

Course Unit	Recombinant DNA Technologies		Field of study	Biology and biochemistry	
Master in	Biotechnological Engineering		School	School of Agriculture	
Academic Year	2023/2024	Year of study	1	Level	2-1
Type	Semestral	Semester	2	ECTS credits	5.0
Code	5010-784-1205-00-23				
Workload (hours)	135	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

Learning outcomes and competences

At the end of the course unit the learner is expected to be able to:
Identify recombinant DNA techniques. Know genetic concepts and biological models/applications. Recognize requirements for manipulation/characteristics/potentialities/limitations of techniques/models

Prerequisites

Before the course unit the learner is expected to be able to:
have knowledge of biology, genetics and biochemistry

Course contents

Genetic manipulation: Animals, plants, microorganisms' models. Expression vectors, heterologous DNA, biological models' selection/determination. Application in different areas. Metabolic engineering: homologous recombination, gene insertion/deletion. Genome editing: Synthetic biology: Principles/techniques: Red/ET recombination, Linear-Linear Homologous Recombination, Transformation Associated Recombination, in vitro Sequence Ligation Independent Cloning and bioblocks

Course contents (extended version)

- Genetic manipulation of organisms to obtain bioproducts
 - What are DNA recombination techniques and its historical perspective
 - Where we can find genetic manipulation. Some examples
- Transgenic animals in human / veterinary medicine
 - Studies of diseases
 - Xenotransplantation
- Transgenic plants producing a protein of pharmacological interest
 - Production of hormones, vaccines or other examples
 - Agronomic and commercial improvement
 - Production of compounds
 - Genetic manipulation of microorganisms: getting GMO producers compounds.
- Molecular Biology
 - Selection of expression vectors,
 - techniques of heterologous DNA insertion
 - selection and determination of different biological models
 - Application and examples in: agronomic, human/veterinary health, pharmacological and environmental.
- Metabolic Engineering Techniques used to improve metabolism production and diversification
 - homologous recombination
 - gene insertion / deletion
 - Genome editing.
 - Application and examples in different areas
- Synthetic biology. Principles and techniques
 - Red / ET (exonuclease / polymerase) recombination
 - Linear-Linear Homologous Recombination, LLHR
 - Transformation Associated Recombination (TAR)
 - in vitro Sequence Ligation Independent Cloning (SLIC) and bioblocks.
 - Application and examples in different areas.

Recommended reading

- Genome Editing and Engineering: From TALENs, ZFNs and CRISPRs to Molecular Surgery (2018) by Krishnarao Appasani (Editor), George M. Church (Foreword), Cambridge University Press; 1 edition
- Kurnaz I. A. (2015). Techniques in Genetic Engineering. Taylor & Francis Group
- Mitra S. (2015). Genetic Engineering principles and practice. McGraw Hill Education
- Vogel P. and Stafforst T. (2019) Critical review on engineering deaminases for site-directed RNA editing. Current Opinion in Biotechnology, 55: 74 -80

Teaching and learning methods

Theoretical lessons with expositive methods, utilization of audio-visual resources. Laboratorial practical lessons with final presentation of reports

Assessment methods

- Attendance of 3/4 of practical lessons - (Regular) (Final, Supplementary, Special)
- practical exam - (Regular) (Final, Supplementary)
 - Final Written Exam - 30% (practical work with a final written exam. Minimum successful result 9, 5 marks)
 - Practical Work - 10% (lab. work and presentation)
- evaluation of practical part - (Student Worker) (Final, Supplementary, Special)
 - Final Written Exam - 40% (practical work with a final written exam. Minimum successful result 9, 5 marks)
- evaluation of theoretical part - (Regular) (Final, Supplementary, Special)
 - Final Written Exam - 50% (practical work with a final written exam. Minimum successful result 9, 5 marks)
 - Development Topics - 10% (work developed and presented by students in class)
- final exam theoretical - (Student Worker) (Final, Supplementary, Special)
 - Final Written Exam - 60% (theoretical work with a final written exam. Minimum successful result 9, 5 marks)

Language of instruction

English

Electronic validation			
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16-01-2024	16-01-2024	23-01-2024	25-01-2024

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