Course specifications

A- Administrative Information

Program(s) on which the course is given: **Post-graduate student of Applied Mathematics.**

Major or minor element of program: **Major, Minor**

Department offering the program **Mathematics Applied Mathematics**.

Department offering the course: **Mathematics**

Academic year / Level: Pre-Master in Applied Mathematics

Date of specification approval:

Title: Quantum Mechanics **Code:** M 625

Credit Hours: 2 **Lecture:** 2

Tutorial: 0 **Practical:** 0 **Total:** 2

B- Professional Information

1 – Overall aims of course

Upon successful completion of this course, students should be able to understand to solve complex bond state problems. The student should be able to understand how the scattering theory is applied in different physical systems.

2 – Intended learning outcomes of course (ILOs)

a- Knowledge and understanding:

a1- Display a sound understanding of the scattering processes and the field theory.

a2-Apply the principles and techniques of the scattering processes to solve a wide range of mathematical physics.

a3- become familiar with research with scattering theory and the field theory.

b- Intellectual skills

b1-The student should apply on the different problems to able to gain the mathematical skills.

c-Professional and practical skills

The student should to able to solve some problems such as:-

c1- Appreciate the partial wave method to calculate the total scattering cross-section in the limiting at very low and very high incident energy for the scattering of a particles.

C2- Apply the scattering theory in the case of high energy electron collides with a hydrogen atom .and Born-approximation

C4-Apply the Lagrange density for Dirac field, Meson field, Schrödinger field, and Maxwell field on some problems.

d- General and transferable skills

d1- Apply the techniques PC and Internet to solve the specific topics related to the course material.

d2- The students' oral communication during presenting their own written reports.

d3- Work effectively the idea of teamwork through assigning a group of students for each report.

3- Contents

Topic	No. of hrs	Lecture
Ch. 1: Fourier techniques and momentum representation in quantum mechanics	4	2
Ch. 2: bound state problems: Hydrogen Atom	6	3
Ch. 3: Theory of scattering	6	3
Ch. 4: Some applications	6	3

Ch. 5: Elements of classical theory of fields	6	3

4– Teaching and learning methods

4.1- Course notes
4.2- Reports Assignment
4.3- Oral presentations

5- Student assessment methods

5.1 Reports to assess skill of collecting data & ability of team work

5.2 Oral to assess skill of discussing and analyzing the report

5.3 mid-term exam to assess understanding and memorizing skills

5.4 Final term Exam to assess overall performance

Assessment schedule

Assessment 1 : Reports 1report/3 weeks
Assessment 2 : report defense every 3 weeks
Assessment 3 : mid-term 7^{th} week
Assessment 4 : Final term 14^{th} week

Weighting of assessments

20 % Mid-Term Examination
60 % Final-term Examination
10 % Oral Examination.
10 % Other types of assessment
100% Total

Any formative only assessments
N/A

6- List of references

1- S. L. Gupta and I. D. Gupta, Advanced quantum theory and fields, Chand and company Ltd, New Delhi, 1986.
2- U. Mosel, Fields, Symmetries and Quraks. McGraw-Hill Book Company, (1989)

7- Facilities required for teaching and learning

Dark room equipped with overhead projector and LCD projector.

Students’ computer Lab. with printing and internet facilities.

Course coordinator:

Dr. Mohamed Abu-shady

Head of Department: Prof. Dr. Mohamed A. Ramadan