PHYSICS (2014-15)

GENERAL INFORMATION

Code 26517

ECTS Credits 6

Departments and areas

Department	Area	Area	Report R.
APPLIED PHYSICS	APPLIED PHYSICS	YES	YES

Studies

DEGREE IN MARINE SCIENCES

DEGREE IN BIOLOGY

Context of subject

The study of Physics in a Biology degree is fully justified since physical mechanisms are the underlying processes that govern every phenomena, including biological ones. Moreover, much of the instrumentation used in Biology comes from developments in physics. Therefore, it is of outmost importance that a future biologist acquires a basic understanding in Physics. It is also important for them to realize the role played by physics on biological processes and that understanding complex systems such as life requires of knowledge in many different fields.

On the other hand, problem solving, in this case in Physics, is an important element in any science. It helps develop critical thinking and creative ways of confronting problems, that can be of use for any other subject in their studies and later on, in their professional lives.

OBJECTIVES

Subject objectives/competences (2014-15)

The main objective in this class is to provide the students with concepts and technics in physics that are relevant to Biology, and to apply these ideas to different biological phenomena. In this way, the students will understand the importance of physics in many fields of Biology.

Problem solving will be one of the main focus of the class, so the the student will have to think, solve and check the results of a set of problems, which will be useful in all their scientific activities. It is also important that the students learn about how to use different sources of information such as books or journals, both in paper and electronic, and that they learn about scientific instrumentation, as well as writting laboratory reports.

CONTENTS

Theoretical and practical contents (2014-15)

Syllabus

Ch1.- Biomechanics. Work and Energy.

1.1 General laws of motion.
1.2 Work and power.
1.3 Kinetic and potential energy. Energy Conservation.
1.4 Metabolic rate. Scaling laws.

Ch2.- Elastic properties of materials

2.1 Stress and Strain.
2.2 Elasticity in biological systems.
2.3 Allotropic laws. Scaling law.

Ch3.- Fluids

3.1 Static fluids. Archimedes principle.
3.2 Continuity equation.
3.3 Ideal fluids: Bernouilli equation. Biological consequences.
3.4 Viscosity. Poiseuille's law.
3.5 Circulatory system in humans.

Ch4.- Surface phenomena.

4.1 Surface tension.
4.2 Capillarity.
4.3 Laplace law. Pulmonary surfactants.
4.4 Ascension of sap in trees.

Ch5.- Waves. Light and sound.

5.1 Description of an oscillatory motion.
5.2 Sound waves.
5.3 Nature of light. Electromagnetic spectrum.
5.4 Reflection and refraction. Lenses. Image formation. Optical instruments.

Ch6.- Transport phenomena.

6.1 Particle diffusion. Osmosis.
6.2 Heat transport:
a.- Conduction
b.- Convection
c.- Radiation
6.3 Applications in Biology.

Ch7.- Bioelectromagnetism

7.1 Interaction between charged particles: Coulomb law.
7.2 Electric field, electric potential energy and potential difference.
7.3 Magnetism. Magnetic field.
7.4 Nervous impulse.

Ch8.- Radioactivity. Biological effects of ionizing radiation.

8.1 Radioactivity. Radioactive decay.
8.2 Radioisotopes in Biology. Carbon dating.
8.3 Interaction of radiation with matter.
8.4 Dosimetry. Physical dose and biological dose.

EVALUATION

Instruments and criteria of Evaluation 2014-15

To be able to pass this class it is REQUIRED a minimum of 4.5 points (out of 10) in the laboratory.
The laboratory grade will be calculated from the laboratory reports (70%), the homework (10%) and an exam (20%).

Those students who do not pass the laboratory in the first semestre will be able to take a make-up exam at the end of June if they have attended at least 90% of all the laboratory sessions.

Those students that have a final grade lower than 4.5 points (out of 10) will have to do the laboratory again the next year.

In order to average all grades of a student, which comes from the laboratory grade, the final exam and those activities performed in the continuous evaluation during the semester, it is REQUIRED to have al least 4 points (out of 10) in the final exam.

Type	Criterion	Description	Ponderation
FINAL TEST			50
ACTIVITIES OF EVALUATION DURING THE SEMESTER			15
ACTIVITIES OF EVALUATION DURING THE SEMESTER			25
ACTIVITIES OF EVALUATION DURING THE SEMESTER			10