COURSE DATA

DATA SUBJECT

Code: 33069
Name: Physics
Cycle: Undergraduate Studies
ECTS Credits: 6
Academic year: 2025-26

STUDY (S)

Degree	Center	Acad. year	Period
1106 - Degree in Biology	Facultat de Ciències Biològiques	1	Second quarter

SUBJECT-MATTER

Degree	Subject-matter	Character
1106 - Degree in Biology	Física	BASIC

COORDINATION

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SUMMARY

"Physics" is a course of the first year of the degree in Biology which consists of 6 ECTS and is taught in the second term.

Physics is included in the syllabus of most scientific degrees and, particularly in Biology, introduces basic concepts that allow understanding the basis of many biological processes and some of the most advanced measurement techniques. In the first year of the degree, this subject is related to others, such as "Mathematics" and "Chemistry." In more advanced years Physics allows a deeper understanding of many aspects of Plant Physiology, Animal Physiology and Palaeontology, mainly.
The experience has shown that the majority of the students reaching the first year in the area of ¿¿"Life Sciences" have serious deficiencies that affect their performance in the subject of Physics. The shortcomings observed are related mainly to the subjects chosen in the options of high school.
Given this evidence, this course in Physics makes a clear the connection between physics and life sciences and includes detailed applications of physics to biological systems in each chapter. The goal is to motivate the students by demonstrating the clear relationship between these disciplines. In each of the themes, new physical magnitudes, their physical meaning and their relationship with biological systems are emphasized.

PREVIOUS KNOWLEDGE

RELATIONSHIP TO OTHER SUBJECTS OF THE SAME DEGREE

There are no specified enrollment restrictions with other subjects of the curriculum.

OTHER REQUIREMENTS

"Physics" is structured considering a starting level of knowledge equivalent to the last year of high school. First year students of the Degree of Biology are recommended to take options including Physics and Chemistry in high school. It is also advisable to have a similar level in math courses.

COMPETENCES / LEARNING OUTCOMES

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Apply principles of physics, chemistry and geology to the field of biology.

Capacidad de construir un texto escrito comprensible y organizado.

Capacidad para obtener la información adecuada con la que poder afrontar nuevos problemas científicos que se le planteen.

Capacidad para realizar una exposición oral de forma clara y coherente.

Capacidad para trabajar en grupo a la hora de enfrentarse a situaciones problemáticas de forma colectiva.

Conocer algunos de los ámbitos biológicos en los que se dan fenómenos eléctricos.

Conocer el concepto de precisión ligado con una medida y su incertidumbre.

Conocer el fenómeno de elasticidad y su aplicación a muestras biológicas.

Conocer las leyes de reflexión y refracción y aplicarlas a la formación de imágenes a través de lentes y espejos.

Conocer las unidades del SI, asignarlas correctamente y trabajar con múltiplos y submúltiplos.

Conocer los principios de la radioactividad.

Conocer los tipos de fluidos y las ecuaciones que los describen, con especial atención al concepto de presión hidrostática.

Entender el carácter vectorial del campo eléctrico y magnético.

Estudiar y conocer el ojo humano desde la perspectiva de sistema óptico.

Estudiar y conocer los instrumentos ópticos elementales (lupa y microscopio).

Habilidad para argumentar desde criterios racionales.

Interpret, analyse, evaluate, process and synthesise biological data and information by applying mathematical and statistical methods.

Organise, plan and manage information in a manner that allows the individual to analyse, synthesise and develop critical reasoning that can be applied to solve problems, make decisions and carry out work.

Saber aplicar los conceptos físicos teóricos a casos prácticos de índole biológica.

Students must be able to apply their knowledge to their work or vocation in a professional manner and have acquired the competences required for the preparation and defence of arguments and for problem solving in their field of study.

Students must be able to communicate information, ideas, problems and solutions to both expert and lay audiences.

Students must have acquired knowledge and understanding in a specific field of study, on the basis of general secondary education and at a level that includes mainly knowledge drawn from advanced textbooks, but also some cutting-edge knowledge in their field of study.

Students must have developed the learning skills needed to undertake further study with a high degree of autonomy.

Students must have the ability to gather and interpret relevant data (usually in their field of study) to make judgements that take relevant social, scientific or ethical issues into consideration.

Use ICTs, apps and other computer tools to manage and disseminate information in both educational and professional environments.

Use scientific language, both oral and written, and be able to adapt the register to the target audience and/or readers. Use the most common foreign languages in each discipline as a vehicle for communication in a globalised system.

DESCRIPTION OF CONTENTS

1. Introduction

- Unit systems
- Data analysis and presentation
- Errors
- Magnitudes. Graphical analysis

2.1. Elasticity. Hookes law.
2.2. Tension, compression. Youngs modulus. Poisson coefficient
2.3. Other strain experiments

2. Principles of Biomechanics

2.1. Elasticity. Hookes law.
2.2. Tension, compression. Youngs modulus. Poisson coefficient2.4. Structural design in nature.
2.5. Hydrostatics.
2.6. Ideal fluids: Bernouilli equation.
2.7. Viscosity: Poiseuille equation.

