1. OVERVIEW

Subject Area	Biophysics
Degree	Bachelor's Degree in Biotechnology
School/Faculty	School of Biomedical and Health Sciences
Year	First
ECTS	6
Type	Core
Language(s)	Spanish
Delivery Mode	On campus
Semester	Second semester
Academic Year	24-25
Coordinating professor	María Piedad Ros Viñegla
Professor	

2. INTRODUCTION

Biophysics is a Physics subject which is part of the Physics, Maths and IT module. This module is taught in the first part of the degree as core matter over years 1 and 2. It is worth 30 ECTS divided across five different subjects.

This subject is one of the core subjects worth 6 ECTS credits and is delivered each semester in the first year of the Bachelor's Degree in Biotechnology. The main aim of this subject area is to help students acquire a solid base in the fundamental aspects of classical physics. Knowledge of the principles of physics at work in biological processes and awareness of the main tools applied in this area will provide students with a strong foundation on which they can then take on more advanced subject area on the degree programme with more independence.

The subject mainly deals with the laws of physics and phenomena associated with physical processes in the biological field.

All subject content is oriented towards its application to the physical, biological and technological systems present in the field of biotechnology.

3. LEARNING OUTCOMES (RA, by the acronym in Spanish)

Knowledge (CON, by the acronym in Spanish)

CON03. Identify the physical, biophysical and thermodynamic processes which affect biological structures and the different phenomena which occur in them.

• Acquire the basic biophysical principles of the mechanics which determine the properties of biological membranes and the bioelectric phenomena which occur in them.

Abilities (HAB, by the acronym in Spanish)

HAB03. Apply the right equations or procedures to interpret the mathematical, statistical, biophysical and thermodynamic data to study systems of interest in biotechnology.

• Apply the basic biophysical principles which determine the transformation mechanisms of energy, as well as the transport processes in biological systems.

• Plan the application of biophysical methods and know how to apply and interpret the possibilities offered by these methods in the field of biotechnology.

Skills

COMP03. Apply the laws and principles of physicochemical processes which govern biological systems.

COMP18. Identify and apply mathematical methods and tools to the field of biotechnology.

4. CONTENTS

- Physical magnitudes and units of measurement. Measurement uncertainty. Processing and presentation of experimental data.
- Mechanics: Newton's laws. Conservation laws. Mechanical properties of biomaterials. Mechanical properties of biological membranes.
- Electric field: The electrical double layer and electrokinetic phenomena. The electrostatic structure of the membrane.
- Fluids: ideal and real. Rheology: Newtonian and non-Newtonian fluids. Viscoelasticity.
- Transport phenomena: Fick's law. Flow of uncharged substances. Electrolyte flow. Diffusion potential.
- Wave phenomena: Oscillations and waves: Electromagnetic waves. Light. Biotechnological applications. Mechanical waves. Sound. Bioacoustics.

This subject area is divided into five learning units, which are then divided into various topics:

Learning Unit 1. Physical magnitudes
- Topic 1. Physical magnitudes and units of measurement.
- Topic 2. Measurement uncertainty.

Learning Unit 2. Mechanics
- Topic 3. Kinematics
- Topic 4. Dynamics
- Topic 5. Work and energy
- Topic 6. Mechanical properties of biomaterials and biological membranes

Learning Unit 3. Electric and magnetic field
- Topic 7. Electric fields
- Topic 8. Electrical phenomena in biological systems
- Topic 9. Magnetic fields

Learning Unit 4. Fluids
- Topic 10. Ideal and real fluids.

- Topic 11. Transport phenomena.

Learning Unit 5. Acoustic and optical waves.
- Topic 12. Oscillations and waves. Electromagnetic waves.
- Topic 13. Mechanical waves. Sound. Bioacoustics.
- Topic 14. Physical optics.

5. TEACHING/LEARNING METHODS

The types of teaching/learning methods are as follows:
- Lecture.
- Collaborative learning.
- Problem-based learning.

6. LEARNING ACTIVITIES

The types of learning activities, plus the amount of time spent on each activity, are as follows:

On campus:

Learning activity	Number of hours
Lectures	30
Asynchronous master lectures	10
Problem-solving	24
Written reports and essays	15
Tutorials	15
Independent working	50
On-campus knowledge tests	6
TOTAL	**150**

7. ASSESSMENT

The assessment methods, together with how much they each count towards the final grade for the subject area, are as follows:

On campus:

Assessment system	Weight
Objective knowledge test	60%
Case study/problem scenario	20%
Written reports	20%

On the Virtual Campus, when you open the subject area, you can see all the details of your assessment activities and the deadlines and assessment procedures for each activity.

