# General Biology and Biochemistry

Code: 102443
ECTS Credits: 6

2024/2025

| Degree | Type | Year |
|---|---|---|
| 2500897 Chemical Engineering | OB | 1 |
| 2500897 Chemical Engineering | OB | 2 |

## Contact

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## Teachers

Marina Guillen Montalban

## Teaching groups languages

You can view this information at the end of this document.

## Prerequisites

There are no specific prerequisites for this subject.

## Objectives and Contextualisation

To work in fields related to biotechnology or environmental engineering, chemical engineers must be able to combine the comprehension of the basic principles of biology with the problem-solving skills of an engineer. Thus, the main objective of this subject is to provide the basic biological concepts that can be applied to chemical engineering. In addition, we want to familiarize the student with the language used in the field of biology and biochemistry, with the aim of making them comfortable when working in areas such as biochemical engineering or environmental engineering, or working in multidisciplinary teams that include specialists in these areas.

## Competences

Chemical Engineering

- Apply relevant knowledge of the basic sciences, such as mathematics, chemistry, physics and biology, and the principles of economics, biochemistry, statistics and material science, to comprehend, describe and resolve typical chemical engineering problems.

- Apply scientific method to systems in which chemical, physical or biological transformations are produced both on a microscopic and macroscopic scale.
- Communication
- Develop personal work habits.
- Develop thinking habits.
- Students must have and understand knowledge of an area of study built on the basis of general secondary education, and while it relies on some advanced textbooks it also includes some aspects coming from the forefront of its field of study.

## Learning Outcomes

1. Analyse the biocatalyst, whether a cell or cell component, as a base of reactions in the production of goods and services. Conceptualise the importance of living elements, their structure and operations on the different levels of organisation, from the most elementary, such as the biochemical and molecular, to the associative effect in complex ecological organisms and systems.
2. Analyse the different levels of interaction in biological elements and the mechanisms for the capture of matter and energy that contribute to their self-generation.
3. Communicate efficiently, orally and in writing, knowledge, results and skills, both professionally and to non-expert audiences.
4. Describe the different applications to health, diet, the environment and industry of organisms and their components, and how their manipulation in production systems leads to these applications.
5. Develop a capacity for analysis, synthesis and prospection.
6. Develop independent learning strategies.
7. Develop scientific thinking.
8. Develop systemic thinking.
9. Efficiently translate the findings of basic biological research into engineering applications for society.
10. Efficiently use ICT for the communication and transmission of ideas and results.
11. Explain how organisms are the fruit of the expression of chemically based genetic information, which is transmitted and can be modified to adapt both to productive and utilisation needs.
12. Explain the relevant biological concepts for engineering initiatives.
13. Identify the available methods to create, analyse and manipulate molecules and biological systems.
14. Interpret the structure and function of organisms and their components.
15. Students must have and understand knowledge of an area of study built on the basis of general secondary education, and while it relies on some advanced textbooks it also includes some aspects coming from the forefront of its field of study.
16. Work autonomously.

## Content

The contents of the course are divided into 7 topics:

- 1- From the atom to the cell. Biomolecules. Taxonomy. Cell structure and virus. Evolution and diversity.
- 2- Macromolecules. DNA and RNA structure. Proteins structure. Carbohydrates structure. Lipids structure.
- 3- Membranes and Transport across membrane.The cell membrane. Transport across membrane
- 4- Basic principles of metabolism.Bioenergetics. Activated molecules. Enzymes. Control of metabolic pathways. Cell signaling.
- 5- Main metabolic routes and their regulation. Degradation and utilization of sugars and lipids. Oxidative phosphorylation.
- 6- Routes of transmission and modification of genetic information.Synthesis and repair of DNA. RNA metabolism. The genetic code and translation (protein synthesis).
- 7- pplications to engineering. Group-work

## Activities and Methodology

| Title | Hours | ECTS | Learning Outcomes |
|---|---|---|---|
| Type: Directed | | | |
| Lessons | 30 | 1.2 | 1, 2, 4, 11, 12, 13, 14 |
| Problems and class activities | 15 | 0.6 | 1, 2, 4, 5, 9, 11, 12, 13, 14 |
| Type: Supervised | | | |
| Follow-up and discussion of the projects | 1 | 0.04 | 3, 5, 6, 7, 8, 10, 16 |
| Type: Autonomous | | | |
| Goup-work | 24 | 0.96 | 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 16 |
| Study | 71 | 2.84 | 1, 2, 4, 5, 6, 7, 8, 9, 11, 12, 13, 14, 16 |

In-person Sessions

In addition to lectures, in-person classes will be used for problem-solving and active student participation in asking questions. There will also be classes where students are required to prepare the content beforehand, which will then be discussed in class. Evaluative activities will also take place during class hours.

Group Work

In addition to other evaluative activities, a group project will be assigned. Students, in groups of 4 or 5 people, will conduct research on a current topic related to the subject. The topic of the project will be chosen from a list of topics provided at the beginning of the course.

If an oral presentation is required for the project, all members of the group must participate in the presentation. Just before the start of the presentation, the professor will indicate the role of each group member. The duration of the presentation and discussion will depend on the number of groups. Presentations will take place throughout the course.

There will be at least one mandatory session to monitor the progress of the project for each group.

