Basics of Physics

Code: 106753
ECTS Credits: 6

2024/2025

Degree	Type	Year
2504604 Environmental Sciences	FB	1

Contact

Name: Juan Camacho Castro

Email: juan.camacho@uab.cat

Teachers

Albert Beardo Ricol

Teaching groups languages

You can view this information at the end of this document.

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

1. CM13 (Competence) Determine the relevant physical parameters and magnitudes associated with basic environmental problems and practical cases in the field of physics.
2. CM14 (Competence) Convey the basic physics associated with an environmental problem appropriately.
3. KM20 (Knowledge) Identify the main principles of physics involved in environmental processes.
4. KM21 (Knowledge) Identify the principles of particle, fluid and wave motion.
5. KM22 (Knowledge) Recognise the principles of heat, electromagnetism, radiation and energy.
6. KM23 (Knowledge) Recognise the concepts, the most relevant physical parameters and the tools in physics to define, analyse and manage environmental problems.
7. SM19 (Skill) Use the laws and principles of physics to solve guided problems related to the environment.
8. SM20 (Skill) Analyse and adequately represent data and observations in the field of physics.
9. 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. Viscosity. Laminar and turbulent flows. Poiseuille's law

4.6. Desalination of sea water. Inverse osmosis

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

7. Heat transport

Heat transfer: conduction, convection, radiation. Radiative balance

8. Electromagnetism
8.1. The electromagnetic interaction. Coulomb's law. Electric potential.
8.2. Electric current. Dissipation in a conductor. Direct current and alternating current.
8.3. Magnetic field. Electromagnetic induction. Electricity generation.

9. Nuclear physics and radioactivity
9.1. Atomic and nuclear structure
9.2. Nuclear binding energy and mass defect
9.3. Radioactivity. Law of radioactive decay
9.4. Nuclear reactions. Fusion and fission.

Activities and Methodology

Title	Hours	ECTS	Learning Outcomes
Type: Directed			
Exercises classes	10	0.4	
Seminars	2	0.08	
Theory classes	38	1.52	
Type: Supervised			
Practice tutorial	5	0.2	
Type: Autonomous			
Personal study	76	3.04	

The body of the subject is made up of theoretical and problem classes, and a seminar session, 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.

Assessment

Continous Assessment Activities

Title	Weighting	Hours	ECTS	Learning Outcomes
Partial exams	85	4	0.16	CM13, CM14, KM20, KM21, KM22, KM23, SM19, SM20, SM21
Seminars	15	15	0.6	CM13, CM14, KM20, KM21, KM22, KM23, SM19, SM20, SM21

85% of the final grade is calculated based on the grades of two partial exams. These will consist of theoretical and practical questions with test questions, and practical problems.

The remaining 15% of the final mark corresponds to the grade for the deliveries related to the seminars.

Resit exam

To pass the subject you must obtain an overall grade for the course greater than or equal to 5. If this condition is not reached, there is a resit exam where the entire course syllabus is included. This exam consists of a part of test questions and the resolution of practical problems, and it counts for 85% of the overall grade. The delivery note cannot be recovered.

In accordance with university regulations, to be able to attend the recovery, students must have been previously evaluated in activities that are equivalent to at least 2/3 of all the evaluable activities of the course.

Unassessable: The grade of Unassessable will be obtained if the student does not take any exam.

SINGLE EVALUATION

Students who have accepted the single evaluation modality must take a final test that will consist of a written exam that will consist of the resolution of theoretical-practical questions and problems. This test will be taken on the same day as the second exam of the continuous evaluation. When you have finished, you will deliver the seminar deliverables.

The final grade is obtained in the same way as in the continuous evaluation: the exam counts for 85% of the final grade and the deliveries count for 15%.

If the overall grade does not reach 5, there is a recovery exam that will be held on the date set by the degree coordination. The same recovery system will be applied as for continuous evaluation: the part of the grade corresponding to theory and problems (85%)

Bibliography

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

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- P.A. Tipler, *Física,* Reverté, Barcelona, 2010. Online acces:

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Software

There is no specific software for this subject

Language list

Name	Group	Language	Semester	Turn
(PAUL) Classroom practices	1	Catalan/Spanish	second semester	afternoon
(PAUL) Classroom practices	2	Catalan/Spanish	second semester	afternoon
(SEM) Seminars	1	Catalan	second semester	morning-mixed
(SEM) Seminars	2	Catalan	second semester	morning-mixed
(SEM) Seminars	3	Catalan	second semester	morning-mixed
(SEM) Seminars	4	Catalan	second semester	morning-mixed
(TE) Theory	1	Catalan/Spanish	second semester	afternoon