

SUBJECT TEACHING GUIDE

G55 - Quantum Physics and the Structure of Matter I: Fundamentals of Quantum Physics
Double Degree in Physics and Mathematics
Degree in Physics

Academic year 2016-2017

1. IDENTIFYING DATA					
Degree	Double Degree in Physics and Mathematics Degree in Physics			Type and Year	Compulsory. Year 2 Compulsory. Year 2
Faculty	Faculty of Sciences				
Discipline	MODULE WITH SECOND COURSE SUBJECTS Subject Area: Quantum Physics and the Structure of Matter Central Module				
Course unit title and code	G55 - Quantum Physics and the Structure of Matter I: Fundamentals of Quantum Physics				
Number of ECTS credits allocated	6	Term	Semester based (2)		
Web					
Language of instruction	Spanish	English Friendly	No	Mode of delivery	Face-to-face

Department	DPTO. FISICA MODERNA				
Name of lecturer	DIEGO HERRANZ MUÑOZ				
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Office	Instituto de Fisica de Cantabria. Planta: + 1. Despacho (116)				
Other lecturers	RAMON NIEMBRO BARCENA				

3.1 LEARNING OUTCOMES

- The goals of this course are:
 - To introduce to the student the first experimental observations that led to the birth of Quantum Physics: the blackbody radiation, photoelectric effect, particle scattering, atomic spectra.
 - To show the relevance of Quantum Physics in the study of the microscopic world.
 - To understand the fundamentals of Quantum Physics: wave-particle duality, the Heisenberg uncertainty principle, wave functions, the Born interpretation of the wave function, eigenstates, constants of motion.
 - To introduce the Schrödinger equation and to solve it for basic potentials such as the potential well, barriers and the harmonic oscillator.
 - To solve the Schrödinger equation for the hydrogen atom.
 - To introduce the ideas on angular momentum and spin for the hydrogen atom.

4. OBJECTIVES

The student must understand and be able to apply her knowledge about:

- The historical, theoretical and experimental setting that lead to the formulation of Quantum Physics.
- The interaction between radiation and matter.
- The wave-particle duality.
- The physical meaning of the wave function and its probabilistic interpretation.
- The role and mathematical description of observables in Quantum Physics, commutators and their relationship with the Uncertainty Principle.
- Schrödinger's Equation.
- Stationary states and constants of motion.
- Solving the Schrödinger's Equation for basic one-dimensional potentials such as barriers and potential wells. Tunnel effect.
- Solution of the Schrödinger Equation for the hydrogen atom.
- Angular momentum.
- Spin.

6. COURSE ORGANIZATION

CONTENTS

1	Black body radiation and the Planck's hypothesis
2	The Bohr atomic model. Frank-Hertz experiment.
3	Photoelectric effect and Compton effect. Wave-Particle duality.
4	Wave properties of matter. The de Broglie postulate. Uncertainty principle.
5	Schrödinger's equation. Eigenstates and eigenvalues.
6	Basic one-dimensional potentials. Tunnel effect.
7	Schrödinger atomic model
8	Introduction to angular moment, spin and magnetic properties
9	Final exam

7. ASSESSMENT METHODS AND CRITERIA

Description	Type	Final Eval.	Reassessn	%
Final exam	Written exam	Yes	Yes	60,00
Midterm tests	Written exam	No	Yes	40,00
TOTAL				100,00
Observations				
Two midterm tests will be done around weeks 6 and 12. In case the student passes both midterm tests, she will be given the option to pass the course without needing to go to the final exam.				
Observations for part-time students				
Students who cannot do the midterm tests will go directly to the final exam.				

8. BIBLIOGRAPHY AND TEACHING MATERIALS

BASIC

- 1.- A.Beiser. □Concepts of Modern Physics□. Ed. McGraw Hill (2003)
- 2.-R.Eisberg y R.Resnick. □Física Cuántica□. Ed.Limusa (1978)