COURSE DATA

Data Subject	
Code	33121
Name	Physics
Cycle	Grade
ECTS Credits	6.0
Academic year	2023 - 2024

Study (s)

Degree	Center	Acad. year	Period
1109 - Degree in Biochemistry and Biomedical Sciences	Faculty of Biological Sciences	1	Second term

Subject-matter

Degree	Subject-matter	Character
1109 - Degree in Biochemistry and Biomedical Sciences	2 - Física	Basic Training

Coordination

Name	Department
PELLICER PORRES, JULIO	175 - Applied Physics and Electromagnetism

SUMMARY

Physics is a subject in the first degree course in Biochemistry and Biomedical Sciences, given during the second quarter and consisting of 6 ECTS credits.

Physics is a basic subject in many scientific degrees. In Biochemistry and Biomedical degree is necessary to understand the conceptual basis 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 it can delve into many aspects of other subjects, including Bioenergetics, methods in Biochemistry, cell analysis techniques and Physiology.

PREVIOUS KNOWLEDGE

Relationship to other subjects of the same degree

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

Other requirements

It is strongly recommended to have completed the subjects of Mathematics and Physics in high school. The course takes for granted concepts related to forces and especially to work and energy.

OUTCOMES

1101 - Degree in Biochemistry and Biomedical Sciences

- Conocer los principios físicos del análisis dimensional, de la biomecánica de las propiedades de los fluidos, de la bioelectricidad, de las propiedades de las ondas, de la óptica, del bioelectromagnetismo y de la radiactividad.
- Saber aplicar los conceptos físicos teóricos a casos prácticos de índole biológica.

LEARNING OUTCOMES

- Assimilation of the laws of physics with more importance in the description of biological processes, providing the necessary foundation to tackle other subjects of the degree, in the same course or subsequent courses.

- Knowledge of basic terminology in Physics, along with the ability to express magnitudes with the precision required in the field of Science. Development of reasoning in scientific terms.

- Achievement of operational capacity to apply and relate laws and concepts, as well as mastering the different procedures for the resolution of problems, including the necessary math skills.

- Development of experimental methods, focusing on the application of measurement techniques.

- Develop the skills to analyze and present in a concise and organized way the results of a lab.

- Acquisition of habits of study and planning for the learning, searching, selecting and synthesizing information in various literature sources.

DESCRIPTION OF CONTENTS

1. 1.Physical magnitudes

- To know how to express a physical quantity correctly, including the appropriate number of significant figures, uncertainty and a unit of the International System.

- Fluid units transformation. Use of dimensional analysis as a guide for checking physical laws.

2. 2.Fluids

- To know how pressure varies with altitude in liquids and derive some consequences and applications. To master the concept of thrust, applied in particular to the analysis of buoyancy in fishes.

- Use the flow conservation equation and the Bernoulli principle. Calculation of the pressure drop in a viscous fluid along a pipe and energy implications. Dealing with the analogy between the circulatory system and electrical circuits.

3. Bioelectromagnetics

- Calculation of the electric field and potential distributions of simple point charges. Connection between field and potential for uniform fields and point charges. Relationship between electric potential, potential energy and the principle of conservation of energy. Mastery of the concept of capacity and application in the description of the electrical characteristics of the cell membrane.
- Resolution of single mesh electrical circuits. Association of resistances. Management of the voltmeter and ammeter.
- Identification of magnetism as a basic mechanism of interaction between currents. Calculation of the force exerted by a magnetic field on a moving charge or current. Interpretation of the magnetic field lines and knowledge of the general characteristics of the field of some current distributions. Functioning and utility of the mass spectrometer.

4. Waves

- Recognition of mathematical expressions describing waves. Identification of the wavelength period and phase velocity of a harmonic wave.
- Establishment of the relationship between the intensity of an acoustic wave and the amplitude of the wave pressure or displacement.
- Expression of the intensity in the decibel scale. Variation of intensity with distance in a spherical wave.
- Understanding the phenomenon of the Doppler effect and knowledge of technological applications.
- Using the laws of reflection and refraction of light. Total internal reflection.
- Analysis of the Young experience. Identification of stationary wave patterns in vibrant strings and tubes.
- Estimation of the limits on the resolution of optical systems or echolocation imposed by diffraction.

