes that would be incorporated will be informed in advance.