

## Course guide

# 390212 - MMM - Microbiology and Microbial Metabolism

Last modified: 06/06/2023

**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:** 2023    **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 matter learning consists of lectures (large group) in which the teacher makes a speech to introduce the learning objectives related to the basic concepts of the subject. These sessions incorporate spaces for participation and involvement of students through questions and exposure of some technical-scientific topic published in the press, etc. The students participation is required in lab also. In the practical sessions the students develop typical skills of a microbiology lab, such as learning microbiological techniques, and they improve the group work learning.

### 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 assess its ecological role, its geochemistry function and its usefulness in industrial processes. At the end of the course, the student must demonstrate an overview of 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 continuous: chemostat.
- Environmental effects on microbial growth: nutrients, temperature, pH, osmotic pressure and oxygen effects.
- Bacterial Genetics. Mutations. Ames test. Transformation. Transduction. Plasmids. Conjugation. Bacteriophage.

**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: 1st mid-term exam

N2: 2nd mid-term exam

N3: mark of lab

$$N_{\text{final}} = 0,4 N1 + 0,4 N2 + 0,2 N3$$

## EXAMINATION RULES.

---

Attendance at lab practices is mandatory. Students have to bring the material indicated in the guide of lab protocols, and have to be on time at the practical sessions.

## BIBLIOGRAPHY

---

### Basic:

- Ratledge, Colin; Kristiansen, B. Biotecnología básica. 2a ed. Zaragoza: Acribia, 2009. ISBN 9788420011332.
- 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](https://www-ingebook-com.recursos.biblioteca.upc.edu/ib/NPcd/IB_BooksVis?cod_primaria=1000187&codigo_libro=5850). ISBN 8420536792.
- 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.
- Ingraham, J.L. Introducción a la microbiología. Barcelona: Reverté, 1998. ISBN 8429118691.
- Prescott, Lansing M.; Harley, John P.; Klein, Donald A. Microbiología. 2a ed. Madrid: McGraw-Hill Interamericana, 2004. ISBN 844860525X.

## 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>