Teaching guide

IDENTIFICATION DETAILS

Degree:	Biomedicine
Scope	Biology and Genetics
Faculty/School:	Experimental Sciences
Course:	BIOPHYSICS
Type:	Compulsory
ECTS credits:	3
Year:	1
Code:	2133
Teaching period:	Second semester
Subject:	Physics
Module:	Fundamental Sciences
Teaching type:	Classroom-based
Language:	Spanish
Total number of student study hours:	75

SUBJECT DESCRIPTION

Present the basic physical principles of Classical Thermodynamics, Thermodynamics of irreversible processes; energy transduction processes in biological systems; association between molecules; molecular transport; cellular bioelectric phenomena; cell membrane, axons and ion channels, focusing on their practical application to topics that will be the student's competence throughout the training.

GOAL

We want students, regardless of the knowledge they have at the beginning of their university studies, to acquire a Physical-Thermodynamic culture in which the concepts that govern biology are present.
The specific purposes of the course are:

That he is able to perform with ease in the management of the different units, which must necessarily accompany any scientific result.
Let him learn the meaning of the modeling process, as a means of representing physical laws in their mathematical form.

PRIOR KNOWLEDGE

To take the course, you must have the level of knowledge of the 2nd year of Baccalaureate for the subjects of physics, chemistry and mathematics.

COURSE SYLLABUS

TOPIC 1.- Principles of Classical Thermodynamics
1.1 Work, heat and internal energy Ideal gases.
1.2 First principle.
1.3 Reversible processes.
TOPIC 2.- Irreversible Processes
2.1 Second principle. Entropy and irreversible processes.
2.2 Statistical postulate of entropy.
2.3 Thermodynamic potentials.
TOPIC 3.- Molecular transport
3.1 Brownian Movement. Friction.
3.2 Dissemination. Fick's Law.
3.3 Random path and polymer conformation.
TOPIC 4.- Bioelectric Phenomena
4.1 Nernst equation and membrane potential.
4.2 Ion pump. Conductance. Stationary potential.
4.2 Action potential. Analog circuits. Synapse.

EDUCATION ACTIVITIES

FACE-TO-FACE TRAINING ACTIVITIES AFP1. Theory classes: Students will be provided with essential and organized information from a variety of sources. In addition to the oral presentation, other teaching resources (readings, examples, websites,...) will be used and the active participation of students in class will be encouraged in order to facilitate greater reception and understanding. AFP2. Practical classes: Individual or paired tutored internships in the corresponding bioinformatics laboratories, for the application of theoretical knowledge. Various statistical packages will be used: excel, SPSS and/or R. AFP3. Problem classes and exercises: by solving practical cases, the theoretical concepts previously seen will be studied and consolidated. AFP4. Seminars and/or

exhibition of works. In these sessions, students will present the results obtained in the work/project carried out in the subject. AFP5. Tutoring: individual or in groups, to answer questions related to the subject. AFP6. Conducting exams. AUTONOMOUS TRAINING ACTIVITIES AFNP1. Study of theory, exercises and problems. AFNP2. Preparation and study of practices. AFNP3. Preparation of works, both individual and group. AFNP4. Tutoring preparation. * The tutoring schedule can be consulted in the degree coordinator and will be informed by the teacher at the beginning of the course.
The teachers of the subject do not authorize the publication by the student of the material provided by the teachers of the subject in the virtual classroom, or by any other means.

DISTRIBUTION OF WORK TIME

TEACHER-LED TRAINING ACTIVITIES	INDIVIDUAL WORK
35 Horas	40 Horas

LEARNING RESULTS

Study the interaction between molecules from a quantitative point of view.

To know the different forms of transport of molecules across biological membranes and their consequences.

Understand the principles of thermodynamics and their application to biological systems.

SPECIFIC LEARNING RESULTS

Apply the physical laws that govern the functioning of living beings at the molecular level.

Distinguish the main physical laws that govern biophysics.

Select the theoretical models that lead to the laws governing biological processes.

Solve the problems that arise of a physical nature in the models that are presented.

LEARNING APPRAISAL SYSTEM

Ordinary evaluation system:

Written exam (70%) - A written exam will be taken at the end of the semester. It is necessary to achieve a grade greater than or equal to 5 in this exam in order to pass the subject. This exam will be carried out on paper with the help of a calculator only.
Practical exercises (30%) - These are practical exercises that will be performed in certain classes. The teacher will

indicate that a specific exercise will be evaluable for this section.

For students in second and third enrollment, class attendance will not be mandatory and, therefore, the presentation of practical exercises will not be mandatory. In that case, the written exam score will be 100% of your grade. A grade greater than or equal to 5 is required to pass the course.
Plagiarism, as well as the use of illegitimate means in evaluation tests, will be sanctioned in accordance with those established in the Evaluation Regulations and the University's Coexistence Regulations

ETHICAL AND RESPONSIBLE USE OF ARTIFICIAL INTELLIGENCE

1.- The use of any Artificial Intelligence (AI) system or service shall be determined by the lecturer, and may only be used in the manner and under the conditions indicated by them. In all cases, its use must comply with the following principles:
a) The use of AI systems or services must be accompanied by critical reflection on the part of the student regarding their impact and/or limitations in the development of the assigned task or project.
b) The selection of AI systems or services must be justified, explaining their advantages over other tools or methods of obtaining information. The chosen model and the version of AI used must be described in as much detail as possible.
c) The student must appropriately cite the use of AI systems or services, specifying the parts of the work where they were used and describing the creative process followed. The use of citation formats and usage examples may be consulted on the Library website(https://www.ufv.es/gestion-de-la-informacion_biblioteca/).
d) The results obtained through AI systems or services must always be verified. As the author, the student is responsible for their work and for the legitimacy of the sources used.
2.- In all cases, the use of AI systems or services must always respect the principles of responsible and ethical use upheld by the university, as outlined in the Guide for the Responsible Use of Artificial Intelligence in Studies at UFV. Additionally, the lecturer may request other types of individual commitments from the student when deemed necessary.
3.- Without prejudice to the above, in cases of doubt regarding the ethical and responsible use of any AI system or service, the lecturer may require an oral presentation of any assignment or partial submission. This oral evaluation shall take precedence over any other form of assessment outlined in the Teaching Guide. In this oral defense, the student must demonstrate knowledge of the subject, justify their decisions, and explain the development of their work.

BIBLIOGRAPHY AND OTHER RESOURCES

Basic

Tipler, Paul Allen. Physics for Science and Technology 6th ed.
(Tipler, Paul Allen. Physics for Science and Technology 6th ed. , Barcelona:Reverté,2016.||Buceta Fernández, Javier. Biophysics Topics [electronic resource])

Nelson, Philip. Biological Physics: Energy, Information, Life
(Nelson, Philip. Biological Physics: Energy, Information, Life , Barcelona: Reverté, 2005)

Additional

Sears and Zemansky; [co-authors] Hugh D. Young, Roger A. Freedman; with the contribution of A. Lewis Ford;

translation by Ana Elizabeth García Hernández; technical review, Bertha Molina Brito... [et al.]. University Physics with Modern Physics
(Sears and Zemansky; [co-authors] Hugh D. Young, Roger A. Freedman; with the contribution of A. Lewis Ford; translation by Ana Elizabeth García Hernández; technical review, Bertha Molina Brito... [et al.]. University Physics with Modern Physics , Mexico City:Pearson,2018.||David Boal Mechanics of the cell)