Universitat Autònoma de Barcelona

2020/2021

Physics

Code: 102812
ECTS Credits: 9

Degree	Type	Year	Semester
2501915 Environmental Sciences	FB	1	1

The proposed teaching and assessment methodology that appear in the guide may be subject to changes as a result of the restrictions to face-to-face class attendance imposed by the health authorities.

Contact

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Use of Languages

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

Teachers

Josep Enric Llebot Rabagliati

Prerequisites

Although, due to being a first-year assignee, there are no specific requisites to attend the course, it is very recommendable that students have previously taken the courses of physics offered by the school previous to the beginning of the term, especially all those students who have not followed any physics program in their stage in secundary school.

Objectives and Contextualisation

The aim of the subject is that the student can 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 provide 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 adequately provided 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 evaluation and management of all kinds of problems related to the environment, the use of natural resources and energy generation.

The subject of Physics is one of the subjects of 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 thatgovern natural processes, with special emphasis on issues related to the transfer of matter and energy in fluid media (air and water), and that they were 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. Laws of scale

1. The movement

1.1. Uniform and accelerated movement.

1.2. Newton's laws. Forces

1.3. Circular and harmonic movement

1.4. Inertia, centrifuge, 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. Principle of Pascal. Archimedes' principle

3.3. Cohesion forces. Surface tension

3.4. Continuity equation. Bernouilli equation

3.5 Wind energy

3.6. Viscosity of a fluid. Law of Poiseuille

3.7. Sedimentation in a fluid

4. The heat

4.1. First Law of thermodynamics

4.2. Calorimetry

4.3. Ideal gases

4.4. Second principle of thermodynamics

4.5. Generation of work: Thermal machines

5. Flux of matter

5.1. Diffusion

5.2. Transport of pollutants

6. Oscillations i ones

6.1. Oscillations

6.2. Wave propagation

6.3. Superposition and interference of waves

6.4. Nature of light

6.5. Sound waves

6.6. Acoustic pollution

7. Electromagnetism

7.1. The electrostatic field

7.2. DC

7.3. Electromagnetic induction

Methodology

The bulk of the course is made up of the theoretical and problem classes, where the theoretical and practical con

Activities

Title	Hours	ECTS	Learning Outcomes
Type: Directed			
Practical lectures	4	0.16	2, 15, 6, 5, 12, 13, 11, 16
Problem solving lectures	16	0.64	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 two practical problems.

The remaining 30% of the final grade corresponds to the grade obtained from the practices that must be delivered during the course and the Moodle questionnaires related to them that will be discussed during the practical classes.

The recovery 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 terms of solving practical problems. In order to participate in the recovery 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	30	2	0.08	15, 3, 9, 12, 13, 11, 16, 1, 18
Exam: second part	40	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
Practices	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

Relació entre el moviment circular i el moviment harmònic - http://www.youtube.com/watch?v=Cw9eFeVY74I

Demostració de l'efecte Coriolis al laboratori - http://www.youtube.com/watch?v=Wda7azMvabE

Importància de la geometria dels objectes en la dinàmica de rotació - http://www.youtube.com/watch?v=iBDJvsE5Es4

Conservació del momentlineal en les col·lisions: les boles de Newton - http://www.youtube.com/watch?v=KNNxUIOLt_o&feature=fvwrel

Vídeo sobre el consum energètic del cotxe - http://www.uab.cat/servlet/Satellite?c=Page&cid=1203938399434&pagename=v-OAID%2FPage%2FTemplateP

Explosió d'un aerogenerador - http://www.youtube.com/watch?v=7nSB1SdVHqQ&feature=player_embedded

Equilibri de sedimentació - http://polimedia.uab.cat/#v_172

Energia solar tèrmica - http://polimedia.uab.cat/#v_177

Explicació força de Stokes - http://polimedia.uab.cat/#v_171

Vídeo sobre llei de Fourier i aïllaments tèrmics - http://polimedia.uab.cat/#v_242

Motor Stirling - http://www.youtube.com/watch?v=8GGzlUMzNpQ