Course Unit	Cellular Biology			Field of study	Biology and Biochemistry		
Bachelor in	Pharmacy			School	School of Health		
Academic Year	2022/2023	Year of study	1	Level	1-1	ECTS credits	5.0
Type	Semestral	Semester	1	Code	9549-644-1103-00-22		

Workload (hours)	135	Contact hours	T -	TP 22,5	PL 30	TC -	S -	E -	OT 7,5	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 José Miranda Arabolaza

Learning outcomes and competences

At the end of the course unit the learner is expected to be able to:
Know the complexity of the cell as structural and functional unit of all living beings.

Prerequisites

Before the course unit the learner is expected to be able to:
NONE

Course contents

THEORETICAL- Biomembranes. Macrotransport. Microtransport. Specialities of membrane. Extracellular matrix. Nucleus. Endoplasmic reticulum. Golgi apparatus. Lysosomes. Mitochondria. Peroxysomes. Cytoskeleton. Cell communication. Cell cycle. Meiose. Gametogenesis. PRACTICE - Microscopy. Micrometria. Bacteria. Cellular composition of blood. Permeability of biomembrane. Globular resistance. Caryotipe. Polytene chromosome. Catalase activity. Mitosis. Extraction of DNA. Cells in meiosis.

Course contents (extended version)

1. PRACTICAL CLASSES Microscopy: Optical microscope Types. The electron microscope. Types. Micrometria
   - Observation of bacteria. Comparison cellular composition blood analyzed with Wright's stain method
   - Effects of heat, freezing and solvents in the biomembranes permeability.
   - Behavior of animals cells in different osmolarities
   - Preparation of karyotipes
   - Observation polytene chromosomes of salivary glands of Drosophila melanogaster
   - Catalase activity
   - Observation of cell divides by mitosis.
   - DNA extraction, quantification and purity determination from living tissue.
   - Observation of cell divides by meiosis.
2. THEORETICAL CELL ORGANIZATION -- Biological Membranes. The lipid bilayer . Membrane proteins
3. Membrane transport of small molecules. Diffusion. Active ion transport .
4. Transport into the cell of large molecules and particles. Endocytosis and exocytosis. Transcytosis
5. Specialities cell membrane. Cell junctions: tight junctions, adherens junctions and gap junctions
   - Microvilli cilium, flagellum, stereocilia
6. Extracellular matrix of animals. Components of the extracellular matrix. Functions
7. Nucleus Constitution Molecular structure, function of the genetic material Chromatin and chromosomes
8. Endoplasmic Reticulum Structure and types Relationship with cellular organelles/structures Functions
   - Structure and function of the ribosomes
9. Golgi apparatus. Framework . Compartimentation. Functions
10. Lysosomes. Ultra-structure. The lysosomes and the intracellular digestion. Lysosomal diseases.
11. Mitochondrion Ultra-structure, composition and functions. Mitochondrial DNA.
12. Peroxisomes. Structure. Functions. Peroxisomical diseases.
13. Cytoeskeleton. Membership, organization and functional significance.
14. Cell communication. Types of signals. Recetors
15. Cell Cycle. Overview of the cell cycle. Mitosis. Control of the cell cycle events. Apoptosis
16. Meiosis and fertilization . Meiosis. Eggs. Sperm. Fertilization.

Recommended reading

1. ALBERTS, B. et al. (2018) – Biología Molecular de la Célula, 6ª ed. Ed. Omega, Barcelona.
2. AMABIS & MARTHO (2004) - Biologia dos organismos, 2ª ed. Ed. Moderna, São Paulo.
3. AZEVEDO, C. & C. E. SUNKEL (2012) – Biologia Celular e Molecular, 5ª ed. Edições Lidel, Lisboa.
4. LODISH et al. (2005) - Biología Celular y Molecular, 5ª ed. Médica Panamericana
5. BERG, J. M. ; J. L. TYMOCZKO & L. STRYER (2004) - Bioquímica, 5ª ed. Guanabara Koogan

Teaching and learning methods

Theoretical-practices - Methodology actively using the multimedia, texts and question-answer sessions. Practical classes - carrying out practical laboratory with preparation of their reports.

Assessment methods

1. Theoretical and Practices - (Regular) (Final)
   - Intermediate Written Test - 20% (Practices - Students perform one test during the semester Minimum grade 8, 5)
   - Portfolio - 20% (Practies - At the end of the practical classes they deliver their portfolio to be evaluated)
   - Final Written Exam - 60% (Theoretical - Students perform a test Minimum grade 8, 5)
2. Theoretical and Practices - (Student Worker) (Final, Supplementary, Special)
   - Final Written Exam - 40% (Practices - Students perform a test Minimum grade 8, 5)
   - Final Written Exam - 60% (Theoretical - Students perform a test Minimum grade 8, 5)
3. Theoretical and Practices - (Regular) (Supplementary, Special)
   - Final Written Exam - 40% (Practices - Students perform a test Minimum grade 8, 5)
   - Final Written Exam - 60% (Theoretical - Students perform a test Minimum grade 8, 5)

Language of instruction

Portuguese

Electronic validation

Maria José Miranda Arabolaza	Olívia Rodrigues Pereira	Ana Maria Nunes Português Galvão	Adília Maria Pires da Silva Fernandes
09-11-2022	15-11-2022	15-11-2022	15-11-2022