

Degree programme	Type	Course
Biochemistry	FB	1

Contact lecturer

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Group languages

You can consult this information at the [end](#) of the document.

Prerequisites

For the proper understanding and successful completion of the Physics course in the Biochemistry Degree, it is a desirable requirement that students have achieved the competencies typical of High School Physics.

The course is designed assuming that these prior knowledge are possessed, as they are fundamental for understanding the concepts and solving problems that will be addressed throughout the course.

In case you have not taken Physics in High School or if you believe your knowledge is not sufficiently solid, we strongly urge you to update your Physics foundation before the start of classes. This can be achieved through self-study of High School syllabi, consulting textbooks, or by taking a preparatory (leveling) course in Physics.

Ensuring you master these fundamentals will allow you to keep up with the pace of the course successfully and avoid unnecessary difficulties during the semester.

Objectives

Because of its fundamental nature, knowledge in physics is very often a necessary tool for the correct understanding of the phenomena described in other sciences. In the specific case of Biotechnology, for example, to correctly understand the dynamics of chemical reactions within cells, it is completely indispensable to know the physics of diffusion, the field and electrical current or thermodynamics. Without this knowledge a misunderstanding of the biochemistry of the cell is possible.

On the other hand, Physics is required to understand some of the experimental methods that biochemists use daily. In our case, for example, radioactive or fluorescent marking of molecules, centrifugation or magnetic resonance are examples of methods that are clearly based on fundamental physical principles.

The objective of this subject will be the introductory study of all the necessary physical concepts for both, modeling and experimental design in Biochemistry.

Some of the topics will be the starting point of other courses such as Thermodynamics, Bioenergetics and other topics will be fundamental for the practices included in Integrated Laboratories.

Learning outcomes

- CM02 (Understand the specialist terminology used in the field of physics.) Understand the specialist terminology used in the field of physics.
- KM05 (Describe the atomic and nuclear structure of matter.) Describe the atomic and nuclear structure

- of matter.
- KM06 (Define the basic principles of mechanics, electromagnetism and thermodynamics that are applied in biological systems.) Define the basic principles of mechanics, electromagnetism and thermodynamics that are applied in biological systems.
- KM07 (Describe the biological damage caused by radiation.) Describe the biological damage caused by radiation.
- SM03 (Apply physical principles to the study of muscle fibres, body fluids, and nerve impulses.) Apply physical principles to the study of muscle fibres, body fluids, and nerve impulses.
- SM04 (Understand the biological damage caused by radiation.) Understand the biological damage caused by radiation.

Contents

1 Basic ideas of kinematics and dynamics.

Position, speed and acceleration.

Intrinsic components of acceleration: types of movements.

Newton's laws: relationship between force and acceleration.

2 Transport of molecules in fluids.

Hydrostatics.

Hydrodynamics.

Viscosity: sedimentation.

Centrifugation; separation of macromolecules.

Diffusion, Fick's law and Brownian motion.

3 Thermodynamics and Statistical Physics.

Kinetic theory.

Calorimetry.

Entropy and Free Energy in Chemical Reactions.

4 Electricity.

Coulomb's law: force between charges, atoms and molecules. Electrostatic contribution to ATP energy.

Dipoles: polar molecules and hydrogen bonds.

Electrophoresis.

Membrane potential.

Ionic pumps: ATP-ase and oxidative phosphorylation.

5 Magnetism.

Magnetic forces: charge in a magnetic field and mass spectrometry.

Magnetic dipole.

Nuclear magnetic resonance: applications to chemistry, molecular structure and medical imaging.

6 Elasticity and Oscillations.

Elasticity. Experiments with macromolecules: DNA and protein stretching.

Harmonic, damped and forced oscillations: optical spectroscopy, energy absorption and resonance.
 H_2O oscillations and microwave heating. CO_2 oscillations and greenhouse effect.

7 Physical optics

Wave nature of light: electromagnetic waves.

Interference and diffraction.

Light diffraction in crystals and molecules: molecular structure.

Synchrotron radiation.

8 Some ideas of quantum physics

Einstein-Planck and de Broglie equations.

Quantification of energy levels: particle in a box.

Bohr atom: absorption and emission spectra. Fluorescence.

Some ideas of nuclear physics: Radioactivity.

Learning activities and methodology

Title	Hours	ECTS	Learning outcomes
Resolution of computer assisted questionnaires	20	0.8	KM05, KM06
Problem solving classes	12	0.48	CM02, KM05, KM06, KM07, SM03, SM04
Practices	5	0.2	CM02, KM05, KM06, KM07, SM03, SM04
Reading of educational material	10	0.4	CM02
Watching educational videos	5	0.2	CM02, KM05, KM06, KM07, SM03, SM04
Homework	35	1.4	CM02, KM05, KM06, KM07, SM03, SM04
Theory classes	29	1.16	CM02, KM05, KM06, KM07, SM03, SM04

The subject will be given alternating different types of methodologies:

- Master classes where the general concepts of the different topics will be introduced
- Solving problems where the teachers will solve the exercises previously selected in previous days
- Resolution of autocorrection questionnaires through a computer using the Moodle platform

Annotation: within the schedule set by the centre or degree programme, 15 minutes of one class will be reserved for students to evaluate their lecturers and their courses or modules through questionnaires.

