INSTITUTO POLITÉCNICO DE BRAGANÇA

Course Unit	Microbial Biotechnology			Field of study	Engineering and related technics		
Bachelor in	Biology and Biotechnology			School	School of Agriculture		
Academic Year	2022/2023	Year of study	3	Level	1-3	ECTS credits	6.0
Type	Semestral	Semester	2	Code	9029-510-3202-00-22		

Workload (hours)	162	Contact hours	T	TP	PL	TC	S	E	OT	O
			30	-	30	-	-	-	4	-

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): Joaquina Teresa Gaudêncio Dias

Learning outcomes and competences

At the end of the course unit the learner is expected to be able to:
1. To know the molecular techniques regarding the production of news biotechnological products.
2. To select the genetic systems more appropriate for each microorganisms.
3. To apply the different modifications in alimentary, agricultural, pharmaceutical and environmmental industries.
4. To know the current and perspective applications in different technological processes (vaccines, probiotios, bioremediation).

Prerequisites

Before the course unit the learner is expected to be able to:
1. Knowledge of Biology, Microbiology, Molecular Biology, Genetic Engineer and Biochemistry.
2. knowledge of English is recommendable.

Course contents

Lectures: Structure of the gene and relation gene / protein. Folding and translocation. Production of recombinants proteins: expression in procaryotic and eucaryotic systems. Engineering of proteins: methodologies and applications. Applications in several sectors: pharmaceutical and food industry, diagnosis and investigation, microorganisms and production of energy. practices: Induction and selection of mutants; extraction and purification of protein.

Course contents (extended version)

1. Lectures . Fundamentals of Microbial Biotecnology
2. Prokaryotic and eukaryotic genes structure. Genetic code. Transcription
3. Translation in prokaryotic and eukaryotic . Protein translocation. Pos-translation modifications
4. Protein Folding . Hsp70 function in cell. Chaperone and chaperonine role in protein folding
5. Protein expression in prokaryotic and eukaryotic. Methods to increase the yield and purification.
6. Expression systems in prokaryotic and eukaryotic organisms (Yeast, , insect and animals cells)
7. Protein engineering: Methodology: Oligonucleotide-directed mutagenesis (M13, pALTER, PCR)
8. Two-hybrid and phage display system. iRNA techniques. Microarrays and 2-D electroforetics techniques
9. Protein engineering in industrial Biotecnology
10. Production and Potential applications of recombinant gastric lipase
11. Stabilization of carbamylase from Agrobacterium radiobacter.
12. Protein engineering for affinity purification: the strep-tag
13. Laboratory Classes. Genes isolation. Induction and selection of mutation with MNNG in yeasts
14. Methods for extraction and purification of enzymes. Extraction of citosolyc proteins
15. Isolation and screening of microorganisms with industrial potential.

Recommended reading

1. Perry Johnson-Green, (2002) Introduction to Food Biotechnology, CRC Press, CRC Series in Contemporary Food Science
2. Bhima Bhukya, Anjana Devi Tangutur (2016) Microbial Biotechnology: Technological Challenges and Developmental Trends, Apple Academic Press
3. Keith Wilson & John Walker. (2005)Principles and Techniques of Biochemistry and Molecular Biology. Sixth edition. Cambrige University Press. New York. USA.
4. Protein Engineering (2012) edited by Pravin Kaumaya

Teaching and learning methods

Conventional lectures; use of power point presentations. Laboratory classes. Course materials available in the e-learning plataform.

Assessment methods

1. coursework - (Regular) (Final, Supplementary, Special)
   - Intermediate Written Test - 25% (1st written exam)
   - Intermediate Written Test - 25% (2nd written exam)
   - Final Written Exam - 30% (written laboratory exam)
   - Reports and Guides - 20% (written laboratory reports)
2. exam avaliation - (Student Worker) (Final, Supplementary, Special)
   - Final Written Exam - 100% (written exam)

Language of instruction

Portuguese

Electronic validation

Joaquina Teresa Gaudêncio Dias	Maria Letícia Miranda Fernandes Estevinho	Altino Branco Choupina	Paula Cristina Azevedo Rodrigues
14-12-2022	14-12-2022	14-12-2022	18-12-2022

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