5. Optics

- Formation of images by plane mirrors and thin lenses. Numerical analysis and graphics.
- Knowledge of the eye from the perspective of optical systems.
- Calculation of corrective lenses for nearsighted and farsighted.
- Analysis of the magnifying glass and microscope.

6. Radioactivity

- Radioactivity. Interaction of ionizing radiation with matter.
- Calculate the mass defect associated with a nucleus and the Q value of a nuclear reaction. Assimilation of order of magnitude of the energy involved. Implications for nuclear fission and fusion.
- Acquisition of a familiarity with the radioactive decays, with the aim of understanding the applications of radioactivity and ionizing radiation effects. Distinction between absorbed dose and equivalent dose.
- Using the law of radioactive decay and application to dating.

WORKLOAD

ACTIVITY	Hours	% To be attended
Theory classes	35,00	100
Laboratory practices	15,00	100
Classroom practices	10,00	100
Development of individual work	12,00	0
Study and independent work	30,00	0
Preparation of evaluation activities	15,00	0
Preparation of practical classes and problem	30,00	0
Resolution of online questionnaires	3,00	0
TOTAL	**150,00**	

TEACHING METHODOLOGY

The available material will be as follows:

- Printed slides of the presentations made in class by the teacher. The slides provide a very brief summary and cannot be considered notes. Students must complete them both with the comments made by the teacher as well as using the recommended bibliography.

- A collection of problems, some of which will be solved in the classroom, and the rest must be worked on personally.

- Lab documents.

- Multiple choice questions to be completed online.

- The theory classes will be held with the full group of 80 students, twice a week. The teacher will develop, in each session, part of the thematic unit, maintaining a certain cohesion. The teacher will tell students the best resources for the subsequent preparation of the subject during the study time.

- The practical problems are performed in groups of about 25 students. In this classes students solve the problems guided by the teacher, applying the knowledge gained in the lectures. Sometimes the resolution will be developed by the teacher.

- The lab classes are taught in groups of 16 students and are structured in sessions that provide students the rudiments of the experimental method (data processing, error analysis, graphical representations of experimental data, presentation of results, ...) and highlight methodological aspects of physics and science in general. Students attend the lab having read the script for practice. During the session, the teacher will guide the realization of the experience. The student must submit the results of laboratory experience in a short report following the format provided by the teacher.

- Students carry out online a series of multiple choice questions that are related to theoretical and practical content of the course.

EVALUATION

- The theoretical contents will be evaluated with an exam. The written exam will consist of questions and short problems and weight 75% of the final grade. The content of the examination may include questions about the practices.

-Students can improve their mark up to 10% solving problems in the blackboard.

The minimum grade to average with the other contributions will be 4 out of 10.

- Evaluation of lab reports constitute 25% of the final grade. The minimum for average with the other contributions will be 4 out of 10. The practice note is saved for the second call.

REFERENCES

Basic

- F. Cussó, C. López, R. Villar, Física de los procesos biológicos, Ed. Ariel, 2004.
- J.M. Kane, Fisica, Ed. Reverté, 2000.
- D. Jou, J.E. Llebot, C. Pérez, Física para las ciencias de la vida, Ed. McGraw Hill, 1994.
- A.H. Cromer, Física para las ciencias de la vida, Ed. Reverté, 1996.

Additional

- P.A. Tipler y G. Mosca, Física para la Ciencia y la Tecnología, Ed. Reverté, 2005.
- D. Halliday, R. Resnicky K. S. Krane, Física¸ Compañía Editorial Continental, 1994.
- R. A. Serway y J. W. Jewett, Física, Ed. Thomson, 2003.
- R. Feynman, R. Leighton y M. Sands, Física, Ed. Addison-Wesley Iberoamericana, 1987.
- R. K. Hobbie, Intermediate Physics for Medicine and Biology, Ed. Springer-AIP Press, 1997.
- G. B. Benedek y F. M. H. Villars, Physics with Illustrative Examples from Medicine and Biology, Ed. Springer-AIP Press, 2000.