Course Unit	Genomics, Metabolomics and Proteomics			Field of study	Biotechnology		
Master in	Applied Health Sciences - Biotechnology			School	School of Health		
Academic Year	2022/2023	Year of study	1	Level	2-1	ECTS credits	4.5
Type	Semestral	Semester	2	Code	5055-669-1202-00-22		

Workload (hours)	121,5	Contact hours	T	-	TP	-	PL	-	TC	-	S	-	E	-	OT	-	O	32

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. To understand the principles of technologies for generating whole genome data.
2. To identify methods for studying the pathogenicity of genetic variants and relating them to real case studies.
3. To understand the basic principles of advanced genomics, metabolomics, and proteomics technologies
4. To use specific online Bioinformatics tools to analyze and integrate information.
5. To analyze important information for carriers of inherited conditions or multifactorial diseases, such as cancer.
6. To discuss the social and ethical implications of data generated by technologies.
7. To research and critically interpret the literature in this field of study.

Prerequisites

Not applicable

Course contents

The contents encompass the field of genomics and its branches, known as "omics," a series of technologies and studies that have revolutionized our understanding of genetics and its application in medicine. Various technological approaches in Proteomics and Metabolomics and how they enhance our understanding of molecular interactions. Through the analysis of the genome, metabolome, and proteome, we grasp the foundations of diseases and the significance of early detection.

Course contents (extended version)

1. The Human Genome Project: the beginning of omics.
2. The foundation and principles of genotyping and detection of genetic variation: genomic approach.
3. The exome and whole genome sequencing, including library preparation methods;
4. Genomics and Personalized/Precision Medicine: Nutrigenomics, Pharmacogenomics, Epigenomics.
5. High-capacity techniques for generating information, including RNA expression and sequencing.
6. Current methods for detecting different types of genetic variation.
7. Overview of bioinformatics approaches for genomic data analysis.
8. Ethical, legal, and social issues related to genomic findings in medicine.
9. The proteomics: the origin.
10. The profile of our proteome is based on different mass spectrometry and electrophoresis methods.
11. The importance of proteomics for early treatment of certain diseases.
12. Protein databases, and protein information using web tools: NCBI and UniProt.
13. Metabolomics and its applications in life sciences, clinical settings, and environmental contexts.
14. Various techniques used to extract metabolites and analyze samples: HPLC, GC-MS, and NMR.
15. How to identify metabolites using available databases for the study of metabolic pathways.

Recommended reading

1. Alberts B., Johnson A., Lewis J., Morgan D., Raff M., Roberts K. & Walter P. (2014). Molecular Biology of the Cell (6th ed.). New York: Garland Science.
2. Watson, Baker, Bell, Gann, Levine & Losick. (2014). Molecular biology of the gene (7th ed.). Pearson.
3. Lewin's GENES XI (2013).11th Edition.
4. Nussbaum, R., L., Mclnnes R., R., Willard H. F. (2015). Thompson and Thompson Genetics in Medicine8th edition Elsevier.

Teaching and learning methods

Theoretical-practical classes involve presenting theoretical concepts using audiovisual and multimedia equipment. Laboratory practical classes encompass data analysis through bioinformatics tools and laboratory protocols involving genome sequencing approaches and HPLC methods.

Assessment methods

1. Alternative 1 - (Regular, Student Worker) (Final)
   - Final Written Exam - 100% (Assessment through a written exam.)
2. Alternative 2 - (Regular, Student Worker) (Supplementary, Special)
   - Final Written Exam - 100% (Assessment through a written exam.)

Language of instruction

1. Portuguese
2. Portuguese, with additional English support for foreign students.

Electronic validation

Carina de Fatima Rodrigues	Ana Maria Geraldes Rodrigues Pereira	Juliana Almeida de Souza	Adília Maria Pires da Silva Fernandes
30-08-2023	30-08-2023	30-08-2023	30-08-2023