Course guide
390212 - MMM - Microbiology and Microbial Metabolism

Last modified: 15/01/2025

Unit in charge: Barcelona School of Agri-Food and Biosystems Engineering
Teaching unit: 745 - DEAB - Department of Agri-Food Engineering and Biotechnology.

Degree: BACHELOR'S DEGREE IN BIOSYSTEMS ENGINEERING (Syllabus 2009). (Compulsory subject).

Academic year: 2024 **ECTS Credits:** 6.0 **Languages:** Catalan, Spanish

LECTURER

Coordinating lecturer: Cendra Gascon, Maria Del Mar

Others:

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Specific:
1. Biochemistry: Microbiology and microbial metabolism.

TEACHING METHODOLOGY

The learning hours include lectures (large group), in which the teacher explains the learning objectives of the subject concepts. These sessions promote the participation and involvement of students through questions as well as by showing them technical-scientific topic published in press, scientific journals, etc. The students participation is also encouraged during the lab sessions. In the lab sessions the students will learn general and technical skills used in a microbiology lab, and they will also improve the team work.

LEARNING OBJECTIVES OF THE SUBJECT

Students must acquire knowledge related to general and metabolic characteristics of microorganisms. Besides, they must know how to classify microorganisms into categories according to their specific metabolic characteristics and be able to assess their ecological role, geochemistry function and their utility in industrial processes. At the end of the course, the student must demonstrate the adquisition of an overview about the importance of microorganisms in the production of industrial products and in environmental sustainability.

STUDY LOAD

Type	Hours	Percentage
Self study	90,0	60.00
Hours small group	20,0	13.33
Hours large group	40,0	26.67

Total learning time: 150 h

CONTENTS

GENERAL MICROBIOLOGY

Description:
- Introduction to microbiology. Classification and main characteristics of the microorganisms.
- Microorganism growth: cell growth and cell binary division. Populations growth: growth curve. Batch culture and continuos: chemostat.
- Environmental effects on microbial growth: nutrients, temperature, pH, osmotic pressure and oxygen effects.
- Bacterial Genetics. Mutations. Ames test. Transformation. Transduction. Plasmids. Conjugation. Bacteriophages.

Related activities:
Activity 1. Theory classes
Activity 2. Individual assessment test
Activity 3. Laboratory work

Full-or-part-time: 50h
Theory classes: 12h
Laboratory classes: 10h
Self study : 28h

METABOLIC DIVERSITY

Description:
- Catabolic and anabolic reactions. Obtaining precursor metabolites and energy.
- Metabolism of microorganisms linked to cycles of matter with agricultural applications, in regeneration of water and environment. Oxidation and reduction of carbon, nitrogen and sulfur.
- Aerobic and fermentative metabolism applied to industrial microbiology. Oxidation of different carbon sources (hexoses, polysaccharides, hydrocarbons ...), acids and lipids. Fermentative Diversity.
- Photosynthetic microorganisms: importance in the environment and in obtaining metabolites of industrial interest. Photosynthetic Pigments.

Related activities:
Activity 1. Theory classes
Activity 2. Individual assessment test
Activity 3. Laboratory work

Full-or-part-time: 50h
Theory classes: 14h
Laboratory classes: 10h
Self study : 26h

APPLICATION OF METABOLIC DIVERSITY

Description:
- Selection of microorganisms and the improved of the strains (industrial microbiology, food industry, environmental microbiology, pharmaceuticals etc.)
- Use of microbial metabolic activity: starter used, biochemistry and application technology

Related activities:
Activity 1. Theory classes
Activity 2. Individual assessment test
Activity 3. Laboratory work

Full-or-part-time: 50h
Theory classes: 10h
Guided activities: 2h
Self study : 38h

GRADING SYSTEM

The final qualification, Nfinal, is the sum of the partial marks:

N1: Mid-term exam
N2: Final-term exam
N3: Laboratory classes

Nfinal = 0,4 N1 + 0,4 N2 + 0,2 N3

EXAMINATION RULES.

Attendance to the lab classes is mandatory. Students have to bring lab coat, should arrive on time to the lab sessions and respect the health and safety standards.

BIBLIOGRAPHY

Basic:
- Ingraham, J.L. Introducció a la microbiologia. Barcelona: Reverté, 1998. ISBN 8429118691.
- Prescott, Lansing M.; Harley, John P.; Klein, Donald A. Microbiología. 2a ed. Madrid: McGraw-Hill Interamericana, 2004. ISBN 844860525X.
- Tortora, Gerard J.; Funke, Berdell R.; Case, Christine L. Introducción a la microbiología. 9a ed. Buenos Aires: Médica Panamericana, 2007. ISBN 9789500607407.
- Caldwell, Daniel R. Microbial physiology and metabolism. 2a ed. Belmont: Star Publishing Company, 2000. ISBN 9780898632088.
- Madigan, Michael T.; Martinko, John M.; Parker, Jack. Brock biología de los microorganismos [on line]. 10ª ed. Madrid [etc.]: Prentice Hall, 2004 [Consultation: 26/07/2022]. Available on: https://www-ingebook-com.recursos.biblioteca.upc.edu/ib/NPcd/IB_BooksVis?cod_primaria=1000187&codigo_libro=5850. ISBN 8420536792.
- Ratledge, Colin; Kristiansen, B. Biotecnología básica. 2a ed. Zaragoza: Acribia, 2009. ISBN 9788420011332.

RESOURCES

Hyperlink:
- Presentacions de classe. http://atenea.upc.edu/moodle/- Guió de pràctiques. http://atenea.upc.edu/moodle/- Lists of Bacterial Names Washington (DC): American Society for Microbiology. http://www.ncbi.nlm.nih.gov/books/bv.fcgi?call=bv.View..ShowTOC&rid=bacname.TOC&depth=2- Todar's Online textbook of Bacteriology. http://www.textbookbacteriology.net/- Colección Española de Cultivos Tipo (CECT). http://www.cect.org