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

## Continous Assessment Activities

| Title | Weighting | Hours | ECTS | Learning Outcomes |
|---|---|---|---|---|
| Group assignments or in-class evaluation activities | 25 | 2 | 0.08 | 3, 4, 5, 6, 7, 8, 9, 10, 12, 13, 16 |
| Partial exams | 50 | 5 | 0.2 | 1, 2, 4, 5, 6, 7, 8, 9, 11, 12, 13, 14, 15, 16 |
| Synthesis exam | 25 | 2 | 0.08 | 1, 2, 3, 4, 5, 6, 7, 8, 9, 11, 12, 13, 14, |

Processes and Scheduled Evaluation Activities

Throughout the course, different evaluation activities will be carried out, resulting in the final grade of the subject obtained through continuous assessment. The content of the exam-type activities will correspond to what has been worked on in theory sessions, problem-solving sessions, and seminars. Specifically, the evaluative activities will be:

- First midterm: Topics 1, 2, and 3 (approximately). 25% of the final grade.
- Second midterm: Topics 4, 5, and 6 (approximately). 25% of the final grade.
- Synthesis exam: 25% of the final grade. A minimum grade of 3.5 is required in this exam to pass the subject.
- Group work: 15% of the final grade. Non-recoverable. A minimum grade of 5 in this activity is required to pass the subject.
- Evaluable class activities: 10% of the final grade. Non-recoverable.

The second midterm and the synthesis exam will be held on the same day.

In the exam grading, aspects such as presentation of the exam, writing, and basic errors will be considered, modifying, if necessary, the final grade obtained from the weighted average of each of the grades.

Recovery Process

If the subject is not passed based on the grades obtained in the midterm exams, the synthesis exam, and the work, a recovery exam can be taken as long as a set of activities representing at least two-thirds of the total grade of the subject has been submitted. For the recovery process, it should be noted that:

- Midterm exams are eliminatory as long as the grade is equal to or greater than 5.
- The calculation of the final grade in the recovery process will be done in the same way as in the continuous assessment and with the same minimum grade criteria.
- Group work and evaluable class activities are non-recoverable.

Grade Review Procedure

For each evaluation activity with an individual weight greater than 20%, a place, date, and time for review will be indicated, during which the activity can be reviewed in person. In this context, claims regarding the activity's grade can be made, which will be evaluated by the course's responsible faculty. If the student does not attend this review, the activity will not be reviewed later. For the rest of the activities, the student will have a 48-hour period from the moment the grade is published to request a review.

Grades

Awarding an honors grade (MH) is at the discretion of the faculty responsible for the subject. The UAB regulations indicate that MH can only be awarded to people who have obtained a final grade equal to or greater than 9.00. Up to 5% of MH can be awarded from the total number of students enrolled. In this subject, in addition to the previous criteria, a grade equal to or greater than 8.5 in each of the evaluable activities and not having had to recover any of the exams will be required to be eligible for the honors grade.

If a grade lower than 5 is obtained in the Case Study, being non-recoverable, a final grade of Fail will be given for the subject. The final grade obtained will correspond to the lowest grade obtained between the grade of the work and the average of the exams.

If, after the recovery process, a final grade equal to or greater than 5 is obtained, but a grade lower than 3.5 in the synthesis exam is achieved, a grade of Fail will be given, with the final grade reflecting the grade of the synthesis exam.

It will be considered as Not Assessable for a person who, not having passed the subject through continuous assessment, does not attend the recovery of the midterm exams.

Irregularities: Copying and Plagiarism

Copying in any evaluation activity will result in failing the subject with a grade of 3 out of 10, without the possibility of taking any recovery exam.

Evaluation of Repeating Students

No different evaluation system is foreseen for repeating students. However, the possibility of maintaining the grade of the work done the previous year will be considered, as long as they do not repeat due to having copied.

Single Assessment

The content will correspond to what has been worked on in the theory sessions, problem-solving sessions, and seminars. The single assessment modality will consist of the following tests:

1. Firstly, a synthesis exam, plus the corresponding exams for the first and second midterm of the subject, with the same characteristics as those taken by the other students (75% of the final grade).
2. Secondly, an oral session, where a previously indicated topic will be presented followed by a question session on the presented work and general questions about the subject (25% of the final grade).

The day of the single assessment will coincide with the day assigned for the second midterm of the subject and, if recovery is necessary, it will be done on the day assigned for the recovery of the subject.

The minimum grade criteria that will be applied are:

- A minimum grade of 3.5 in the synthesis exam.
- A minimum grade of 5 in the oral session.

## Bibliography


- Alberts B, Bray D, Hopkin K, Johnson A, Lewis J, Raff M, Roberts K, Walter P. *Introducción a la biología celular* Editorial Médica Panamericana.
- Alberts B, Johnson A, Lewis J, Morgan, Raff M, Roberts K, Walter P. *Biología Molecular de la Célula*. Editorial Omega.
- McKee T, McKee JR. 2014. Bioquímica. *Las bases moleculares de la vida*. McGraw Hill Education. 7a Edició. https://bibcercador.uab.cat/permalink/34CSUC_UAB/1eqfv2p/alma991010606587806709
- Nelson, D.L., Cox, M.M. *Lehninger: principios de bioquímica*, Editorial Omega.
- Stryer, L. *Bioquímica*, Editorial Reverté.
- Voet D, Voet J.G., Pratt C.W. 2008. *Fundamentos de Bioquímica: La vida a nivel molecular*. Editorial Médica Panamericana.


## Software

N/A

## Language list

| Name | Group | Language | Semester | Turn |
|---|---|---|---|---|
| (PAUL) Classroom practices | 211 | Catalan | first semester | morning-mixed |

| | | | | |
|---|---|---|---|---|
| (PAUL) Classroom practices | 212 | Catalan | first semester | morning-mixed |
| (SEM) Seminars | 211 | Catalan | first semester | morning-mixed |
| (SEM) Seminars | 212 | Catalan | first semester | morning-mixed |
| (TE) Theory | 21 | Catalan | first semester | morning-mixed |