3. Principles of Bioelectromagnetism

3.1 Electric force and electric field.
3.2 Electric potential.
3.3 Cell membrane. Capacitors.
3.4 Electric currents. Resistence.
3.5 CC circuits.
3.6 Magnetic field. Force on moving carriers.
3.7 Mass spectrometer.

4. Optics

4.1 The electromagnetic spectrum.
4.2 Refractive index. Reflexion and refraction.
4.3 Mirrors and lenses.
4.4 Image formation.
4.5 Optical instruments: magnifier and microscopy.
4.6 Human eye.
4.7 Ametropies.

5. Waves

5.1 Classification of waves.
5.2 Wave equation: wavelength, frequency and velocity.
5.3 Energy and intensity. Absorption.
5.4 Wave superposition.
5.5 Introduction to acoustics.

6. Radioactivity

6.1 Structure of the nucleus. Nuclear forces.
6.2. Mass and binding energy.
6.3 Radioactive decays.
6.4 Archeological and geological dating.
6.5 Artificial radioactivity. Applications.
6.6 Ionising radiations. Biological effects. Dose.

7. Physics Laboratory

Session 1: Scaling laws.
Session 2: Density and viscosity of a liquid.
Session 3: Electric circuits. Measurements of currents and potentials.
Session 4: Image formation by slim lenses and optical microscopy.
Session 5: Evaluation

WORKLOAD

PRESENCIAL ACTIVITIES

Activity	Hours
Theory	35,00
Laboratory	15,00
Classroom practices	10,00
Total hours	**60,00**

NON PRESENCIAL ACTIVITIES

Activity	Hours
Attendance at other activities	0,00
Individual or group project	0,00
Independent study and work	28,00
Preparation of lessons	54,00
Preparation for assessment activities	8,00
Resolution of case studies	0,00
Total hours	**90,00**

TEACHING METHODOLOGY

The development of the subject in the lecture time is conducted as described in section ¿workload¿.

The working material will be as follows:

- An outline of the matter will be dealt with throughout the curriculum and the student must complete it with the recommended bibliography.

- A collection of problems, including: (a) some solved ones, (b) others to be solved in the classroom-in an oriented way, (c) the rest for individual work.

- Some scripts containing the basic information for the laboratory sessions.

- On line questionnaires.

Theory classes are developed in groups of 64 students with a periodicity of two sessions per week. In each session, the lecturer will develop the thematic part, keeping cohesion, and giving the students the most appropriate resources for further development of the subject during the time of study and individual work.

Problem solving classes are done in groups of 32 students. In them, students solve a collection problems guided by the lecturer, aiming to the application of theoretical knowledge presented in the theory classes. The resolution and discussion will take place, sometimes by the lecturer and others by the students, either individually or in groups.

Laboratory classes are taught in groups of 16 students and sessions are structured to provide students with the rudiments of experimental method (data, error analysis, graphical representations of experimental data, presentation of results, ...) and highlight methodological aspects of physics and science in general. The lecturer responsible for the lab group will give, at the beginning of each session, a brief introduction to the content, methodology and development of the demonstration. During the session, the lecturer will guide the experience. The students should present the results of laboratory experience in a memory / abstract format indicated by the lecturer of the subject.

The students will complete a series of multiple-choice questions in the ¿Aula Virtual¿ that are related to theoretical and practical content of the course. Each test should be performed in a given period of time fixed by the lecturer.

Seminars are cross-cutting between the subjects of the first year of the degree. Students choose a topic from a set of topics proposed by the faculty, should make a poster and present it to the rest of the class.

EVALUATION

. The on-line questionnaires will constitute 5% of the total grade. The minimum to average with the other contributions will be 4 out of 10.

. The seminar will contribute up to 10% of the final grade. The evaluation of this activity will test the ability of access to scientific information, the ability of synthesis and the ability of dissemination of scientific knowledge through a public oral presentation. The qualification will be valid for the academic year.

. A final exam consisting of short questions and problems will weight 60% of the final grade. This percentage includes the evaluation of the ability to access scientific information, the capacity of synthesis and the ability to dissemination of scientific knowledge through the active participation of students in the classroom. The assessment of the exercises given or solved ¿¿in the board will have up to 10%. The deadlines and format of delivering exercises will be indicated by the lecturer. The minimum to average with the other contributions will be 4 out of 10.

. The laboratory evaluation will be 25% of the final grade. Attendance at laboratory classes is mandatory. The laboratory can be assessed with a specific test or/and reports which certify the knowledge acquired by students. The minimum to average with the other contributions will be 4 out of 10. The laboratory mark, if it is gretear than 5/10 points, will be valid for the academic year in which the student performs the laboratory

sessions and the subsequent year.

. The subject is passed with a final score greater or equal to 5 points out of 10.

REFERENCES

- J.M. Kane, FISICA, Ed. Reverté.
- F. Cussó, C. López, R. Villar, FISICA DE LOS PROCESOS BIOLOGICOS, Ed. Ariel.
- M. Ortuño, FISICA PARA BIOLOGÍA, MEDICINA, VETERINARIA Y FARMACIA, Ed. Critica.
- D. Jou, J.E. Llebot, C. Pérez, FISICA PARA LAS CIENCIAS DE LA VIDA, Ed. McGraw Hill.
- A.H. Cromer, FISICA PARA LAS CIENCIAS DE LA VIDA, Ed. Reverté.