Universitat Autònoma de Barcelona

2020/2021

Microbial Physiology and Metabolism

Code: 100772
ECTS Credits: 6

Degree	Type	Year	Semester
2500250 Biology	OT	4	0

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

Prerequisites

The student must have successfully completed Microbiology and Biochemistry from the Microbiology degree, or subjects of equivalent content.

Objectives and Contextualisation

The aim of the course is to provide the student with an overall vision of the operation of the different processes that allow growth of prokaryotic cells as well as their adaptation to a changing environment. In the first part of the course, the main elements of the process of structure building and cell growth are presented hierarchically: biosynthesis, polymerization of macromolecules, formation of structures, transport and secretion processes. Emphasis is made in the quantitative assessment of the impact of thiese processes on global growth expenditure. The subject describes the different mechanisms of energy generation necessary to cover growth expenses. In this part, students learn how to make predictions about the viability of certain metabolic reactions, as well as the tools to determine the energy performance of different types of metabolism. Finally, the student is introduced to some of the elements needed to carry out microbial physiology studies: work with continuous bioreactors, analysis of metabolic budgets and calculation of metabolic rates from steady state data.

Competences

- Act with ethical responsibility and respect for fundamental rights and duties, diversity and democratic values.
- Be able to analyse and synthesise
- Be able to organise and plan.
- Make changes to methods and processes in the area of knowledge in order to provide innovative responses to society's needs and demands.
- Students must be capable of applying their knowledge to their work or vocation in a professional way and they should have building arguments and problem resolution skills within their area of study.
- Students must be capable of collecting and interpreting relevant data (usually within their area of study) in order to make statements that reflect social, scientific or ethical relevant issues.
- Students must be capable of communicating information, ideas, problems and solutions to both specialised and non-specialised audiences.

- Students must develop the necessary learning skills to undertake further training with a high degree of autonomy.
- Take account of social, economic and environmental impacts when operating within one's own area of knowledge.
- Understand the processes that determine the functioning of living beings in each of their levels of organisation.

Learning Outcomes

1. Analyse a situation and identify its points for improvement.
2. Be able to analyse and synthesise.
3. Be able to organise and plan.
4. Critically analyse the principles, values and procedures that govern the exercise of the profession.
5. Describe the role of microorganisms in important industrial processes and as producers of key compounds for the development of our societies and the improvement of quality of life.
6. Propose new methods or well-founded alternative solutions.
7. Propose viable projects and actions to boost social, economic and environmental benefits.
8. Students must be capable of applying their knowledge to their work or vocation in a professional way and they should have building arguments and problem resolution skills within their area of study.
9. Students must be capable of collecting and interpreting relevant data (usually within their area of study) in order to make statements that reflect social, scientific or ethical relevant issues.
10. Students must be capable of communicating information, ideas, problems and solutions to both specialised and non-specialised audiences.
11. Students must develop the necessary learning skills to undertake further training with a high degree of autonomy.

Content

1.- Composition of the bacterial cell.

2.- Diversity and relative abundance of cellular components

3.- Cellular Envelopes

4.- Structure and formation of the cytoplasm components.

5.- Protein secretion i prokaryotes.

6.- Energetic cost of cellular construction

7.- Bioenergetics and electron transport chains

8.- Use of organic substrates

9.- Fermentative metabolism

**Unless the requirements enforced by the health authorities demand a prioritization or reduction of these contents.*

Methodology

Teaching is carried out through a combination of theory lectures, problem solving sessions, and seminars.

Theory lectures. The theory classes are designed to allow the student to incorporate the elements required to achieve a structured knowledge of the prokaryotic cell function. The contents are taught in the classroom using teaching resources available to the student through moodle.

Problem-solving sessions. These sessions are strictly dedicated to work out, interactively and in small groups, procedures aimed at determining the coherence of experimental data, making metabolic balances and formulating predictions about the viability of different types of metabolism.

Seminars. In the seminars, students carry out a supervised discussion of selected scientific articles related to the content of the subject. The articles are distributed previously together with a questionnaire related to their content. Questionnaires must be completed and delivered before the start of the seminar.

**The proposed teaching methodology may experience some modifications depending on the restrictions to face-to-face activities enforced by health authorities.*

Activities

Title	Hours	ECTS	Learning Outcomes
Type: Directed			
Problem-solving sessions	10	0.4	4, 1, 5, 6, 7, 11, 10, 8, 9, 2, 3
Seminars	5	0.2	4, 1, 5, 6, 7, 11, 10, 8, 9, 2, 3
Theory lectures	30	1.2	4, 1, 5, 6, 7, 11, 10, 8, 9, 2, 3
Type: Supervised			
Tutorial	5	0.2	4, 1, 5, 6, 7, 11, 10, 8, 9, 2, 3
Type: Autonomous			
Literature search	20	0.8	4, 1, 5, 6, 7, 11, 10, 8, 9, 2, 3
Problem solving	25	1	4, 1, 5, 6, 7, 11, 10, 8, 9, 2, 3
Study	31	1.24	4, 1, 5, 6, 7, 11, 10, 8, 9, 2, 3
Text readings	20	0.8	4, 1, 5, 6, 7, 11, 10, 8, 9, 2, 3

Assessment

Assessment will be carried out through two exams each contributing 45% of the final grade. Each of the exams will cover theory (25% of the global grade) and problem-solving (20% of the global grade) contents. The remaining 10% of the grade will complement the exam scores only if both exams have been successfully passed, and will be based on the level of participation in the problem-solving sessions, requiring the completion of the assigned tasks within the established deadlines. To pass the subject the student must obtain 5 or higher in each exam. If the event of failing to pass any of the exams, a reassessment exam is scheduled at the end of the semester. To participate in the reassessment exam, students must have been previously assessed in a set of activities the weight of which equals a minimum of two thirds of the total grade of the subject or module. Students will obtain the "Not Evaluable" qualification when the evaluation activities carried out have a weight lower than 67% of the final grade. Students that, having passed the exams, want to improve their grades may also take the reassessment exam. In the event of taking the reassessment exam, students implicitly renounce to their previously obtained grades.

**Student's assessment may experience some modifications depending on the restrictions to face-to-face activities enforced by health authorities.*

Assessment Activities

Title	Weighting	Hours	ECTS	Learning Outcomes
Exam 1. Theory (25%) + Seminars (20%)	45%	2	0.08	4, 1, 5, 6, 7, 11, 10, 8, 9, 2, 3
Exam 2. Theory (25%) + Problems (20%)	45%	2	0.08	4, 1, 5, 6, 7, 11, 10, 8, 9, 2, 3
Participation in programmed activities	10%	0	0	4, 1, 5, 6, 7, 11, 10, 8, 9, 2, 3

Bibliography

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