Course Syllabus

2018-19

1. Course Description

Course	Physics
Code	202002
Faculty	School of Experimental Sciences
Degrees it is part of	Degree in Biotechnology
Module it belongs to	Physics, Mathematics and Computer Sciences for Molecular Biosciences
Subject it belongs to	Physics
Department	Physical, Chemical and Natural Systems
Year	1st year
Term	1st semester
Total credits	6
Type of course	Basic
Course language	Spanish
Teaching model	B1

Number of classroom teaching hours of B1 teaching model for each student: 27 hours of general teaching (background), 18 hours of theory-into-practice (practical group tutoring and skill development) and 0 hours of guided academic activities. Up to 10% of face-to-face sessions can be substituted by online teaching, in accordance with the course schedule published before it begins.

2. Course Coordinator

Name	María Carmen Gordillo Bargueño
Department	Physical, Chemical and Natural Systems
Field of knowledge	Applied Physics
Category	Associate professor
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3. Academic Context

Course description	This is a basic content course and its objective is to explain the physical nature concepts that will be useful in the following courses of the degree in Biotechnology, and it is also going to provide the student the basic tools to interpret experimental results obtained in different disciplines laboratories.
Learning objectives	a) To know how to use appropriately the unit systems and assess the results obtained in any experiment from their error analysis. b) To know the basic knowledge of mechanics in general and fluid mechanics in particular. To use this knowledge to solve engineering problems related to Biotechnology. c) To know the basic knowledge in electricity, magnetism, optics and radioactivity. To use this knowledge to understand how the necessary instrumental and analytical techniques in Biotechnology and in different biological phenomena work.
Prerequisites	None.
Recommendations	Students must be sure about having a minimum of mathematical knowledge to solve first and second degree equations, basic linear equation systems, trigonometry, logarithms and determinants.

4. Course Content: Topics

UNIT 1	INTRODUCTION AND BASIC CONCEPTS
1.1.	Methodology of the course
1.2.	Relation of Physics with other sciences
1.3.	Scientific method
UNIT 2	MECHANICS
2.1.	Motion in one dimension
2.2.	Uniformly accelerated motion: free fall
2.3.	Projectile motion
2.4.	Uniform circular motion
2.5.	Newton´s laws
2.6.	Gravity. Weight
2.7.	Friction
2.8.	Definition of work
2.9.	Relation between work and kinetic energy
2.10.	Conservative forces. Potential energy
2.11.	Principle of conservation of energy
UNIT 3	FLUIDS
3.1.	Ideal fluids
3.2.	Archimedes' principle
3.3.	Continuity equation
3.4.	Bernoulli´s equation

3.5.	Real fluids: viscosity
3.6.	Poiseulle´s law
3.7.	Surface tension
3.8.	Wetting
UNIT 4	ELECTRIC AND MAGNETIC FIELDS
4.1.	Electric charges: history, types and conservation
4.2.	Coulomb´s law
4.3.	Superposition principle
4.4.	Electric field
4.5.	Electric dipoles
4.6.	Electric potential
4.7.	Electric current
4.8.	Current intensity
4.9.	Ohm´s law. Resistivity
4.10.	Direct current circuits: Kirchhoff´s laws
4.11.	Magnetic phenomena: Lorentz force
4.12.	Mass spectrometry
UNIT 5	WAVES AND OPTICS
5.1.	Wave motion
5.2.	Wave types
5.3.	Wave equation
5.4.	Interference
5.5.	Standing waves
5.6.	Intensity and power
5.7.	Sound. Intensity of sound: decibel scale
5.8.	Light waves
5.9	Reflection and refraction
5.10.	Lens equation
5.11.	Lens maker´s equation
UNIT 6	NUCLEAR PHYSICS AND RADIOACTIVITY
6.1.	Atomic nucleus
6.2.	Nuclear reactions: radioactivity
6.3.	Dating organic samples

5. Methodology and Resources

General teaching (EB[1])	These sessions will consist of professor´s presentations and the presentation of types of problems to reinforce the concepts. It is recommended that the students follow the sessions with a copy of the PowerPoint presentations used by the professor. This copy will be available in the virtual classroom platform. The problems will be provided in advance and the students will solve them in the sessions, individually at the blackboard or in groups of students led by the professor.

[1] EB is the acronym for Enseñanzas básicas.

Theory-into-practice (EPD[2])	Students will carry out a project in the first five sessions, whose objective is to learn how to manage the experimental data and to check if they are reliable and if the laws of physics obey them according to the laboratory measurement. Students will be divided in groups of 4 and 6 and they will work together during the five sessions. The distribution of the sessions will be the following: 1st week. Measurement of different magnitudes in the laboratory to check the motion laws and some properties of fluids. Each group of students will be divided in couples to consider the reproducibility of measures. 2nd week. Error theory foundations and correlation concept will be explained. All calculations and graphic representations will be made with the excel program so its use will be explained. 3rd week. How to limit errors of indirect measures will be explained. 4th week. Students will work in groups under the supervision of the professor who checks if the data is compatible with the motion and fluid mechanic laws. 5th week. Each group will present in approximately 20 minutes the main conclusions of their projects. Every student must participate in a random order determined by raffle. At the end of the session, the professor can ask questions to assess if each student had acquired the knowledge. This session will be complemented with an individual test on error calculation. The assistance to this five sessions is compulsory. The sixth week will consist of a seminar of three hours where the students will solve problems similar to those of the exam. The assistance is optional.
Guided academic activities (AD)	Not applicable.

[2] EPD is the acronym for Enseñanzas prácticas y de desarrollo.