

General Biology and Biochemistry

Code: 102443
ECTS Credits: 6

Degree	Type	Year	Semester
2500897 Chemical Engineering	OB	1	1
2500897 Chemical Engineering	OB	2	1

Contact

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Use of Languages

Principal working language: catalan (cat)
Some groups entirely in English: No
Some groups entirely in Catalan: Yes
Some groups entirely in Spanish: No

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- Applications to engineering. Group-work

Methodology

Face-to-face sessions

In addition to lectures, the face-to-face classes will be used to solve problems and questions in an active way by the students.

Group-work

Students, in groups of 4 or 5 people, should do a research work on a topic of current interest related to the course. The topic of the work will be chosen from a list of topics that will be given at the beginning of the course.

The work will be presented in writing and then presented orally and discussed in class. All members of the group will have to participate in the oral presentation. The teacher, just before the start of the presentation, will indicate what each member of the group presents. The duration of the presentation and discussion will depend on the number of groups. The presentation of the works will be carried out throughout the subject.

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.

Activities

Title	Hours	ECTS	Learning Outcomes
Type: Directed			
Lessons	30	1.2	1, 2, 4, 12, 11, 13, 14
Problems and class activities	15	0.6	1, 2, 4, 5, 12, 11, 13, 14, 9
Type: Supervised			
Presentation and discussion of the projects	5	0.2	3, 7, 8, 6, 5, 10, 16
Type: Autonomous			
Group-work	20	0.8	1, 2, 4, 7, 8, 6, 5, 12, 11, 10, 13, 14, 9, 16
Study	71	2.84	1, 2, 4, 7, 8, 6, 5, 12, 11, 13, 14, 9, 16
Work-group evaluation	3	0.12	7, 8, 5, 16

Assessment

Programmed evaluation process and activities

Throughout the course, different evaluation activities will be carried out that will result in the final grade of the course obtained by continuous evaluation. Specifically, the evaluation activities will be:

- First partial: Subjects 1, 2 and 3 (approximately). The exam will include the work that has been presented in class during the evaluated period. 40% of the final grade.
- Second partial: Topics 4, 5 and 6 (approximately). The exam will include the work that has been presented in class during the evaluated period and may include concepts evaluated in the first midterm. 45% of the final grade.
- Group work: 15% of the final grade. The oral presentation (20%), the written paper (40%) and the contents of both the presentation and the written paper (40%) will be assessed.

Minimum grade requirements:

- A minimum grade of 5 must be achieved in the content part of the group work in order to pass the subject. Therefore, not achieving this grade means failing the course with a grade equal to the grade obtained in the content part of the group work.
- If a student is not present on the day of the oral presentation of the group work, he/she will fail the work with a grade of 0 and, therefore, the course.
- Group work is not recoverable.

The exam grade will take into account aspects such as: presentation of the exam, writing, making basic mistakes, modifying, if necessary, the final grade obtained from the weighted average of each of the grades.

Programming of evaluation activities

At the beginning of the course groups will be formed to do the work. The delivery of the written work and the presentations will be done throughout the course, depending on the work chosen. A calendar will be made at the beginning of the course.

The exams will be held according to the timetable established in the exams calendar of the Degree.

Recovery process

For the evaluation process it must be taken into account that:

- The partial exams are eliminatory as long as the grade is equal to or higher than 5. Therefore, a student with a grade equal to or higher than 5 cannot attend the recovery process.
- The calculation of the final grade, in the recovery process, will be done in the same way as in the continuous evaluation and with the same minimum grade criteria.
- Group work is not recoverable.

Procedure of revision of the grades

For each evaluation activity, a place, date and time of review will be indicated in which the student will be able to review the activity with the professor. In this context, claims on the grade of the activity may be made, which will be evaluated by the faculty responsible for the subject. If the student does not show up for this review, the activity will not be reviewed afterwards.

Qualifications

Awarding a grade of matriculation of honor (MH) is the decision of the faculty responsible for the subject. UAB regulations state that MHs may only be awarded to students who have earned a final grade equal to or higher than 9.00. Up to 5% of the total number of students enrolled may be awarded MHs. In this subject, in addition to the above criteria, in order to be eligible for the Honorable Mention, the student must have a grade equal to or higher than 8.5 in each of the evaluative activities and must not have had to make up any of the partial exams.

Students who obtain a grade lower than 5 in the content part of the group work will fail the course. The final grade obtained will correspond to the lowest grade between the weighted average of the grades and the grade of the content part of the work.

A student who has not passed the course by continuous evaluation and does not attend the recovery of the partial exams will be considered as not evaluable.

Irregularities on the part of the student, copying and plagiarism

Copying in any of the evaluation activities will result in failing the course with a grade of 3 out of 10.

Evaluation of repeating students

No different evaluation system is foreseen for repeating students. However, the possibility of maintaining the grade of the work done in the previous course will be considered, provided that:

- The student so requests in writing (e-mail) before the formation of the groups of the work.
- The student does not repeat the course for having copied.

Assessment Activities

Title	Weighting	Hours	ECTS	Learning Outcomes
Group-work	10	0.5	0.02	3, 4, 7, 8, 6, 5, 12, 10, 13, 9, 16
Partial exams	85	5	0.2	1, 2, 4, 7, 8, 6, 5, 12, 11, 13, 14, 15, 9, 16
Questions	5	0.5	0.02	3, 7, 8, 5

Bibliography

- Alberts B, Johnson A, Lewis J, Raff M, Roberts K, Walter P. 2008. Molecular Biology of the Cell. 5th Ed. Garland, cop. 2008
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- Glick BR. 2010. Molecular Biotechnology : Principles and applications of recombinant DNA. 4th Ed. ASM Press.
- Heinzle E, Biver A, Cooney C. 2006. Development of Sustainable Bioprocesses:Modelling and Assessment. John Wiley & Sons, Ltd.
- Voet D, Voet J.G., Pratt C.W. 2008. Principles of Biochemistry. John Wiley & Sons

Software

N/A