Universidad Zaragoza

Academic Year/course: 2022/23

27102 - Physics

Syllabus Information

Academic Year: 2022/23
Subject: 27102 - Physics
Faculty / School: 100 - Facultad de Ciencias
Degree: 446 - Degree in Biotechnology
ECTS: 9.0
Year: 1
Semester: Annual
Subject Type: Basic Education
Module:

1. General information

1.1. Aims of the course

It is a basic formation course within the degree whose objective is to provide the student with a basic training in general aspects of Physics. Special emphasis on introductory, specific and instrumental aspects for the study of Biology, Biochemistry and Biotechnology.

These approaches and objectives are aligned with the following Sustainable Development Goals (SDGs) of the United Nations 2030 Agenda (https://www.un.org/sustainabledevelopment/es/), in such a way that the acquisition of the results of subject learning provides training and competence to contribute to some extent to its achievement:

- Objective 4: Quality education.
- Objective 5: Gender equality.
- Objective 9: Industry, innovation and infrastructures

1.2. Context and importance of this course in the degree

- The course is within the module of basic training taught the first year of the degree that has as objectives to provide the student with basic training not only in Chemistry and Biology, but also in scientific-technic disciplines, necessary for the study of Biotechnology, such as Physics. It also homogenizes the knowledge level of students from different backgrounds.
- The course is necessary to understand basic physical aspects of Biotechnology as well as to be able to apply some of the laboratory techniques used in other courses.
- It provides basic knowledge to be able to take other courses (Physical Chemistry, Biophysics, etc.)

1.3. Recommendations to take this course

- To attend class regularly.
- To work regularly and respect the assigned delivery dates.
- To consult and use the recommended bibliography.
- To use the different materials provided by the teacher through the ADD.
- To ask the teacher questions in the tutoring sessions

2. Learning goals

2.1. Competences

Be able to:

- solve theoretical and practical issues related to the contents of the course, knowing the the basic laws

of physics and being able to apply them to biological systems.

-describe in physical terms the properties of body fluids: viscosity, turbulence, flow velocity and drag forces.

-derive some macroscopic properties of gaseous systems based on microscopic behavior.

-apply correctly the principles of Thermodynamics to biological phenomena.

-understand thermal regulation mechanisms analyze the effects of electrostatic fields on different material media

-calculate the effects of magnetic fields on charges and currents, as well as on the different types of materials.

-analyze the propagation of electromagnetic waves in general, and of light in particular, in different material media and to be able to analyze interference and diffraction phenomena.

-understand the basic principles of operation and applications of a colorimeter, spectrophotometer, mass spectrometer, magnetic resonance, etc.

-describe the main effects of radiation at the cellular and organism level, apply the magnitudes used for its measurement and know basic measures of radiological protection.

2.2. Learning goals

- To solve theoretical and practical issues related to the cointents of the course in each of the topics in which the course is divided
- To prepare reports on specific topics (laboratory practices, bibliographic works, etc.) with scientific rigor and linguistic precision.

2.3. Importance of learning goals

The behavior of biological systems is conditioned by physical laws (fluid dynamics, movement of gases, thermodynamics, electromagnetic interactions, etc. ..) in addition to laws and chemical reactions. This physics knowledge is necessary to understand this basic behavior, to model complex behaviors , as well as to support a large number of analysis techniques used to study biological systems.

3. Assessment (1st and 2nd call)

3.1. Assessment tasks (description of tasks, marking system and assessment criteria)

Several theoretical-practical tests will be carried out throughout the course (70% of the final mark) to evaluate parst of the course. It will require a minimum mark of 4 in any test. Within each test both the theoretical part and the practice must also needs a 4 as a minimum mark. The minimum number of test will be two: first and second semester.

However the offical test will be held at faculty official dates.
Evaluation of other learning activities as student solving problems, practical cases proposed by the teacher and work in the laboratory addup to 30% of the final mark. A minimum mark of 4 will be required in this part of the evaluation.

