



Course specification

University/Academy: Damanhour University

Faculty/Institute: Science

Department: Mathematics

1. course Data:

Course code: Math426	Course title: Quantum Mechanics	Academic year/level: 2010-2011 Fourth year - Second term
Specialization: Mathematics and Physics	No. of instructional units: lecture <input type="text" value="4"/> tutorial <input type="text" value="2"/> practical <input type="text" value="-"/>	

2. course Aim

Explain that, the quantum mechanics is a more general theory which contains classical mechanics as a limiting case and in fact historically quantum mechanics was developed by analogy with classical theory. Demonstrate theoretical knowledge and have practical skills and personal attributes that will be required for quantum mechanics. Demonstrate an ability to initiate and sustain in-depth research relevant to quantum mechanics.

3. Intended learning outcome

a) Knowledge and understanding

- a1. Define the nature and operations of quantum mechanics.
- a2. Describe familiarity with theories and concepts used in the quantum mechanics.
- a3. Recognize the structure and organization of the public and private sectors of the concepts in quantum mechanics.
- a4. Identify the steps required to carry out a piece of research on a topic within quantum mechanics.



b) Intellectual skills	<p>b1. Apply appropriate theories, principles and concepts relevant to the quantum mechanics.</p> <p>b2. Critically assess and evaluate the literature within quantum mechanics.</p> <p>b3. Analyze and interpret information from a variety of sources relevant to quantum mechanics.</p> <p>b4. Demonstrate a reasoned argument to the solution of familiar and unfamiliar problems relevant to mathematical equations in quantum mechanics.</p>
c) Professional skills	<p>c1. Plan, design and execute practical activities using techniques and procedures appropriate to mathematic related to quantum mechanics.</p> <p>c2. Plan, design, record, execute and communicate a piece of independent research using mathematics media and techniques in quantum mechanics.</p> <p>c3. Respond to change within the external and internal mathematics to quantum mechanics.</p> <p>c4. Solve problems relevant to quantum mechanics</p>
d) General skills	<p>d1. Deal with an appropriate effective data relevant to quantum mechanics.</p> <p>d2. Demonstrate the ability to work effectively as part of a group, involving leadership, group dynamics and interpersonal skills such as listening, negotiation and persuasion relevant to mathematics and theoretical physics.</p> <p>d3. Use organization skills (including task and time management) relevant to quantum mechanics both individually and in a group situation.</p> <p>d4. Solve problems relevant to quantum mechanics using ideas and techniques some of which are at the forefront of the discipline.</p> <p>d5. Acquire the ability to self appraise and reflect on practice relevant to quantum mechanics.</p>
4. course content	<p>The Schrödinger wave equation in three dimensions.</p> <p>The three dimensional harmonic oscillator problem, the</p>



	<p>particle in a box.</p> <p>Angular momentum in quantum mechanics. The isotropic harmonic oscillator in spherical polar coordinates.</p> <p>Energy levels of the hydrogen atom.</p> <p>Matrix representations of wave functions and operators.</p> <p>Matrix representations of the harmonic oscillator problem.</p> <p>Approximation methods.</p> <p>Time dependent and time independent perturbation theory.</p> <p>The variation method</p> <p>The spin matrices and addition of angular momenta.</p> <p>Relativistic quantum mechanics</p> <p>Dirac equation</p>
5. Teaching and learning methods	<p>5.1 Lectures.</p> <p>5.2 Tutorials</p> <p>5.3 Homework</p> <p>5.4 Oral discussion</p>
6. teaching and learning methods for students with special needs	Non
7. Student Assessment	
a. Procedures used:	Final exam
b. Schedule:	Assessment 1 Final exam Week 15
c. Weighing of Assessment:	Final exam 200 Marks
8. List of Textbooks and References:	
a. Course Notes	Course notes provided by the staff member of Math department, to be handed at the beginning



	of the semester.
b. Required Books (Textbooks)	None
1- Recommended Books	None
2- Periodicals, web sites,...,etc	None

Course Instructor: Dr. Ragab Omar Abd El-Rahman

Head of Department: Dr. Ragab Omar Abd El-Rahman

Date: / /