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 2020-2021

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	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	https://moodle.unican.es/course/view.php?id=4768				
Language of instruction	Spanish	English Friendly	Yes	Mode of delivery	Face-to-face

Department	DPTO. FISICA MODERNA
Name of lecturer	DIEGO HERRANZ MUÑOZ
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Other lecturers	PATRICIA DIEGO PALAZUELOS

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 Quantun 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 Physicis.
- 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	%
The final exam will serve to recover those parts of the subject that have not been passed through midterms.	Written exam	Yes	No	0,00
Written exam, to be held around the fourth week of the course.	Written exam	No	Yes	40,00
Written exam, to be held around the eighth week of the course.	Written exam	No	Yes	30,00
Written exam, to be held around the twelfth week of the course.	Written exam	No	Yes	30,00
TOTAL				100,00

Observations

Three midterm tests will be done around weeks 4, 8 and 12. In case the student passes all 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.- R.Eisberg y R.Resnick. "Física Cuántica". Ed.Limusa (1978)