The University of Jordan

Accreditation & Quality Assurance Center

COURSE Syllabus
Quantum Mechanics-1 (0332361)

1	Course title	**Quantum Mechanics-1**
2	Course number	**0332361**
3	**Credit hours (theory, practical)**	**3 theory**
	Contact hours (theory, practical)	**3 theory**
4	Prerequisites/corequisites	**Modern Physics (0302261)**
5	Program title	**BSc. In Physics**
6	Program code	
7	Awarding institution	**The University of Jordan**
8	Faculty	**Faculty of Science**
9	Department	**Department of Physics**
10	Level of course	**2nd year**
11	Year of study and semester (s)	**2nd Semester 2014/2015**
12	Final Qualification	**Bachelor**
13	Other department (s) involved in teaching the course	**-**
14	Language of Instruction	**English**
15	Date of production/revision	**Jan 2015/April 2015**

16. Course Coordinator:

Dr. Hanan Sa'adeh
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Dr. Mohammad S. Shikakhwa
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17. Other instructors:

18. Course Description:

Introduction to Wave Mechanics; Wave Functions; Schrödinger Equation; Probability Amplitudes; Stationary States; Heisenberg Uncertainty Relation; One-Dimensional System; Potential Well and Potential Barrier Problems. Matrix Mechanics: Linear Vector Spaces, Operators, measurements and Probability Amplitudes, Position and Momentum Space, Wave Functions. Schrödinger Equation in Three Dimensions: Central Potentials, Orbital Angular Momentum and Spin, Hydrogen-Like Atoms.

1. 19. Course aims and outcomes:

A- Aims:
I- Establishment of a strong background on basics of quantum mechanics.
2- Understanding the ideas, tools, and rules of quantum mechanics.
3-Utilizing the rules of quantum mechanics to study simple quantum mechanical systems.

B- Intended Learning Outcomes (ILOs):
Upon successful completion of this course students will be able to
1- Interpret wave functions for quantum mechanical systems.
2- Know that Schrodinger equation determines the time evolution of any quantum mechanical system.
3- Know the meaning of stationary states and appreciate their significance for any quantum mechanical system.
4-Solve the Schrodinger equation for the stationary states of simple one-dimensional systems.
5- Acquire an understanding of the notion of Hilbert space and its use to represent quantum states and observables.
6- Master the idea of expansion of wave functions/states using as basis the eigenfunctions/states of Hermitian operators, and be able to interpret this expansion and extract information out of it.

20. Topic Outline and Schedule:

Ch. #	Sec. #	Topics	# of hrs	Suggested Problems
-	-	Introduction	1	-
1	1-6	**The Wave Function** The Schrödinger Equation The Statistical Interpretation Probability Normalization Momentum The Uncertainty Principle	6	1, 3, 4, 5, (14)* 7, 8, 9, 16, (15)
2	1-6	**Time-Independent Schrödinger Equation** Stationary States The Infinite Square Well The Harmonic Oscillator The Free Particle The Delta-Function Potential The Finite Square Well	14	3, 4, 7, 8, (5) 10, 11, 13, 18, (22) 23, 26, 29, 34, (31)
3	1-6	**Formalism** Hilbert Space Observables Eigenfunctions of a Hermitian Operator Generalized Statistical Interpretation The Uncertainty Principle Dirac Notation	13	3, 4, 5, 7, (6) 11, 16, 17, 34, (35)
4	1-4	**Quantum Mechanics in Three Dimensions** Schrödinger Equation in Spherical Coordinates The Hydrogen Atom Angular Momentum Spin	6	1, 3, 10, 13, 14, 16 19, 22, 27, 28

21. Teaching Methods and Assignments:

Development of ILOs is promoted through the following teaching and learning methods:
Lecturing
Solving Problems
Guiding the students to look for some interactive simulations.

22. Evaluation Methods and Course Requirements:

Opportunities to demonstrate achievement of the ILOs are provided through the following assessment methods and requirements:
Exams
Homework Assignments
Discussion in the class

23. Course Policies:

A- Attendance policies:

Class attendance is expected. Past experience has shown that students who do not attend the lectures invariably receive poor grades.

A student whose absence exceeds 15% of lectures will be dismissed.

B- Absences from exams and handing in assignments on time:

Absence from exams without an acceptable excuse means ZERO.

The homework assignments will not be graded due to time limitation. However, some problems will be selected and discussed in an extra lecture for every chapter.

C- Health and safety procedures:

No special precautions.

D- Honesty policy regarding cheating, plagiarism, misbehavior:

All these issues will be considered according to the regulations and laws adopted at the University of Jordan.

E- Grading policy:

First Exam: 20%

Second Exam: 30%

Final Exam: 50%

F- Available university services that support achievement in the course:

Class Room, Students Computer Lab.

24. Required equipment:

Text Book, Lecture Notes, Calculator.

25. References:

A- Required book (s), assigned reading and audio-visuals:
Introduction to Quantum Mechanics, 2nd Edition (2005), by David J. Griffiths.

B- Recommended books, materials, and media:
1- Quantum Physics of Atoms, Molecules, Solids, Nuclei, and Particles, 2nd Edition (1985), by R. Eisberg and R. Resnick.

2- Understanding Quantum Physics: A User's Manual (1990), by Michael A. Morrison.

26. Additional information:

Name of Course Coordinator: Dr. Hanan Sa'adeh Signature: ---------- Date: 5/4/2014

Head of curriculum committee/Department: ---------- Signature: ----------

Head of Department: ---------- Signature: ----------

Head of curriculum committee/Faculty: ---------- Signature: ----------

Dean: ---------- -Signature: ----------

Copy to:
Head of Department
Assistant Dean for Quality Assurance
Course File