SYLLABUS

Course Code	Course Num.	Course Name	Credit Hours	Lec.	Lab.	Tut.	Private study	Pre-requisites	Course Level	Language
PHY	312	Quantum Mechanics	3	2	0	2	4	PHY 303, STA 111	6	English

A. Course Description

This course provides an introduction to the concepts and formalism of quantum mechanics, which are based on a number of postulats. It presents a formal discussion of the postulates, and how they can be used to extract quantitative information about microphysical systems. Primary emphasis is on the time-independent Schrödinger equation and its applications to simple systems such as the harmonic oscillator, the potential barrier and well, Delta-function potential, and the hydrogen atom without spin. The postulates of quantum mechanics will be developed in the formalism of operator observables acting on a linear state space of wave functions, in analogy with finite dimensional matrix operations on vectors.

B. Course Outcomes

At the end of this course the student will be able to**:**

1. Know the main features of the historical development of quantum mechanics.
2. Acquire knowledge of the core aspects of quantum mechanics.
3. Learn how to use the tools of quantum mechanics.
4. Provide the techniques to solve, through discussion and reading, a wide range of specific theoretical problems including their backgrounds and implications.

C. References

Required Textbook

Griffiths D.J*., Introduction to Quantum Mechanics,* 2nd Edition, Pearson Prentice Hall, NJ, (2004).

Other references

- Gasiorowicz. S., ***Quantum Physics,*** 3rd Edition, Wiley, NJ, USA (2003).
- Zettili N., ***Quantum Mechanics Concepts & Applications***, 2nd Edition, John Wiley & Sons (2009).
- Liboff R.L., ***Introductory Quantum Mechanics,*** Addison Wesley (2002).

Course Website: http://www.imamm.org/

D. Topics Outline

1. ***Introduction (Historical Background):*** *Development of the quantum theory, experiments that led to the formulation of quantum mechanics, wave-particle duality (*Contact hours*: 4).*
2. ***Wave Function:*** *Schrödinger equation, statistical interpretation, probability, normalization, Fourier transform, momentum, position and momentum operators, expectation value, Eherenfest's theorem, wave function in momentum space, probability current, uncertainty principle (*Contact hours*: 16).*
3. ***Time-Independent Schrödinger Equation:*** *Introduction, method of separation of variables, stationary states, Hamiltonian, linear combination, infinite square well, harmonic oscillator,*

*free particle, Delta-function potential, potential step, potential barrier, finite square well, spherically symmetric potential (Hydrogen atom without spin) (*Contact hours*: 24).*

4. ***Formalism & Mathematical background:*** *Hilbert space; vectors; inner product; linear transformation, observables; Hermitian operators; determinate states, eigenfunctions of a Hermitian operator; discrete spectra; continuous spectra, generalized statistical interpretation, the uncertainty principle; proof the generalized uncertainty principle; the minimal-uncertainty wave packet; the energy-time uncertainty principle, Dirac notation; matrix elements; Ket; Bra; dual space; projection operator (*Contact hours*:16).*

E. Office Hours

Office hours give students the opportunity to ask in-depth questions and to explore points of confusion or interest that cannot be fully addressed in class.

F. Exams & Grading System

The semi-official dates of the exams for this course are:

- **Midterm 1:** 6th or 7th week.
- **Midterm 2:** 11th or 12th week.
- **Quizzes & Homeworks:** During the semester.
- **Final Exam**: 16th week.

Your course grade will be based on your semester work as follows:

Midterm 1: 20 %	**Midterm 2:** 20 %	**Final Exam:** 40 %
Quizzes, Homework, Attendance & Participation: 20 %		

The grading distribution:

A+	A	B+	B	C+	C	D+	D	F
[95, 100]	[90, 95)	[85, 90)	[80, 85)	[75, 80)	[70, 75)	[65, 70)	[60, 65)	[0, 60)

G. Student Workload

#	Teaching/Learning activities	Contact hours	Frequency	Total contact hours	Self-study hours	Total self-study hours	Student learning time
1	Lecture	2	15	30	1	15	45
2	Tutorial	2	15	30	1	15	45
3	Lab\practical	0	0	0	0	0	0
4	Homework	0	4	0	2	8	8
5	Quiz	0.5	2	1	1	2	3
6	Midterm	1.5	2	3	5	10	13
7	Final Exam	2	1	2	12	12	14
Total				**66**		**62**	**128**

The independent self-study is approximately 4 hours per week.

H. Student Attendance/Absence

Only three situations will be considered as possible excused absences:

- Occurrence of a birth or death in the immediate family will be excused. ("Immediate family" is defined by the University as spouse, grandparents, parents, brother, or sister).
- Severe illness in which a student is under the care of a doctor and physically unable to attend class will be excused. Students are not excused for a doctor's appointment. Do not make appointments that conflict with rehearsals. Notes from the University Health Center will be accepted.

Executive Rules for Study Regulations and Exams
goo.gl/ykm7t3