BIRLA INSTITUTE OF TECHNOLOGY AND SCIENCE, PILANI

INSTRUCTION DIVISION

FIRST SEMESTER 2015-2016

Course Handout (Part-II)

Date: 02/08/2016

In addition to part I (General handout for all courses appended to the timetable) this portion gives further details regarding the course.

Course Number : **PHY F311/ PHY C321**

Course Title : **QUANTUM MECHANICS II / QUANTUM MECHANICS I**

Instructor-in-Charge : **R.R. Mishra**

Scope & Objective of the Course:

Assuming a knowledge of elementary quantum mechanics covered in the Quantum Mechanics I/Modern Physics course, this course aims to expose the students to some advanced aspects of Quantum Mechanics.
The course starts with formal formulation of Quantum Mechanics with a stress on the exactly solvable problems. The course also covers several approximate methods for both the time dependent and independent case. A focus of the course is the study of symmetries in QM specially through the detailed look at rotations.

Text Book:

T: Modern Quantum Mechanics, J.J. Sakurai, Revised Edition, Addison-Wesley Publishing Company

Reference Books:

R1: Quantum Mechanics B.H. Bransden, C. J. Joachain, (second edition) Pearson.
R2: Principles of Quantum Mechanics, R Shankar (Second Edition), Springer

Course Plan:

Lecture Number	Learning Objectives	Topics to be Covered	Reference
1- 6 (6)	The language of Quantum mechanics	Linear Vector space (LVS), Structures on LVS, Dirac Notation, Orthonormal basis, Operators, Matrix representation of vectors and operators, Hermitian and Unitary operators, Eigen-value problem	T: CHAPTER 1 R2: CHAPTER I
7-12 (6)	Formalism	Postulates of Quantum Mechanics, Measurements, Observables and Uncertainty Relation, Position and Momentum Operators, Wave Functions in Position and Momentum Space,	T: CHAPTER 1 R2: CHAPTER I
13-18 (2)	Quantum Dynamics	Time Evolution and Schrodinger Equation, The Schrodinger Versus the Heisenberg Picture, Simple harmonic Oscillator through Operator Method	T: CHAPTER 2, (2.1 - 2.4)
19-24 (6)	Angular Momentum	Rotations and Angular momentum. Angular momentum algebra, Eigenvalues and Eigen Vectors of Angular Momentum, Orbital Angular Momentum, Addition of Angular Momenta, Spin Half Systems	T: CHAPTER 3 (3.1 - 3.2, 3.5 - 3.7)

25-28 (4)	3-D Central potential	Central potential, Hydrogen atom problem, 3D Oscillator.	R1: CHAPTER 7
29-33 (5)	Approximate Methods I (Perturbative)	Time independent Perturbation theory Degenerate and non-degenerate case Zeeman and Stark effect.	T: CHAPTER 5, (5.1-5.3) R1: (8.1-8.2)
34-36 (3)	Approximate Methods II (Nonperturbative)	The Variational techniques, WKB Method	T: CHAPTER 5, (5.4) R1: 8.3
37-40 (4)	Time dependent perturbation	Interaction picture, Dyson series, Application of perturbation technique for 2 state systems. Fermi's Golden rule (statement).	T: CHAPTER 5 (5.5-5.6)

Evaluation Scheme:

EC No.	Evaluation Component	Duration	Weightage (%)	Date, Time & Venue	Nature of Component
2	Mid-semester Test	90 mins.	30	4/10 10:00 - 11:30 AM	Closed Book
3	Assgn./Tutorials Tests		30		Closed Book + Open Book
4	Comprehensive Exam	3 hours.	40	3/12 FN	Closed Book + Open book

Chamber Consultation Hour: To be announced in the class.

Notices: Notices and solutions will be displayed only on **PHYSICS/FDIII** notice board.

Make-up Policy [STRICT] No Make-ups for tutorial tests. Make up for regular tests will be given only to genuine cases, *i.e.* (i) Sickness leading to ***hospitalization***, (ii) out-of-station with prior ***intimation to / permission from*** the IC.

Instructor-in-Charge

PHY PHYF311