

Course Unit	Cell Biology		Field of study	Science Base	
Bachelor in	Biomedical Laboratory Sciences		School	School of Health	
Academic Year	2022/2023	Year of study	1	Level	1-1
Type	Semestral	Semester	1	ECTS credits	5.0
Code	9995-550-1103-00-22				
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) Carina de Fatima Rodrigues

Learning outcomes and competences

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

1. Know the complexity of the cell as structural and functional unit of all living beings. Establish the main differences between eukaryotic and prokaryotic cells and between animal and vegetal cell.
2. Understand the function and activity in the nucleus. Describe the levels of chromatin organization and explain the presence of structures such as Barr's corpuscle and nucleolus.
3. Classify how different molecules enter the cell (including glucose and drugs) and the transport routes in the cell and the lysosomes formation.
4. Identify the characteristics of mitochondria regarding its structure and genetic information. Understand the sequence of mechanisms that occur in this organelle to obtain energy.
5. Relate the various components of the cytoskeleton with their structure and function. identify its location in the cell.
6. Know the different cellular signaling mechanisms and the various intervenients. Identify different signal molecules, receptors, and signaling pathways and their consequences in the cell.
7. Identify the various phases of mitotic division and the regulatory mechanisms of the cell cycle (mitotic checkpoints and apoptosis mechanisms in cell cycle control and carcinogenesis).
8. Understand and identify the various laboratory techniques applied to cell study and understand how they will be developed in other UCs throughout the course.

Prerequisites

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

Course contents

General organization of the cell and main differences between prokaryotic and eukaryotic cell. Organization of the endomembrane system and transport through the membrane. The process of secretion and vesicular transport. The cytoskeleton of the cell. Organization of the nucleus and genetic material. Cell cycle and its regulation. Meiosis and fertilization. Cell signalling. Energy in the cell. Microscopy and different microscopic preparations. Other cellular and molecular biology techniques.

Course contents (extended version)

1. CELL ORGANIZATION: eucaritic an procariotic cells.
2. Biological membranes. The lipid bilayer. Membrane and non-membrane organelles.
 - Citoplasmatic membrane funtions. Diferent types of transport across membrane. Osmose.
 - Endoplasmic Reticulum Structure and funtion.
 - Vesicular transport from Golgi apparatus.
 - Lysosomes . Genesis and ultra-structure . The lysosomes and the intracellular digestion.
3. Cytoskeleton . Composition, organization and functional significance.
 - Microtubules.
 - Actin filaments.
 - Intermediate filaments.
4. Nucleus Constitution Molecular structure, function of the genetic material Chromatin and chromosomes
5. Cell Cycle. Overview of the cell cycle. Mitosis.
 - Cell cycle negatives and positives controls. Apoptosis.
 - Meiosis and fertilization . Meiosis . Eggs . Sperm . Fertilization
6. Different types of transport in the cell: transport routes
 - Constitutive and controled secretion.
 - Exocitose and endocitose routs.
 - LDL and HDL Transport.
7. Mitochondrion Ultra-structure, composition and functions. Mitochondrial DNA.
8. Peroxisomes . Structure . Functions
9. Cell signalling.
 - Different types of cell signalling and signalling molecules.
 - Different types of receptors.
 - Insulin Receptor.
10. Practical classes: Optical microscope and other techniques applied to cell biology.
 - Different types of staining for prokaryotic and eukaryotic cells.
 - Gram staining
 - Reticulocytes count.
 - Behavior of animals cells in different osmolarities.
 - Observation of mitotic figures in tissues with high rate of cellular division.
 - Preparation of karyotypes. Banding techniques.
 - DNA extraction, quantification.
 - Molecular Biology techniques: PCR
 - Protein and DNA electrophoresis.

Recommended reading

1. Alberts, B. [et al.]. (2002). Fundamentos da biologia celular (2ªed.). Porto Alegre: Artmed.
2. Azevedo, C. & Sunkel, C. E. (2012). Biologia Celular e Molecular (2ª ed.). Lisboa: Lidel .
3. Lodish, H. Berk, A. Zipursky, S. L. Matsudaira, P. (2002). Biologia celular e molecular (4ª ed.). Porto Alegre: Artmed.

Teaching and learning methods

Theoretical-practices - Methodology actively using the multimedia, texts and question-answer sessions. Practical classes - carrying out practical laboratory work.

Assessment methods

1. Alternative 1 - (Regular, Student Worker) (Final, Supplementary, Special)
 - Final Written Exam - 100% (Final Written Exam (TP- 60% and PL 40%))
2. Alternativa 2 - (Student Worker) (Supplementary, Special)
 - Final Written Exam - 100% (Assessment through a written exam)

Language of instruction

Portuguese

Electronic validation

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15-11-2022	16-11-2022	17-11-2022	17-11-2022