Universitat Autònoma de Barcelona

2023/2024

Basics of Physics

Code: 106753
ECTS Credits: 6

Degree	Type	Year	Semester
2504604 Environmental Sciences	FB	1	2

Contact

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Teaching groups languages

You can check it through this link. To consult the language you will need to enter the CODE of the subject.
Please note that this information is provisional until 30 November 2023.

Teachers

Francisco Javier Bafaluy Bafaluy

Prerequisites

Due to the fact that it is a first-year subject, there are no specific indispensable requirements to take the subject.

It is highly recommended, however, that students have previously taken the preparatory physics courses, especially those students who have not taken the physics subject in their stage of secondary education.

Objectives and Contextualisation

The Physics subject is one of the basic and compulsory training subjects. The main purpose of this subject, as well as all those that make up the basic training block, is to provide the basic analytical and methodological knowledge and tools to develop transversal skills in the area of environmental science studies. In particular, the subject must help students understand the fundamental laws of physics that govern the natural environment.

In addition, it contributes to the professional training of students as it encourages learning in a series of general skills (among which stand out the ability to reason critically and to improve independent work strategies), transversal (such as know how to discriminate between the key elements of a given problem and be able to size it correctly) and specific (distinguish the biophysical aspects of human activity) which will be of great use to future professionals in the evaluation and management of all types of problems related to the environment, the use of natural resources and energy generation.

Learning Outcomes

- CM13 (Competence) Determine the relevant physical parameters and magnitudes associated with basic environmental problems and practical cases in the field of physics.
- CM14 (Competence) Convey the basic physics associated with an environmental problem appropriately.
- KM20 (Knowledge) Identify the main principles of physics involved in environmental processes.
- KM21 (Knowledge) Identify the principles of particle, fluid and wave motion.
- KM22 (Knowledge) Recognise the principles of heat, electromagnetism, radiation and energy.
- KM23 (Knowledge) Recognise the concepts, the most relevant physical parameters and the tools in physics to define, analyse and manage environmental problems.
- SM19 (Skill) Use the laws and principles of physics to solve guided problems related to the environment.
- SM20 (Skill) Analyse and adequately represent data and observations in the field of physics.
- SM21 (Skill) Express yourself using scientific language appropriate to fundamental physics, as well as use the magnitudes and units associated with basic physics concepts appropriately.

Content

1. Introduction
1.1. Dimensional analysis
1.2. Scaling laws

2. Movement
2.1. Uniform and accelerated movement. Circular movement
2.2. Forces. Newton's laws. Friction

3. Energy
3.1. Work. Potential energy. Mechanical energy
3.2. Dissipative forces. Conservation of mechanical energy
3.3. Energy generation

4. Fluids
4.1. Pressure and density. Archimedes principle
4.2. Sedimentation: Water purification
4.3. Cohesive forces. Surface tension
4.4. Continuity equation. Bernouilli's equation
4.5. Wind power.
4.6. Viscosity. Laminar and turbulent flows. Poiseuille's law

5. Oscillations and waves
5.1. Oscillations. Resonance
5.2. Wave propagation. Reflection and refraction
5.3. Sound waves. Noise pollution
5.4. Superposition and interference. Standing waves

6. Thermodynamics
6.1. Temperature. Ideal gases. Microscopic interpretation of pressure and temperature.
6.2. First law of thermodynamics. Heat. Phase changes.
6.3. Second law of thermodynamics: Irreversibility.
6.4. Work generation: Thermal machines. Efficiency
6.5. Heat transfer: conduction, convection, radiation. Radiative balance

7. Electromagnetism
7.1. The electromagnetic interaction. Coulomb's law. Electric potential.
7.2. Electric current. Dissipation in a conductor. Direct current and alternating current.
7.3. Magnetic field. Electromagnetic induction. Electricity generation.

8. Nuclear physics and radioactivity
8.1. Atomic and nuclear structure
8.2. Nuclear binding energy and mass defect
8.3. Radioactivity. Law of radioactive decay
8.4. Nuclear reactions. Fusion and fission.

Methodology

The body of the subject is made up of theoretical and problem classes, and some seminar sessions, where the theoretical and practical contents of the course are explained. The rest of the training consists of the student's personal work.

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			
Exercises classes	10	0.4	CM13, CM14, KM20, KM21, KM22, KM23, SM19, SM20, SM21, CM13
Seminars	2	0.08	CM13, CM14, KM20, KM21, KM22, KM23, SM19, SM20, SM21, CM13
Theory classes	38	1.52	CM13, CM14, KM20, KM21, KM22, KM23, SM19, SM20, SM21, CM13
Type: Supervised			
Practice tutorial	5	0.2	CM13, CM14, KM20, KM21, KM22, KM23, SM19, SM20, SM21, CM13
Type: Autonomous			
Personal study	76	3.04	CM13, CM14, KM20, KM21, KM22, KM23, SM19, SM20, SM21, CM13

Assessment

80% of the final grade is calculated based on the average of the exam grades, as long as the minimum grade of 3.5 is reached. The exams will consist of theoretical and practical questions in test format, and practical problems.

The remaining 20% of the final grade corresponds to the deliveries related to the seminars.

Resit exam

If the average grade of 3.5 is not reached in the exams, or the grade of 5 in the overall score for the course, there is a resit exam that covers the entire course syllabus, both in terms of the theory questionnaire and the

resolution of practical problems. This exam counts 80% of the overall mark. The practice grade is not recoverable.

According to the university's regulations, in order to attend the resit exam, the student must have previously been evaluated in activities that are equivalent to, at least, 2/3 of all the evaluable activities of the course.

UNIQUE ASSESSMENT

Students who have accepted the single assessment modality will have to take a final test that will consist of a written exam including theoretical questions and the resolution of problems. This test will take place on the same day as the second continuous assessment exam. When you have finished, you will hand in all the assignments for the seminar part.

The final grade is obtained in the same way as in the continuous assessment: the exam weighs 80% of the final grade and the assignments 20%.

Important: To make an average with the other 20% of the grade, in the exam you must obtain a grade greater than or equal to 3.5 out of 10.

If the exam grade does not reach 3.5 or the final grade does not reach 5, there is a resit exam that will be held on the date set by the degree coordination. The same resit system will be applied as for the continuous assessment: the part of the grade corresponding to theory and problems (80%) can be recovered, but notthe20% of deliveries.

Assessment Activities

Title	Weighting	Hours	ECTS	Learning Outcomes
First exam	40	2	0.08	CM13, CM14, KM20, KM21, KM23, SM20, SM21
Second exam	40	2	0.08	CM13, CM14, KM20, KM22, KM23, SM20, SM21
Seminars	20	15	0.6	CM13, CM14, KM20, KM21, KM22, KM23, SM19, SM20, SM21

Bibliography

- D. Jou, J.E. Llebot y C. Pérez-García, *Física para ciencias de la vida,* McGraw-Hill, Madrid 2009

- P.A. Tipler, *Física,* Reverté, Barcelona, 2010. Online: https://bibcercador.uab.cat/permalink/34CSUC_UAB/avjcib/alma991006936769706709

Software

There is no specific software for this subject