Universitat Autònoma de Barcelona

2021/2022

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

The proposed teaching and assessment methodology that appear in the guide may be subject to changes as a result of the restrictions to face-to-face class attendance imposed by the health authorities.

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

Teachers

Laura Trigo Gallardo

Prerequisites

There are no specific prerequisites for this subject. However, it must be taken into account that the lessons are given in Catalan.

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. Photosynthesis.
- 6- Routes of transmission and modification of genetic information.Synthesis and repair of DNA. RNA metabolism. The genetic code and translation (protein synthesis). Gene expression in prokaryotes and eukaryotes.
- 7- pplications 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. Students will also present.

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 as written document and orally and discussed in class. The duration of the presentation and the discussion will depend on the number of groups

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			
Goup-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

The course will be evaluated according to:

- First partial exam (35% of the final grade)
- Second partial exam (50% of the final grade)
- Group-work (15% of the final grade)

Group-work is not recoverable.

Recovery process

Keep in mind that:

- Partial exams are eliminatory as long as the grade is equal to or greater than 5. Therefore, a student with a grade equal to or greater than 5 cannot attend the recovery process.
- Students with a second partial grade lower than 4 must compulsorily recover this partial.
- When the two partial exams have been suspended, and the grade for the second set is equal to or greater than 4, the student may decide to recover only one of the two partials or both.
- 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 is not recoverable

As it is a prerequisite for this course the knowledge of the Catalan or Spanish language, please refer to the course documentation written in Catalan or Spanish for more information

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
- Alberts B, Bray D, Hopkin K, Johnson A, Lewis J, Raff M, Roberts K, Walter P. 2009. Essential cell biology. 3rd Ed. Garland Science.
- 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