In addition to the evaluation modality indicated in the previous points, the student will have the possibility of being evaluated in a global test, which will judge the achievement of the learning results indicated above. Fraud or total or partial plagiarism in any of the evaluation tests will lead to the fail of the course with the minimum note, in addition to the disciplinary sanctions that the guarantee committee adopts for these cases

4. Methodology, learning tasks, syllabus and resources

4.1. Methodological overview

The methodology followed in this course is oriented towards the achievement of the learning objectives. A wide range of teaching and learning tasks are implemented divided in two formative activities.

- Formative Activity 1: Acquisition of basic knowledge of Physics (6 ECTS).
  Methodology: participatory Lectures in large group.
  Tutorials (small and / or individual groups).
  Working with Web support
  Reporting on topics proposed by the teacher, presentation and discussion in class.
- Formative Activity 2. Troubleshooting and analysis of case studies in small groups in the lab and / or classroom (3 ECTS)
  Methodology: Personal study.
  Problem-based learning.
  Working in the laboratory.
  Prepare reports on laboratory work according to the model proposed by the Professor

4.2. Learning tasks

The course includes the following learning tasks:

- Lectures.
- Practice sessions. Interactive sessions in which on problems.
- Online activities.
- Laboratory practical work in small groups.
- Tutorials.

Support using the available resources in the space allocated to the subject in moodle. It will serve as a repository of materials: presentations of topics, exercises, virtual laboratory, etc.

The teaching and evaluation activities will be carried out in person unless, due to the health situation, the provisions issued by the competent authorities and by the University of Zaragoza require them to be carried out electronically or semi-electronically with reduced capacity.

4.3. Syllabus

The course will address the following topics:

- Classical mechanics.
  Dynamics of a particle. Newton's laws. Static.
  Energy and work. Conservation theorems.
  Forces of friction and drag. Elasticity.
- Fluid Mechanics.
  Statics of fluids. Ideal fluid dynamics. Real fluids.
  Phenomena surface.
- Statistical Mechanics.
  Kinetic theory of gases.
  Thermal equilibrium and temperature.
- Thermodynamics.
  Internal energy. Heat and work. First principle.
  Entropy and second principle.
  Thermal properties of matter.
- Electromagnetism.
  Electrostatics: field and potential.
  Dielectrics and conductors.
  Stationary electric current.
  The static magnetic field.
  Electric and magnetic properties of matter.
  Electromagnetic waves.
- Optics.
  Light progation. Reflection and refraction.
  Diffraction and interference phenomena.
  Formation of the optical image. The eye.
- The structure of matter.
  The atom and atomic nucleus. Radioactivity. Radiation-matter interaction.
  Biological effects of radiation. Dosimetry and radiation protection.

4.4. Course planning and calendar

The period of lectures and practical classes will coincide with the established officially. Available at: https://ciencias.unizar.es/grado-en-biotecnologia.

The places of classes and practical sessions, as well as the calendar and practice groups will be established in coordination with the rest of teachers at the beginning of the academic year. The Coordinator will produce groups of practices in order not to produce overlaps with other subjects.

Personalized tutoring: 1 hour/month per pupil in groups of 10 students in time to agree with the teacher.

Schedule of submission of papers: each proposed task will appear on the moodle platform along with the date of delivery.

For students enrolled in, places, times and dates of lectures and practical sessions will be published in the Biotechnology Official Bulletin Board of the grade on the platform Moodle at the University of Zaragoza https://moodle2.unizar.es/add/ and in the moodle course. These channels are also used to communicate enrolled students distribution by groups of practices that will be organized by the coordination of the degree.

Provisional dates are available on the website of the Faculty of Sciences in the corresponding section of the degree in biotechnology: https://ciencias.unizar.es/grado-en-biotecnologia. In this web the dates of exams in the section degree in biotechnology are also available.

4.5. Bibliography and recommended resources

http://psfunizar10.unizar.es/br13/egAsignaturas.php?codigo=27102&Identificador=12498