Physics

Syllabus

Course code:	6073
Number of ECTS credits:	6
Semester:	1nd (September-December)
Prerequisites:	None
Recommended components:	You should be familiar with basic calculus.
Language of instruction:	Spanish (students are allowed to ask questions and write homeworks and exams in English)

Course description

This is a first-year Physics course that provides a solid introduction to classical (Newtonian) mechanics. It covers the basic concepts of kinematics, dynamics, Newton's law of motion, energy and momentum, conservation laws, gravitation and central forces, oscillations and waves.

Course contents

I. Introduction
Experimental method, fundamental physical magnitudes, systems of units.

II. Kinematics
Position, velocity and acceleration. Uniformly accelerated motion. Circular motion. Relative motion, inertial and non-inertial reference frames.

III. Newton's laws
Formulation of Newton's three laws. Equation of motion. Fundamental interactions, macroscopic forces, frictional forces.

IV. Work and energy
Work and power produced by a force. Kinetic and potential energy (gravitational and elastic). Conservative and non-conservative forces. Motion in a potential, stable and unstable equilibrium.

V. Oscillations.
Periodic motion. The harmonic oscillator and its dynamics. Damped and forced oscillations.

VI. Systems of particles
Center of mass. Momentum and its conservation law. Collisions. Variable mass systems.

VII. Rotation of rigid bodies
Angular momentum. Torque and rotational dynamics. Conservation of angular momentum.

VIII. Central forces

Central forces. Newton's theory of gravity. Kepler's laws of planetary motion. Binary systems of gravitating bodies.

IX. Waves

Introduction to the physics of waves.

References

Main texts

1. Walker J. *Halliday & Resnick's Fundamentals of Physics (9th edition)*, Wiley (2011).

2. Young, H. D., Freedman R. A. *Sears & Zemansky's University Physics (12th edition)*, Addison Wesley (2007).

Supplementary references

1. Spiegel, M. R. *Theory and problems of Theoretical Mechanics*, McGraw-Hill (1982).

Faculty of Mathematics - University of Murcia
Campus Universitario de Espinardo - Murcia - Spain
T. +34 868 88 4181 - F. +34 868 88 4182 - `mailto:decamate@um.es` - `www.um.es/web/matematicas/`