7.1. Ordinary exam period

To pass the subject area in the ordinary exam period you must obtain a mark of 5.0 or more out of 10.0 in all assessed parts of the subject. Any part you do not pass in the ordinary exam period will need to be recovered in the extraordinary exam period (resits).

Your final grade will be the average of the partial marks in each of the learning activities you have passed. The continuous assessment system for the learning activities requires attendance to at least 50% of the classes.

It is compulsory for students studying degrees on-campus to accredit attendance to at least 50% of classes. This requirement qualifies students for the right to obtain academic counselling, support and monitoring from the professor. Failure to accredit attendance to at least 50% of the classes by any of the means proposed by the University will mean that the professor awarding a fail to the student for that subject area in the ordinary exam period in accordance with the grading system outlined in these regulations. All of the above, without prejudice to the other requirements or higher attendance percentages that other faculties may stipulate in their learning guides or internal regulations. Regulations for the assessment of official degree programmes, Art. 1 point 4.

(*https://universidadeuropea.com/documents/1798/6._Reglamento_evaluacion_titulaciones_oficiales_grado_UEM_v2.pdf*)

7.2. Extraordinary exam period (resits)

To pass the subject area in the extraordinary exam period (resits), the students must obtain a mark equal to or above 5.0 out of 10.0 in all parts of the subject assessment they did not pass during the ordinary exam period.

The student must submit the activities not passed in the ordinary exam period taking into account the corrections or comments made by the teacher. The student must also submit any activities which were not submitted.

The final grade will be the average of the partial marks in each of the activities passed (with a mark equal to or higher than 5 out of 10). The marks for the assessable activities the student passed in the ordinary exam period will be maintained for calculating this grade.

8. TIMELINE

The timeline with delivery dates of assessable activities in the subject area is indicated in this section:

Assessable activities	Date
Activity 1. Reports and written work	2-15
Activity 2. Case study/problem	2-15
Activity 3. Objective test 1	Week 7--8
Activity 4. Objective test 2	Week 16

The timeline may be subject to modifications for logistical reasons of the activities. Students will be informed of any changes in due time and course.

9. BIBLIOGRAPHY

The reference work for following this subject area is:

- S. Burbano de Ercilla. E. Burbano García, C. García Muñoz, "Física General", Ed. Tébar, 2006.
- S. Burbano, E. Burbano y C. Gracia, "Problemas de Física", 27ª ed. Tébar, 2007.
- Kane, Joseph W., and Morton M. Sternheim. Física. Ed. Reverté, 2020.

The recommended bibliography is indicated below:

- R. Glaser," Biophysics an introduction", Ed. Heidelberg; New York: Springer, 2012.
- F. Cussó, C. López y R. Villar, "Física de los procesos biológicos", Ed. Ariel, Madrid, 2004
- Paul E. Tippens, "Física: conceptos y aplicaciones", Ed. México D.F.: McGraw-Hill Interamericana, 2011. e-book.
- H.D. Young, R.A. Freedman, F.W. Sears y M.W. Zemansky, "Física universitaria", Vol. 1 y 2, 12ª ed. Pearson Education, 2013.

10. EDUCATIONAL GUIDANCE AND DIVERSITY UNIT

The Educational Guidance and Diversity Unit (ODI in Spanish) offers support throughout your time at university to help you with your academic achievement. Other cornerstones of our educational policy are the inclusion of students with special educational needs, universal access in all our university campuses and equal opportunities.

This ODI unit offers students:

1. Support and monitoring through counselling and personalised student plans for those who need to improve their academic performance.
2. Curricular adaptations to uphold diversity, with assistance for those students who require specific educational support, leading to equal opportunities without significant changes to methodology or evaluation.
3. We offer students a range of extracurricular educational resources to reinforce skills which will enhance their personal and professional development.
4. Career guidance by offering tools and advice to students with doubts regarding their professional careers or those who believe they have chosen the wrong line of study.

Students who need educational support can contact us at:
orientacioneducativa@universidadeuropea.es

11. SATISFACTION SURVEYS

Your opinion matters!

Universidad Europea encourages you to complete our satisfaction surveys to identify strengths and areas for improvement for staff, degree courses and the learning process.

These surveys will be available in the surveys area of your virtual campus or by email.

Your opinion is essential to improve the quality of the course.

Many thanks for taking part.