2022/2023

Forces and Energy in Nature

Code: 106221
ECTS Credits: 6

Degree	Type	Year	Semester
2504235 Science, Technology and Humanities	FB	1	1

Use of Languages

Principal working language: spanish (spa)

Some groups entirely in English: No

Some groups entirely in Catalan: No

Some groups entirely in Spanish: Yes

Prerequisites

There are no previous requirements.

Objectives and Contextualisation

The general objective of the subject is to provide students with knowledge about the laws of the universe. Itwill be shown that all the processes in the universe respond to four fundamental laws. A description will be given of the components of the universe and the laws that govern their behavior. In particular, emphasis will be placed on concepts of gravitation, electromagnetism,optics, and thermodynamics, relating them to the main discoveries in each of the fields.

Competences

- Describe the fundamental forces of nature in relation to the configuration of the universe and the structure of matter.
- Innovate in the methods and processes of this area of knowledge in response to the needs and wishes of society.
- Make critical use of digital tools and interpret specific documentary sources.
- Students must have and understand knowledge of an area of study built on the basis of general secondary education, and while it relies on some advanced textbooks it also includes some aspects coming from the forefront of its field of study.

Learning Outcomes

1. Analyse data rigorously to draw conclusions from them.
2. Apply the theoretical and practical knowledge acquired to problem solving in physics.
3. Assess the reliability of sources, select important data and cross-check information.
4. Describe the basic properties of electromagnetism and the nature and properties of light.
5. Explain how all the physical processes of the universe correspond to only four forces and differentiate these.
6. Explain the thermodynamic view of processes and the concepts of energy and entropy.
7. Identify some findings from the forefront of physics.

Content

1. A universe to understand.
2. Movement.
3. Mechanics.
4. Electromagnetism.
5. Waves. Light and sound.
6. Energy. Type, conservation, and transformation.
7. The atom and nuclear physics.
8. Beyond classical physics.

Methodology

The methodology of the course will consist of theory and problem classes, which will be held in the classroom, and individual student work. Problem classes will be in flexible formats and adaptable to the characteristics of each topic.

Annotation: Within the schedule set by the centre or degree programme, 15 minutes of one class will be reserved for students to evaluate their lecturers and their courses or modules through questionnaires.

Activities

Title	Hours	ECTS	Learning Outcomes
Type: Directed			
Practical lectures	16.5	0.66	1, 2, 3
Theory classes	33	1.32	1, 4, 6, 7
Type: Supervised			
Essays supervision	4.25	0.17	1, 2, 4, 6, 7
Type: Autonomous			
Student studying time	85.75	3.43	1, 2, 4, 6, 3

Assessment

Tests of short duration, made in the class schedule (4 points).

Delivery of problems and / or short essays (2 points).

Written exam at the end of the semester (4 points).

There will be a resit exam with a maximum of 10 points.

In the event of a student committing any irregularity that may lead to a significant variation in the grade awarded to an assessment activity, the student will be given a zero for this activity, regardless of any disciplinary process that may take place. In the event of several irregularities in assessment activities of the same subject, the student will be given a zero as the final grade for this subject.

Assessment Activities

Title	Weighting	Hours	ECTS	Learning Outcomes
Delivery of problems and/or brief essays	20%	6	0.24	1, 2, 4, 6, 7, 3
Exam	40%	1.5	0.06	2, 4, 6, 5, 7
Tests of short duration, in the class schedule	40%	3	0.12	1, 4, 6, 7, 3

Bibliography

Detailed bibliography will be provided throughout the course, and will include selected research and / or dissemination articles. Some works that will be used for the course contents are:

Paul A. Tipler, Gene Mosca. Fïsica para la ciencia y la tecnología. Barcelona: Reverté, 2010.
J. Trefil, R. M. Hazen. Physics Matters: An Introduction to Conceptual Physics. Hoboken, NJ: Wiley, 2004.
R. H March. Physics for Poets. New York: McGraw Hill, 1978.
E. Hecht. Physics in Perspective. Boston: Addison-Wesley, 1980.
E. Segrè. From Falling Bodies to Radio Waves: Classical Physicists and Their Discoveries. New York: Freeman, 1984.

Software

No special software is required.