

Course Unit	Biology	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	1
Level	1-1	ECTS credits	5.5
Code	9099-814-1101-00-23		
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 João Almeida Coelho Sousa, Maria de Fatima Tome Martins

### Learning outcomes and competences

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

To detail structural and functional aspects of cellular biology. To acquire basic abilities of optic microscopy and cytochemistry. To justify concepts based on the recommended bibliography.

### Prerequisites

Before the course unit the learner is expected to be able to: basic knowledge of chemistry and biology

### Course contents

Cell theory, concept of Live. Virus. Cellular organization and classification. Prokaryotic and eukaryotic cell. Eukaryotic cells, chemical composition, structure and function of cellular structures: Cell wall, plasma membrane, and Hialoplasma Mitochondria, Plastids, Peroxysomes. Morphofunctional relations between endoplasmic reticulum, Golgi complex and lysosomes. Nucleus: interphasic, mitotic and meiotic. Mitosis and meiosis.

### Course contents (extended version)

- Theory and Cellular concept of Live. The case of the virus.
  - The cellular organization and classification of living beings. Prokaryotes and eukaryotes.
  - Introduction to microscopy: Types of microscopy. Manipulation of optical microscope.
  - Microscopic observation of prokaryotic and eukaryotic cells.
  - Structural and morphological differentiation of cells of different taxonomic groups.
- Organization of eukaryotic cells.
  - Chemical composition, structure and functions of key cellular structures.
  - Observation of phenomena of transport through the cell membrane in plant/animal after cell staining.
- Cell wall of different taxonomic groups. Plasma membrane and the unitary membrane theory.
  - Cytochemical staining of lignified and non lignified cell walls.
  - Observation of phenomena of transport through the cell membrane in plant/animal after cell staining.
- Hyaloplasm and the energetic metabolism of the cell: Glycolysis, and Pentose phosphate way.
- Mitochondria and energetic metabolism of the cell. Cell location and cellular mechanisms.
  - Oxidative Decarboxylation of pyruvic acid, the Tricarboxylic Acid Cycle and the respiratory chain.
- Plastids: Main types of plastids; reserve plastids and plastids with color. Chloroplasts
  - Photosynthesis in plants C3, C4 and CAM; Cell location and cellular mechanisms.
  - Observation of Plastids: Reserve plastids and plastids with color.
  - Observation of Plastids: amiloplasts and oleoplasts chromoplasts and chloroplasts.
  - Extraction, separation and quantification of photosynthetic pigments.
- Peroxisomes: glyoxylate cycle and Photorespiration.
- Morphofunctional relations between: endoplasmic reticulum, Golgi complex and lysosomes.
- Nucleus: interphasic, mitotic and meiotic. Mitosis and meiosis.
  - Visualization of mitosis and meiosis phenomena in plant cells.

### Recommended reading

- Alberts, B. , Johnson, A. , Lewis, J. , Raff, M. , Roberts, K. , and Walker, P. (2002). Molecular Biology of the Cell, Garland Publishing, New York.
- Becker, W. , Kleinsmith, L. e Hardin, J. (2000). The world of the cell, 4th Ed. . The Benjamin/Cummings Publishing Company. San Francisco.
- Purves, W. , Orians, G. , Heller, H. e Sadava, D. (1998). Life – The science of biology. 5th Ed. Sinauer Associates, Inc. ; W. H. Freeman. Estados Unidos da América.
- Azevedo, C. & C. E. Sunkel (2012). Biologia molecular e celular. 5ª edição. Lidel, Lisboa.
- Ruzin, S. E. (1999). Plant microtechnique and microscopy. Oxford University Press. New York.

### Teaching and learning methods

One hour theoretical lessons twice a week. Expositive methodology, using the media resources. Provision of study materials via e-learning. Two hour practical lessons once a week. Practical laboratory work using educational and scientific laboratory equipment. Tutorials to work on literacy skills. Performances assessed by both coursework and examinations.

### Assessment methods

- Coursework Assessment - (Regular) (Final)
  - Laboratory Work - 5% (Assiduity, participation in practical classes and practical reports)
  - Intermediate Written Test - 40% (Practical contents examination. Minimum 9, 5/20)
  - Final Written Exam - 55% (Final examination with theoretical and theoretical-practical contents. Minimum 9, 5/out of 20)
- Diligent regimen of evaluation - (Student Worker) (Final)
  - Final Written Exam - 45% (Test that includes practical contents.)
  - Final Written Exam - 55% (Final examination with theoretical and theoretical-practical contents.)
- Final examination - (Regular, Student Worker) (Supplementary, Special)
  - Final Written Exam - 45% (Test that includes practical contents. (2, 5 ECTS))
  - Final Written Exam - 55% (Final examination with theoretical and theoretical-practical contents. (3 ECTS))

## Language of instruction

Portuguese

## Electronic validation

Maria João Almeida Coelho Sousa	Maria José Miranda Arabolaza	Artur Jorge de Jesus Gonçalves	Paula Cristina Azevedo Rodrigues
17-01-2024	18-01-2024	22-01-2024	22-01-2024