Universitat Autònoma de Barcelona

2023/2024

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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Teaching groups languages

You can check it through this link. To consult the language you will need to enter the CODE of the subject. Please note that this information is provisional until 30 November 2023.

Teachers

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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

Methodology

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.

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			
Follow-up and discussion of the projects	1	0.04	3, 7, 8, 6, 5, 10, 16
Type: Autonomous			
Goup-work	24	0.96	1, 2, 3, 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

Assessment

Process and Scheduled Evaluation Activities

Throughout the course, different evaluation activities will be carried out, which will contribute to the final grade of the subject obtained through continuous assessment. Specifically, the evaluative activities will be:

- First partial exam: Topics 1, 2, and 3 (approximately). 25% of the final grade.
- Second partial exam: 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 assignments or in-class evaluation activities: 25% of the final grade. Not recoverable. The second partial exam and the synthesis exam will be conducted on the same day.

Aspects such as exam presentation, writing, and basic errors will be considered in the grading process, and if necessary, the final grade obtained from the weighted average of each grade will be adjusted.

Recovery Process

If a student does not pass the subject based on the grades obtained in the partial exams, synthesis exam, and assignments, they may have the opportunity to take a recovery exam, provided they have participated in activities that represent at least two-thirds of the total grade for the subject. It should be noted that:

Partial exams are eliminatory only if 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 continuous assessment, following the same minimum grade criteria. Group assignments and in-class evaluation activities are not recoverable.

Grading Review Procedure

For each evaluation activity, a location, date, and time for review will be provided, where students can review the activity with the professor. In this context, claims regarding the grade of the activity can be made, which will be evaluated by the responsible faculty of the subject. If a student does not attend this review, the activity will not be reviewed later.

Grades

Awarding an honors distinction (MH) is at the discretion of the responsible faculty of the subject. According to UAB regulations, MH can only be granted to individuals who have obtained a final grade equal to or higher than 9.00. Up to 5% of the total number of enrolled students may receive MH. In this subject, in order to be eligible for the honors distinction, in addition to the aforementioned criteria, a grade equal to or higher than 8.5 is required for each evaluative activity, and no exams need to be retaken.

If, after the recovery process, a final grade equal to or higher than 5 is obtained but the synthesis exam has a grade lower than 3, it will be considered a failure, and the final grade will reflect the grade obtained in the synthesis exam during the recovery process.

An individual who did not pass the subject through continuous assessment and does not participate in the recovery of the partial exams will be considered "Not Evaluable".

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 opportunity to take the recovery exam.

Evaluation of Repeat Students

No different evaluation system is planned for repeat students. However, the possibility of maintaining the grade for work completed in the previous course will be considered, provided the repetition is not due to copying.

Unique Assessement

Students who have chosen the single assessment modality must take the following tests on the same day:

- In the first place, a summary exam of the subject that will include both development questions, as well as test questions and problems.
- Secondly, they will have to solve a series of exercises similar to those that have been worked on throughout the course.
- An oral session in which you must defend a previously agreed topic.

Assessment Activities

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

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, Biwer 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