COURSE DATA

DATA SUBJECT

Code: 33162
Name: Physics
Cycle: Undergraduate Studies
ECTS Credits: 6
Academic year: 2025-26

STUDY (S)

Degree	Center	Acad. year	Period
1111 - Grado en Biotecnología	Facultat de Ciències Biològiques	1	Second quarter

SUBJECT-MATTER

Degree	Subject-matter	Character
1111 - Grado en Biotecnología	Physics	BASIC

COORDINATION

AGOURAM OUHTIT SAID

SUMMARY

The course "Physics" is a subject of the degree in Biotechnology that is tought in the second semester of the first year and consists of 6 ECTS credits.

Physics is a basic subject in many of the degrees of Sciences. In the case of Biotechnology, the concepts introduced in Physics establish the foundations of many biological processes and some of the most advanced measurement techniques. Within the first year, the course is related to the subjects "Mathematics" and "Chemistry". In more advanced courses the subject Physics allows understanding basic aspects of chemistry and biology.

Experience has shown that the majority of students reaching the first year of studies in the area of "life sciences" have serious deficiencies that affect the performance of students in the subject of Physics. The shortcomings identified are related mainly to the subjects chosen in the options of high school.

Given this evidence we decided to make a physics course in which the contents make clear the connection between physics and life sciences, including in each chapter detailed applications of physics to biological systems. The aim is to motivate the student to demonstrate the clear relationship between these disciplines. For each of the physical quantities introduced in the different chapters we emphasize their physical meaning and their relation with biological systems.

PREVIOUS KNOWLEDGE

RELATIONSHIP TO OTHER SUBJECTS OF THE SAME DEGREE

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

OTHER REQUIREMENTS

COMPETENCES / LEARNING OUTCOMES

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Actuar con autonomía en el aprendizaje, tomando decisiones fundamentadas en diferentes contextos, emitiendo juicios en base a la experimentación y el análisis y transfiriendo el conocimiento a nuevas situaciones

Adquirir conocimientos sobre mecánica de fluidos, termodinámica, electricidad, ondas electromagnéticas y su interacción con la materia y efectos de las radiaciones sobre los organismos vivos

Apply analytical, synthetic and critical thinking skills in the application of the scientific method.

Calcular correctamente los parámetros relevantes de un proceso o experimento mediante representación de datos experimentales.

Colaborar eficazmente en equipos de trabajo, asumiendo responsabilidades y funciones de liderazgo y contribuyendo a la mejora y desarrollo colectivo

Communicate ideas, problems and solutions within the field of biotechnology.

Conocer los fundamentos físicos y químicos que determinan las propiedades de las moléculas biológicas y que rigen las reacciones en las que participan

Demostrar razonamiento crítico y autocrítico en el ámbito de la titulación, considerando aspectos tales como la ética profesional, los valores morales y las implicaciones sociales de las diferentes actividades realizadas

Dominar bien los cálculos numéricos y el análisis de errores.

Emplear correctamente herramientas informáticas de cálculo, análisis y representación de datos (hojas de cálculo).

Emplear correctamente y con soltura la calculadora científica y otras herramientas de cálculo.

Participate in multidisciplinary teams, engaging in teamwork and collaboration.

Que el estudiantado demuestre su capacidad para calcular correctamente los parámetros relevantes de un proceso o un experimento mediante la representación de los datos experimentales

Que el estudiantado demuestre su capacidad para utilizar herramientas matemáticas y estadísticas para la

resolución de problemas biológicos

Que el estudiantado demuestre su capacidad para utilizar las diferentes fuentes bibliográficas y bases de datos biológicos y usar las herramientas bioinformáticas

Saber aplicar herramientas estadísticas a resultados experimentales.

Saber comunicarse de manera efectiva, tanto de forma oral como escrita, adaptándose a las características de la situación y de la audiencia

Saber expresarse correctamente en términos matemáticos, estadísticos, químicos, físicos y biológicos.

Saber relacionar los conocimientos de física nuclear con los efectos de las radiaciones sobre los organismos vivos.

Ser capaz de comprender el comportamiento físico de las ondas electromagnéticas y su interacción con la materia.

Ser capaz de resolver problemas de aplicaciones físicas relacionadas con mecánica de fluidos, termodinámica y electricidad.

Use English to write reports and to interpret information from protocols, manuals and databases.

Work in laboratories, including safety procedures, waste management and accurate activity logging.

