

SUBJECT TEACHING GUIDE

G49 - Classical Mechanics and Relativity

Double Degree in Physics and Mathematics

Degree in Physics

Degree in Physics

Academic year 2024-2025

1. IDENTIFYING DATA					
Degree	Double Degree in Physics and Mathematics Degree in Physics Degree in Physics			Type and Year	Compulsory. Year 2 Compulsory. Year 2
Faculty	Faculty of Sciences				
Discipline	Subject Area: Classical Mechanics and Astronomy Central Module				
Course unit title and code	G49 - Classical Mechanics and Relativity				
Number of ECTS credits allocated	6	Term	Semester based (1)		
Web	http://moodle.unican.es/course/view.php?id=11436				
Language of instruction	Spanish	English Friendly	Yes	Mode of delivery	Face-to-face

Department	DPTO. FISICA MODERNA				
Name of lecturer	ANGEL ALBERTO VALLE GUTIERREZ				
E-mail	angel.valle@unican.es				
Office	Facultad de Ciencias. Planta: + 1. DESPACHO PROFESORES (1017)				
Other lecturers	ANA QUIRCE TEJA MIGUEL RUIZ GRANDA				

3.1 LEARNING OUTCOMES

- Understanding and selecting adequate reference frames
- Identifying symmetries in a problem and applying the corresponding conservation law
- Identifying the application of classical mechanics of system of particles
- To present and solve simple problems using Newton's laws, and in particular laws of conservation of momentum and energy.

4. OBJECTIVES

Solving problems using Newton's and conservation laws.
 Understanding and relating appropriate reference frames.
 Identifying and understanding symmetries in a physical system and using adequate conservation laws
 Understanding and solving problems in special relativity.
 Understanding the mass-energy equivalence.
 Understanding the concept of hamiltonian and lagrangian of a phjysical system

6. SUBJECT PROGRAM

CONTENTS	
1	Reference frames and Newton's laws. Concept of an inertial reference frame. Relativity's principle of Galileo. Relative motion. Galileo's transformation. Relative motion. Corioli's theorem. Types of forces. Equation of motion. Energy diagrams.
2	Introduction to Analytical Mechanics. Generalized coordinates. Constraints. Lagrangian and Hamiltonian formulation. Harmonic oscillator. Resonances.
3	Systems of particles. Energy and angular momentum. Virial's theorem. Rigid body. Rotation around one axis. Principal axis. Gyroscopic motion.
4	Special relativity. Lorentz's transformation. Relativistic dynamics. Space-time. Quadrivectors.
5	Final exam (it is mandatory for part 4. It is optional for parts 1,2,3 for retaking controls 1,2 or for improving the marks obtained in controls 1,2)

7. ASSESSMENT METHODS AND CRITERIA				
Description	Type	Final Eval.	Reassessn	%
Theoretical and practical exam about the content of part 1.	Written exam	No	Yes	30,00
Theoretical and practical exam about the content of parts 2 and 3.	Written exam	No	Yes	40,00
Final exam: it is mandatory for part 4. It is optional for parts 1,2,3 for retaking controls 1,2, or for improving the marks obtained in controls 1,2.	Written exam	Yes	Yes	30,00
TOTAL				100,00
Observations				
<p>A mark equal or larger than 5 in 10 is required to pass the subject.</p> <p>The final exam is mandatory for part 4. In the final exam parts 1,2,3 can be retaken or improved.</p> <p>There will be a final exam in an extraordinary call</p>				
Observations for part-time students				
There is no special evaluation for part-time students. The teacher will try to facilitate follow-up of the subject.				

8. BIBLIOGRAPHY AND TEACHING MATERIALS
BASIC
Dinámica clásica. A Fernández-Rañada, 2005, Fondo de Cultura Económica.
Introducción a la Relatividad Especial, J. H. Smith, 1977, Reverté.
Teoría y problemas de mecánica teórica. Murray R. Spiegel, 1976, McGraw-Hill