

Forces and Energy in Nature

Code: 106221
ECTS Credits: 6

2025/2026

Degree	Type	Year
Science, Technology and Humanities	FB	1

Contact

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Teachers

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Teaching groups languages

You can view this information at the [end](#) of this document.

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. It will 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. Understanding the univers.
2. Kinematics.
3. Mechanics (statics and dynamics).
4. Thermodynamics
5. Electromagnetism.
6. Waves. Light and sound.
7. The atom and nuclear physics.
8. Beyond classical physics. Relativity.

Activities and Methodology

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

The methodology of the course will consist of theory and problem-solving sessions, which will be held in the classroom, and student's self-work. Problem-solving sessions will be in flexible format and adaptable to the features 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.

Assessment

Continuous 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

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

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

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

In the case on Non-Erasmus students, only requests to change the date of classroom tests and the final exam due to medical reasons will be accepted, and the corresponding medical certificate must be provided. Erasmus students who request to take an exam earlier must present the teacher with a written document from their home university justifying their request.

In order to pass the subject, the student should have an overall grade equal to or higher than 5.0. If the student has failed, but a minimum of 3,5 is obtained in the global assessment, a written makeup test on the entire content of the subject will entitle the student to pass the subject with a maximum grade of 5 out of 10.

In the event a student makes any irregularity that lead to a significant variation in the grade awarded to a specific assessment activity, the student will be given a zero for this activity, regardless of any disciplinary process that may further 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.

One-off assessment: the student who has taken up the One-off Assessment mode will do a final test that will consist of an oral presentation and an exam, which will correspond to the 30% and 60% of the mark, respectively.

This course allows the use of Artificial Intelligence (AI) technologies exclusively for the submission of brief essays, specifically for bibliographic research or information searching and text correction. Lack of transparency regarding the use of AI in the assessed activity will be considered academic dishonesty; the corresponding grade may be lowered, or the work may even be awarded a zero. In cases of greater infringement, more serious action may be taken.

Bibliography

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

D. Cassidy, G. Holton, J. Rutherford. *Understanding Physics Student Guide*. NY: Springer, 2002.

Paul A. Tipler, Gene Mosca. *Física 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.

Groups and Languages

Please note that this information is provisional until 30 November 2025. You can check it through this [link](#). To consult the language you will need to enter the CODE of the subject.

Name	Group	Language	Semester	Turn
(PAUL) Classroom practices	1	Spanish	first semester	morning-mixed
(TE) Theory	1	Spanish	first semester	morning-mixed