DESCRIPTION OF CONTENTS

1. Theoretical Unit

Physic of Fluids:
1.1 Static of fluids. Surface phenomena.
1.2 Dinamic of fluids. Ideal fluids: Bernouilli's equation. Viscous fluids: Poiseuille's equation.
1.3 Movement of solids in fluids: sedimentation.

Principles of bioelectromagnetism:
2.1 Force and electric field.
2.2 Electric potential.
2.3 The cell membrane. Capacity.
2.4 Electric current. Resistance.
2.5 DC electric circuits with a mesh,
2.6 Magnetic field. Force on a moving charge.
2.7 Applications of electric and magnetic fields. Mass spectrometer.

Wave motion:
3.1 Wave types.
3.2 Equation of wave motion: wavelength, frequency and speed.

3.3 Superposition of waves.
3.4 Energy and intensity of a wave. Absorption.
3.5 Brief introduction to acoustics.

Optics:
4.1 The electromagnetic spectrum.
4.2 Refractive index. Laws of reflection and refraction.
4.3 Diopters and lenses.
4.4 Formation of images in lenses.
4.5 Instrumental optics: the magnifying glass and the microscope.
4.6 The human eye as an optical system.
4.7 Defects of the vision.

Radioactivity:
5.1 Nuclear structure. Nuclear forces.
5.2 Nuclear masses and binding energy.
5.3 The radioactive decay and its laws.
5.4 Dating in archeology and geology.
5.5 Artificial radioactivity. Applications.
5.6 Ionizing radiation. Biological effects of radiation. Dosimetric units.

2. Experimental Unit

System of units. Analysis and representation of data. Calculation of uncertainties. Relations between magnitudes: graphic analysis.
Measurement of the density and viscosity of a liquid.
Electrical circuits.
Standing waves.
Formation of images and microscope.
Examination.

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	32,00
Preparation of lessons	39,00
Preparation for assessment activities	19,00
Resolution of case studies	0,00
Total hours	**90,00**

TEACHING METHODOLOGY

The material that will be used throughout the course is the following:

- A base document that includes the full syllabus. Students are expected to complete it using the recommended bibliography.
- Problem collection:

  (a) Some problems are fully solved as examples.
  (b) Others will be solved in class with guidance from the professor.
  (c) The remaining problems must be solved individually by students.

- Laboratory guides: Contain the essential information required to carry out lab experiments.

In Theoretical Lectures, audiovisual materials and live demonstrations from the physics demonstration collection will be used. The goal is to provide a clear and engaging presentation of the key concepts, with visual and practical support.

Problem-Solving Sessions will be conducted in small groups. His aim to apply theoretical knowledge to practical problems. Problem-solving may be done by the professor as a demonstration. In other situations, the problems will be solved by students, either individually or in groups, to encourage active participation.

Laboratory Sessions will be also carried out in small groups. Each session includes: A brief introduction by the professor on the content, methodology, and procedure. Guided supervision during the experiment. Students will learn: Data analysis, Error analysis, Graphical representation and Results presentation and interpretation. Students must submit a lab report or summary, following the format provided by the course professor.

A series of multiple-choice quizzes will be completed through the Virtual Learning Platform (aula virtual), covering both theoretical and practical course content.

EVALUATION

Learning assessment:

A continuous evaluation will be carried out based on:

- On-line questionnaires carried out in the Virtual Classroom. The percentage of this part is 5% of the total score.

- The ability to access information, the ability to synthesize and the ability to disseminate the knowledge acquired, which will be assessed through the active participation of students in face-to-face classes and in carrying out tasks related to theoretical and practical content of the subject. These tasks may be requested from students through the tools of the Virtual Classroom. The percentage of this part is 10% of the total score.

- Experimental practices in the laboratory of the subject, that will be evaluated from the memories presented by the students and from an exam that, depending on the circumstances, will be done in person or using the Virtual Classroom tools. The percentage of this part is 25% of the total score. A minimum score of 4 out of 10 is required. It is obligatory to do the laboratory practices. The laboratory score is valid for the two calls of the course in which it has been carried out and, in case of passing the laboratory with a qualification greater than or equal to 5 out of 10, this score is maintained for the immediately subsequent course.

- An "official" exam that will evaluate the theoretical and practical contents of the subject and that, depending on the circumstances, will be done in person or using the Virtual Classroom tools. This exam will consist of questions and problems. The percentage of this part is 60% of the total score. A minimum score of 4 out of 10 is required.

To pass the course, the final averaged score must be greater or equal than 5 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.
- P.A. Tipler, FISICA (2 volumenes), Ed. Reverté.
- A.S. Frumento, BIOFISICA, Ed. Intermédica.
- J. Catalá, FISICA, Ed. Saber.