

Course Unit	Microbiology	Field of study	Biology and Biochemistry
Bachelor in	Environmental Engineering	School	School of Agriculture
Academic Year	2023/2024	Year of study	1
Type	Semestral	Semester	2
Level	1-1	ECTS credits	5.5
Code	9099-814-1204-00-23		
Workload (hours)	148,5	Contact hours	T - TP - PL - TC - S - E - OT - O -

T - Lectures; TP - Lectures and problem-solving; PL - Problem-solving, project or laboratory; TC - Fieldwork; S - Seminar; E - Placement; OT - Tutorial; O - Other

Name(s) of lecturer(s) Maria Letícia Miranda Fernandes Estevinho, Paula Cristina Azevedo Rodrigues

### Learning outcomes and competences

At the end of the course unit the learner is expected to be able to:

1. Identify the main landmarks in the development of microbiology and appoint the scientists associated with it;
2. Understand the fundamentals of microorganisms' biology and their diversity;
3. Understand the kinetic and the energy of growth and cell death;
4. Understand the effect of environmental factors and anti-microbial agents in microbial growth;
5. Apply the knowledge about the metabolism of microorganisms in the changes they mediate;
6. Understand the basic mechanisms underlying the adaptability proliferation of microorganisms in the human host;
7. Train the students in the use of basic microbiological techniques and prepare them to respond adequately when confronted with real and new problems.

### Prerequisites

Before the course unit the learner is expected to be able to:  
Not applicable.

### Course contents

Lectures Introduction to Microbiology as a science . The position of microorganisms in the living world. Morphology and structure of bacteria. Morphology and structure of moulds. The virus - distribution and structure. Protozoa. Microorganisms' nutrition and growth. Symbiosis. Silage. Pratices: Ubiquity and microbial characterization. Pure culture obtention. Microbial morfology. Evaluation of growth. Biochemical tests.

### Course contents (extended version)

1. Lectures Introduction to Microbiology as a science:
  - Microbiology as an experimental science.
  - The diversity and ubiquity of microorganisms.
  - Microbiology's Evolution.
2. The position of microorganisms in the living world:
  - Living Beings' Classification.
  - Classification of microorganisms based on the sources of energy, carbon and electron donors.
  - Global description of microorganisms.
3. Morphology and structure of bacteria:
  - Size, form and arrange of bacterial cells.
  - Cellular organization in Prokaryots.
4. Morphology and stucture of fungi:
  - Systematics of phylamentous fungi.
  - Systematics of yeasts.
5. Viruses - structure and distribution:
  - Viruses and parasitism.
  - Structure and Composition of Viruses.
  - Bacterial Viruses.
6. Protozoa:
  - Generalities in parasitology.
  - Urogenital and Intestinal Protozoa.
  - Blood and Tissue Protozoa.
  - Secondary pathogenic Protozoa.
  - Cestoda.
  - Trematode.
  - Nematodes.
7. Microorganisms' nutrition and growth:
  - Nutrition categories. Anaplerosis pathway.
  - Regulation of metabolism. Importance of operons.
  - Methods for quantitative assessment of microbial growth.
  - Growth in a closed system.
  - Environmental factors affecting microbial growth.
  - Control of microorganisms.
8. Bacterial Genetics : Genetic transfer and recombination.
9. Symbiosis Silage.
10. Practice Introduction:
  - General rules in Microbiology Laboratory.
  - Asepsis / methods of sterilization.
11. Microorganism Ubiquity:
  - Bacteria observation.
  - Moulds observation.
12. Microbial Characterization:
  - Observation of colonies.
13. Isolating Methods and pure culture obtention.
14. Microbial morphology.
15. Growth evaluation.
16. Biochemical tests.

### Recommended reading

1. Madigan, M. T. , Martinko, J. M. , Stahl, D. and Clark, D. P. (2010). Brock Biology of Microorganisms (13th edition). Benjamin Cummings.
2. Tortola, G. J. , Funke, R. J. and Case, C. L. (2012). Microbiologia (11ª edição). Artemed, London.
3. Black, J. B. (2012). Microbiology: Principles and Explorations (8th edition). Wiley.

**Recommended reading**

4. Cappuccino, J. and Sherman, N. (2013). Microbiology: A Laboratory Manual (10th Edition). Benjamin Cummings.
5. Ferreira, W. F. C. e Sousa, J. C. F. (2010). Microbiologia Vol I, II e III (1ª edição). Lidel, Edições Técnicas.

**Teaching and learning methods**

Lectures - methodology exhibition, using the media. Is encouraged participation of students, with placement of issues and presentation / discussion of cases.  
 Practical classes - carrying out practical laboratory with development of one or more reports using the bibliography of specialty (books, papers, etc. ).

**Assessment methods**

1. Regular Students - (Regular) (Final, Supplementary, Special)
  - Final Written Exam - 70% (Theorical contents; minimum 9. 5 marks.)
  - Intermediate Written Test - 30% (Practical Contents; Mean of the two tests. Minimum 8. 5 marks.)
2. Student Worker - (Student Worker) (Final, Supplementary, Special)
  - Final Written Exam - 70% (Theorical contents; minimum 9. 5 marks.)
  - Final Written Exam - 30% (Practical Contents; Minimum 8. 5 marks.)

**Language of instruction**

Portuguese

**Electronic validation**

Maria Letícia Miranda Fernandes Estevinho	Maria Lurdes Antunes Jorge	Artur Jorge de Jesus Gonçalves	Paula Cristina Azevedo Rodrigues
18-01-2024	19-01-2024	22-01-2024	22-01-2024