Microbial Physiology and Metabolism

Code: 100772
ECTS Credits: 6

2025/2026

Degree	Type	Year
Biology	OT	4

Contact

Name: Jordi Mas Gordi

Email: jordi.mas@uab.cat

Teaching groups languages

You can view this information at the end of this document.

Prerequisites

The student must have completed succesfully the Microbiology and Biochemistry courses 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

Both, theory classes, seminars and classroom practices will be taught in CATALAN.

Activities and Methodology

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

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.

In this course, the use of Artificial Intelligence (AI) technologies is allowed as part of the work development, provided that the final outcome clearly demonstrates the student's meaningful contribution through personal analysis and reflection. Students must clearly indicate which parts were generated using AI, specify the tools employed, and include a critical reflection on how these tools influenced both the process and the final result. Failure to be transparent about the use of AI will be considered a breach of academic integrity and may result in a grade penalty or more severe sanctions in serious cases.

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.

Assessment

Continous Assessment Activities

Title	Weighting	Hours	ECTS	Learning Outcomes
Exam 1. Theory (60%) + Seminars (40%)	45%	2	0.08	4, 1, 5, 6, 7, 11, 10, 8, 9, 2, 3
Exam 2. Theory (60%) + Problems (40%)	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

Assessment will be carried out through two exams each contributing 45% of the final grade. Each of the exams will cover theory (with a weight of 60%)) and seminars/problem-solving (with a weight of 40%) 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 seminar/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.

SINGLE ASSESSMENT
Single common exam that includes both, theory and questions corresponding to theseminar/problem-solving sessions. The single assessment consists of a single exam that includes the contents of the entire theory program with a weight of 60% and seminar/problem-solving with a weight of 40%. The grade obtained in this exam constitutes 90% of the final grade of the subject. The remaining 10% corresponds to the evidence of seminar/problem-solving sessions. The delivery of evidence corresponding to the seminar/problem-solving sessions will follow the same procedure used for the continuous assessment. The single assessment exam will be performed in the same date fixed in the calendar for the last continuous assessment exam and the same recovery system will be applied as for continuous assessment. The same criterion for "not assessable" will be applied as in continuous assessment.

Bibliography

Brock Biology of Microorganisms, Global Edition (16a. ed.) 2022. By: Michael T. Madigan, Jennifer Aiyer, Daniel Buckley, W. Sattley, David Stahl. Pearson Educación. ISBN: 978-1-292-40479-0, ebook ISBN: 978-1-292-40506-3.
https://bibcercador.uab.cat/permalink/34CSUC_UAB/avjcib/alma991010567908206709

Software

Groups and Languages

Please note that this information is provisional until 30 November 2025. You can check it through this link. To consult the language you will need to enter the CODE of the subject.

Name	Group	Language	Semester	Turn
(SEM) Seminars	721	Catalan	first semester	afternoon
(SEM) Seminars	722	Catalan	first semester	afternoon
(TE) Theory	72	Catalan	first semester	afternoon