

SUBJECT TEACHING GUIDE

G1777 - Particle Physics

Double Degree in Physics and Mathematics Degree in Physics

Academic year 2023-2024

1. IDENTIFYING DATA			
Degree	Double Degree in Physics and Mathematics Degree in Physics		Type and Year Optional. Year 5 Optional. Year 4
Faculty	Faculty of Sciences		
Discipline	Subject Area: Physics of Elementary Particles Mention in Fundamental Physics		
Course unit title and code	G1777 - Particle Physics		
Number of ECTS credits allocated	6	Term	Semester based (2)
Web			
Language of instruction	English	Mode of delivery	Face-to-face

Department	DPTO. FISICA MODERNA		
Name of lecturer	JONATAN PIEDRA GOMEZ		
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Office	IFCA - Edificio Juan Jordá. Planta: - 1. DESPACHO (S103)		
Other lecturers	RUBEN LOPEZ RUIZ CLARA LASAOSA GARCIA		

3.1 LEARNING OUTCOMES
- The Standard Model of Particle Physics. Fundamental forces. Symmetries.
- Radiation-matter interaction. Design of sensors and detectors.
- Basic detectors. Application to cosmic radiation.
- Accelerator experiments. Particle collisions.
- Areas of work in an experiment.
- Open problems, proposed models and experimental developments.

4. OBJECTIVES

Understand the Standard Model of Particle Physics.

Understand the physics foundations and techniques of particle acceleration and detection.

Know the current experiments and trends in Particle Physics.

6. COURSE ORGANIZATION

CONTENTS

1	Introduction and overview of basic concepts, Dirac equation, antiparticles, Feynman diagrams, cross sections and branching fractions.
2	Experimental techniques, particle detectors and particle accelerators.
3	QCD, jets and gluons, strong interaction, confinement and asymptotic freedom.
4	Weak interaction as a gauge theory, the Weinberg-Salam model for leptons and quarks, the CKM matrix, the Higgs boson.
5	Beyond the SM, neutrino masses, dark matter, supersymmetry.

7. ASSESSMENT METHODS AND CRITERIA

Description	Type	Final Eval.	Reassessn	%
Written exam Laboratory Exercises and participation in class	Written exam	No	Yes	40,00
Laboratory Exercises and participation in class	Laboratory evaluation	No	No	40,00
	Work	No	Yes	20,00
TOTAL				100,00
Observations				
Re-assessment through the extraordinary exam for students failing the recoverable parts, with a 60% of the total weight.				
Observations for part-time students				
Time-scheduling of lab practices will be adapted to facilitate participation of part-time students.				

8. BIBLIOGRAPHY AND TEACHING MATERIALS

BASIC

Modern Particle Physics, Mark Thomson, Cambridge University Press

Particle Detectors, Claus Grupen and Boris Shwartz, Cambridge, Second Edition