

Physics

Code: 102812
ECTS Credits: 9

Degree	Type	Year	Semester
2501915 Environmental Sciences	FB	1	1

Contact

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Use of Languages

Principal working language: catalan (cat)
Some groups entirely in English: No
Some groups entirely in Catalan: No
Some groups entirely in Spanish: No

Other comments on languages

Some teachers use Spanish and others Catalan, but there is no grup using just one language

Teachers

Juan Manuel Apio Lagua
Daniel Campos Moreno
Vicente Ortega Cejas

Prerequisites

Although, due to being a first-year assignee, there are no specific requisites to attend the course. It is strongly recommendable for students to have taken the Physics course offered by the faculty previous to the beginning of the term, especially for those students who have not followed any physics program in their stage in secondary school.

Objectives and Contextualisation

The aim of the subject is the student to be able by himself to face conceptual and numerical problems that may arise within the scope of his professional activity. In general, the subject must provides the student with enough tools to be able to face general conceptual challenges of the type "How to know if the natural or energetic resources of a territory are properly dimensioned to its population?" "How to make an energy balance that takes into account the performance of each element that intervenes, and how is it possible to optimize this balance?", or concrete ones, such as "What are the physical mechanisms that govern the dispersion of pollutants in the natural environment?" "What characteristics define the capacity of a given environment to mitigate sound levels?"

In addition, it contributes to the professional training of students, since it fosters learning in a series of general competences (among which are the ability to reason critically and improve autonomous work strategies), cross-cutting (how to discriminate between the key elements of a given problem and to be able to correctly size) and specific (distinguish the biophysical aspects of human activity and identify and analyze the

environmental impacts of economic activity) that will be very useful for future professionals in the assessment and management of all kinds of problems related to the environment, the use of natural resources and energy generation.

Physics is one of the subjects which are basic and compulsory in the Environmental Sciences program. The main purpose of this subject, as well as those that form the basic training block, is to provide students with the basic analytical and methodological knowledge and tools to start developing transversal competences in the area of environmental science studies. In particular, the subject must serve so that students can understand the fundamental laws that govern natural processes, with special emphasis on issues related to the transfer of matter and energy in fluid media (air and water), and that they be capable to size properly environmental problems.

Competences

- Adequately convey information verbally, written and graphic, including the use of new communication and information technologies.
- Analyze and use information critically.
- Collect, analyze and represent data and observations, both qualitative and quantitative, using secure adequate classroom, field and laboratory techniques
- Demonstrate adequate knowledge and use the most relevant environmental tools and concepts of biology, geology, chemistry, physics and chemical engineering.
- Demonstrate concern for quality and praxis.
- Demonstrate initiative and adapt to new situations and problems.
- Learn and apply in practice the knowledge acquired and to solve problems.
- Quickly apply the knowledge and skills in the various fields involved in environmental issues, providing innovative proposals.
- Teaming developing personal values regarding social skills and teamwork.
- Work autonomously

Learning Outcomes

1. Adequately convey information verbally, written and graphic, including the use of new communication and information technologies.
2. Analyze and use information critically.
3. Define the basic concepts of mechanics.
4. Define the basic principles of electricity, sound and magnetism.
5. Demonstrate concern for quality and praxis.
6. Demonstrate initiative and adapt to new situations and problems.
7. Describe and apply the Lotka-Volterra equations.
8. Distinguish the main characteristics of hydrostatic and hydrodynamic.
9. Explain the concepts of energy and labor.
10. Explain the main features of thermodynamics applied to physical and biological systems.
11. Identify quantities and units associated with basic physical concepts.
12. Identify the fundamentals of the main areas of physics.
13. Identify the physical processes in the surrounding environment and evaluate them properly and originally.
14. Identify transport processes too and dissemination.
15. Learn and apply in practice the knowledge acquired and to solve problems.
16. Observe, recognize, analyze, measure and properly and safely represent physical processes.
17. Teaming developing personal values regarding social skills and teamwork.
18. Work autonomously

Content

- 0. Introduction
 - 0.1. Dimensional analysis
 - 0.2. Scaling laws
- 1. Movement
 - 1.1. Uniform and accelerated movement.
 - 1.2. Newton's laws. Forces
 - 1.3. Circular and harmonic movement
 - 1.4. Inertia, centrifugal force, Coriolis
 - 1.5. The movement of solids
 - 1.6. Elasticity
- 2. Energy
 - 2.1. Work-energy. Mechanical energy
 - 2.2. Dissipative forces
 - 2.3. Energy consumption
- 3. Fluids
 - 3.1. Continuous media
 - 3.2. Pascal Principle. Archimedes' principle
 - 3.3. Cohesion forces. Surface tension
 - 3.4. Continuity equation. Bernouilli equation
 - 3.5. Wind energy
 - 3.6. Viscosity of a fluid. Poiseuille law
 - 3.7. Sedimentation in a fluid
- 4. Heat
 - 4.1. First law of thermodynamics
 - 4.2. Calorimetry
 - 4.3. Ideal gases
 - 4.4. Second law of thermodynamics
 - 4.5. Generation of work: heat engines
- 5. Flux of matter