Assessment

Continuous assessment activities

Title	Weight	Hours	ECTS	Learning outcomes

Computer assisted practices	20%	30	1.2	CM02, KM05, KM06, KM07, SM03, SM04
Exams	80%	4	0.16	CM02, KM05, KM06, KM07, SM03, SM04

Ordinary Assessment

The ordinary assessment of the course will be based on the following components:

- **Partial Exams (80% of the final grade):** We'll have two partial exams throughout the semester. These exams will assess your understanding of the content covered to date. It's important to note that the specific weight of each partial exam may vary slightly depending on the scope and complexity of the topics evaluated in each. You'll be informed in advance about the exact weight of each partial exam once their contents are defined.
- **Condition for averaging:** For partial exam grades to be averaged, it's essential to obtain a minimum grade of 3.5 in each of them.
- **Virtual Campus Quizzes (20% of the final grade):** Throughout the semester, you'll be assigned a series of quizzes to complete via the Virtual Campus. These quizzes are designed to reinforce your learning of key concepts and allow you to practice regularly. Under no circumstances will quizzes not submitted or submitted past the deadline be evaluated.

Any irregularity committed during an assessment activity (academic misconduct, plagiarism, or improper use of AI, unless such use is expressly authorized in the course guide) that may lead to a significant alteration of the grade will result in that activity being graded as 0. If the course guide stipulates that obtaining a minimum mark in this assessment is an essential requirement to pass the course, or if multiple irregularities occur in the assessment activities of the same course, the final grade for the course will be 0. Furthermore, disciplinary proceedings may be initiated against any student who incurs any of these irregularities.

Resit Assessment

The resit assessment is designed to give you an opportunity to make up for the results of partial exams you didn't pass in the ordinary assessment. To be eligible for the resit, students must have previously been assessed through a set of activities whose combined weighting accounts for at least two-thirds of the total grade for the course.

- **Who must take it?** Students who have not passed the course in the regular assessment, i.e., whose average mark (taking into account the applicable calculation criteria) is below 5, must take the resit examination.
- **What is recovered?** In this assessment, you'll only need to resit the partial exams you failed (with a grade below 5). This means you won't need to retake the Virtual Campus quizzes, as their 20% weight will carry over from the ordinary assessment.
- **Assessment format:** The resit assessment will consist of a specific exam or exams for the partials you need to resit. The grade obtained in this resit assessment will replace the original grade of the failed partial for the calculation of the final grade.
- **Calculation of the final grade (resit):** Once the failed partials are resat, the average will be recalculated using the grades obtained in the resit (or the original grades of the passed partials) and the 20% from the Virtual Campus quizzes. To be able to average these grades, the condition that a minimum of 3.5 must be obtained in the partials (whether original or resit) still applies.

Option to Improve Grade in the Resit Assessment

If you wish to try to improve your grade, you must take the resit assessment under the following conditions:

- **Completion of Both Partial:** You'll be obliged to complete both partial exams for the course, regardless of the grade you obtained in them during the ordinary assessment. This means that the resit

assessment for grade improvement will cover the content of both partials.

- Waiver of the Ordinary Grade: It's crucial that you understand that by opting for this grade improvement option, you automatically waive the grade obtained in the ordinary assessment. The new final course grade will be calculated entirely with the grades obtained in the two partials of the resit assessment (provided you meet the minimum grade condition of 3.5 in each to be averaged) and the 20% from the Virtual Campus quizzes.

Not Evaluated Criterion

Students will receive a "Not Evaluated" grade when the assessment activities performed have a weighting of less than 67% in the final grade.

Single Assessment

The single assessment consists of a unique synthesis test that includes the contents of the entire theory and problem program. The grade obtained in this synthesis test is 100% of the final course grade.

The single assessment test will take place on the same date set in the calendar for the last continuous assessment test (second partial) and the same ordinary assessment resit system will apply.

Bibliography

Basic bibliography

- Jou, Mirabent, David, et al. *Física para ciencias de la vida (2a. ed.)*, McGraw-Hill España, 2009.

ProQuest Ebook Central, <https://ebookcentral.proquest.com/lib/uab/detail.action?docID=3194961>.

Further reading.

- Sternheim, M. M. y Kane. *Física (2a. ed.)*. Editorial Reverté, 2016.
eLibro, <https://elibro.net/es/lc/uab/titulos/100529>.
- A., Tipler, Paul, Mosca, Gene, *FÍSICA PER A LA CIÈNCIA I LA TECNOLOGIA VOLUM 1 (CATALÁN)*.
1. Madrid, España, Reverté, 2016. INGEBOOK. 2021-06-30 10:20:04.0
- A., Tipler, Paul, Mosca, Gene, *FÍSICA PER A LA CIÈNCIA I LA TECNOLOGIA VOLUM 2 (CATALÁN)*.
1. Madrid, España, Reverté, 2016. INGEBOOK. 2021-06-30 10:24:01.0

Software

- Virtual Campus.
- pdf reader.

Course groups and languages

The information provided is provisional until November 30. After this date, you will be able to consult the language of each group through this [link](#). To access the information, you will need to enter the course CODE



Type of teaching	Group	Language	Semester	Shift
(TE) Theory	31	Catalan	second semester	afternoon
(PAUL) Classroom practices	311	Catalan	second semester	afternoon