Universitat Autònoma de Barcelona

2019/2020

General Biology and Biochemistry

Code: 102443
ECTS Credits: 6

Degree	Type	Year	Semester
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. 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 most relevant 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

- 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.

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. 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.

Before the presentation, the document (4 pages maximum) must be uploaded to the Campus Virtual. The day of the presentation, another group will ask some questions from this documentat and the presentation, and will evaluate the work (the writing and the presentation).

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, 15
Type: Autonomous			
Goup-work	20	0.8	1, 2, 4, 7, 8, 6, 5, 12, 11, 10, 13, 14, 9, 15
Study	71	2.84	1, 2, 4, 7, 8, 6, 5, 12, 11, 13, 14, 9, 15
Work-group evaluation	3	0.12	7, 8, 5, 15

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 (10% of the final grade)
- Questions to other groups (5% of the final grade)

Group work and the part corresponding to questions and job evaluation are not recoverable.

Recovery process

The student can present attend to the recovery whenever they have presented to a set of activities that represent at least two thirds of the total grade of the subject. Then keep in mind that:

- Partial exams are eliminatory as long as the grade is equal to or greater than 5.
- Those partial examinations will be compulsorily recovered when the student has obtained a score of less than 3.5, regardless of whether the average obtained according to the calculation of the "Evaluation" section is equal to or greater than 5.
- Students with a mark of a partial equal to or greater than 3.5 and less than 5 can attend to the recovery of this exam, as long as the grade of the continuous evaluation is less than 5.

The calculation of the note, in the recovery process, will be done in the same way as continuous evaluation. The evaluations of the work (10% of the grade) and the part of Questions and Evaluation of the works (5% of the grade), as well as those of those examinations with a grade equal or superior, will be taken into account. to 3.5. The minimum grade criteria to pass the subject through the recovery system will be the same as the continuous evaluation, that is to say:

- Minimum grade of 3.5 in each of the partial exams.
- Minimum grade of 5 in the part of contents of group work.
- Minimum grade of 5 in the Questions and evaluation section of the work.

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, 15
Partial exams	85	5	0.2	1, 2, 4, 7, 8, 6, 5, 12, 11, 13, 14, 9, 15
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