- 5.1. Diffusion
- 5.2. Transport of pollutants
- 6. Oscillations and waves
 - 6.1. Oscillations
 - 6.2. Wave propagation
 - 6.3. Superposition and interference of waves
 - 6.4. The nature of light
 - 6.5. Sound waves
 - 6.6. Acoustic pollution
- 7. Electromagnetism
 - 7.1. The electrostatic field
 - 7.2. DC current
 - 7.3. Electromagnetic induction

Methodology

The bulk of the course is made up of theoretical and problem classes and seminars, where the theoretical and practical contents 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			
Problem solving lectures	16	0.64	2, 15, 6, 5, 12, 13, 11, 16
Seminars	4	0.16	2, 15, 6, 5, 12, 13, 11, 16
Theoretical lectures	55	2.2	2, 3, 4, 8, 9, 10, 12, 13, 11, 14, 16
Type: Supervised			
Practical advising	10	0.4	2, 15, 6, 5, 1, 17
Type: Autonomous			
Personal study	84	3.36	15, 5, 16, 18
Video of Theoretical lectures	10	0.4	3, 9, 12, 13, 11, 16, 18

Assessment

70% of the final grade is calculated based on the average of the marks of the two exams, as long as the minimum grade of 3.5 is obtained. The exams consist of theoretical questions with test questions and practical problems.

The remaining 30% of the final grade corresponds to the mark obtained from the practices developed in the seminars.

El 30% restant de la nota final correspon a la nota de les pràctiques desenvolupades als seminaris.

A resit exam is organized for those students who have not reached the average mark of 3.5, and covers the entire course syllabus, both in terms of the theoretical questionnaire and in solving practical problems. In order to participate in the resit exam, the student must have participated in evaluated activities that involve, at least, 2/3 of all the evaluable activities of the course.

Assessment Activities

Title	Weighting	Hours	ECTS	Learning Outcomes
Exam: first part	35	2	0.08	15, 3, 9, 12, 13, 11, 16, 1, 18
Exam: second part	35	2	0.08	2, 15, 4, 7, 8, 10, 12, 13, 11, 14, 16, 1
Moodle questionnaires	10	12	0.48	15, 1, 18, 17
Seminars	20	30	1.2	2, 6, 5, 16, 1, 17

Bibliography

Reference books

Jou, D, Llebot, J.E. y Pérez Garcia, C. *Física para ciencias de la vida*. Mc Graw-Hill. Biblioteca Ciències 53.Jou

Kane, J.W. y Sternheim, M.M. *Física*. Ed. Reverté.

Jaque, F. y Aguirre de Cárcer, I. *Bases de la física medioambiental*. Ariel.

Tipler/Mosca. *Física per a la ciència i la tecnologia*. Ed. Reverté 6a. ed. 2010

Electronic resources

Physics Today - <http://www.physicstoday.org/>

Física con ordenador - <http://www.sc.ehu.es/sbweb/fisica/default.htm>

Online learning center with PowerWeb - http://highered.mcgraw-hill.com/sites/0070524076/student_view0/interactives.html

Animaciones interactivas de física general - http://www.fisica.uh.cu/bibvirtual/fisica_aplicada/fisica1y2/animaciones.htm

Idaho National Laboratory for Renewable Energies - <https://inlportal.inl.gov/portal/server.pt?open=512&objID=419&parentname=CommunityPage&parentid=3&mode=>

Laboratorio de Física - <http://iris.cnice.mec.es/fisica/index.php>

Flipping physics <https://www.flippingphysics.com/>

Illustrative videos

Relationship between circular motion and harmonic motion - <http://www.youtube.com/watch?v=Cw9eFeVY74I>

Demonstration of the Coriolis effect in the laboratory - <http://www.youtube.com/watch?v=Wda7azMvabE>

Importance of object geometry in rotation dynamics - <http://www.youtube.com/watch?v=iBDJvsE5Es4>

Conservation of linear momentum in collisions: Newton's cradle -
<https://www.youtube.com/watch?v=0LnbyjOyEQ8>

Explosion of a wind turbine - http://www.youtube.com/watch?v=7nSB1SdVHqQ&feature=player_embedded

Sedimentation balance - http://polimedia.uab.cat/#v_172

Thermal solar energy - http://polimedia.uab.cat/#v_177

Stokes force explanation - http://polimedia.uab.cat/#v_171

Video about Fourier's law and thermal insulation - http://polimedia.uab.cat/#v_242

Stirling engine- <http://www.youtube.com/watch?v=8GGzIUMzNpQ>

Software

There is no specific software for this subject