INSTITUTO POLITÉCNICO DE BRAGANÇA

Course Unit	Microbial Physiology and Genetics			Field of study	Biology and biochemistry		
Master in	Biotechnological Engineering			School	School of Agriculture		
Academic Year	2020/2021	Year of study	1	Level	2-1	ECTS credits	5.0
Type	Semestral	Semester	1	Code	5010-509-1104-00-20		

Workload (hours)	135	Contact hours	T	TP	PL	TC	S	E	OT	O
			25	-	25	-	-	-	4	-

T - Lectures; TP - Lectures and problem-solving; PL - Problem-solving, project or laboratory; TC - Fieldwork; S - Seminar; E - Placement; OT - Tuturial; O - Other

Name(s) of lecturer(s): Vitor Manuel Capela Ramos

Learning outcomes and competences

At the end of the course unit the learner is expected to be able to:
1. Revise and deepen concepts on microbial physiology and genetics
2. Acknowledge the major genetic and physiological features of major microorganisms
3. Understand how those features affect growth and responses to biotic and abiotic factos.
4. Recognize the combination of synthetic and systems biology as a powerful framework to study fundamental questions in microbial biology and produce chemicals of immediate practical application.

Prerequisites

Before the course unit the learner is expected to be able to:
Basic knowledge of microbiology and genetics.

Course contents

Flow of information: from genome to fluxome. Metabolic functional pathways and networks. Microbial physiology and metabolism. Microbial genetics. Metabolism regulation. Microbial stress responses. Synthetic and systems biology.

Course contents (extended version)

1. Introduction to microbial physiology and genetics
   - Flow of information: from genome to fluxome
   - Metabolic functional pathways and networks
2. Microbial physiology and metabolism
   - Catabolism and anabolism
   - Metabolic diversity of microbes
   - Microbial energetics: Major mechanisms of energy production
   - Alternative mechanisms of energy production
3. Microbial genetics: Pan-, core and variable genomes; From genes to proteins;
   - Bacterial genetics
   - Fungal genetics
4. Metabolism regulation
   - Genetic regulation
   - Metabolic regulation
   - Epigenetics
5. Microbial stress responses
   - Structural, physiological and genetic changes as response to biotic and abiotic stress
   - Acclimation and adaptation
   - Secondary metabolism
6. Systems biology and Synthetic biology
   - Bridging the gap between systems biology and synthetic biology

Recommended reading

1. Dale J, Park SF, 2010. Molecular Genetics of Bacteria, Wiley
2. Kim BH, Gadd GM, 2008. Bacterial Physiology and Metabolism, Cambridge University Press
3. Moat AG, Foster JW, Spector MP, Sector MP, 2002. Microbial Physiology, 4th Edition, Wiley-Liss
4. Moore D, Frazer LN, 2010. Essential Fungal Genetics, Springer
5. Reddy SM, Reddy SR, 2007. Microbial Physiology, Scientific Publishers Journals Dept

Teaching and learning methods

Theory will be exposed and case studies will be discussed. Laboratory work will be developed, and complemented by literature search and scientific communication activities, with elaboration and discussion of reports and presentations.

Assessment methods

1. Continuous assessment - (Regular, Student Worker) (Final)
   - Work Discussion - 60% (Elaboration and discussion of a lab report and/or of a written and oral scientific presentation)
2. Final assessment - (Regular, Student Worker) (Final)
   - Final Written Exam - 40% (Final written exam of theoretical contents)
3. 2nd chance assessment - (Regular, Student Worker) (Supplementary, Special)
   - Development Topics - 60% (Delivery of a revised version of the written assays/reports)
   - Final Written Exam - 40% (Final written exam of theoretical contents)

Language of instruction

1. English
2. Portuguese

Electronic validation

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15-11-2020	16-11-2020	16-11-2020	16-11-2020