INSTITUTO POLITÉCNICO DE BRAGANÇA

Course Unit	Genetics			Field of study	Biology and Biochemistry		
Bachelor in	Zootechnical Engineering			School	School of Agriculture		
Academic Year	2022/2023	Year of study	1	Level	1-1	ECTS credits	6.0
Type	Semestral	Semester	2	Code	9129-312-1204-00-22		

Workload (hours)	162	Contact hours	T	TP	PL	TC	S	E	OT	O
			30	-	30	-	-	-	20	-

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): Paula Cristina Santos Baptista

Learning outcomes and competences

At the end of the course unit the learner is expected to be able to:
1. Applied the Mendel laws in the resolution of heredity problems
2. Identify and explain the Mendel laws exceptions
3. Interpreting the Hardy-Weinberg equilibrium
4. Identify and explain types of gene mutation and chromosome mutation
5. Knowing the structure and organization of the hereditary material
6. Knowing the extranuclear genes
7. Acquire the basic knowledge in the field of molecular genetics
8. Understanding the relationship genotype-phenotype

Prerequisites

Before the course unit the learner is expected to be able to:
Not applied

Course contents

Mendelian genetics. Multiple Alleles. Sex-linked inheritance. Gene interaction. Molecular basis of heredity: location and characterization of hereditary material. Organization of the hereditary molecules. Replication of DNA. Gene mutation and repair mechanisms. Changes in chromosome structure and number. Linkage. Populations genetics: Hardy-Weinberg Law. Quantitative genetics. Extranuclear inheritance. Genetic engineering.

Course contents (extended version)

1. GENETICS
   - Concept and evolution
   - Importance, applications and perspectives
2. MENDELIAN GENETIC's
   - Mendel's experiments
   - The rediscovery of Mendelism
   - Mendel's laws
3. MENDELIAN INHERITANCE
   - Autosomal dominant and recessive characters
   - Backcross and test cross
4. MENDELISM COMPLEX
   - Multiple allelomorphism
   - The Human ABO blood groups
5. INHERITANCE OF GENES LOCATED ON SEX CHROMOSOME
   - Holandric genes and Sex-Linked Genes
6. X CHROMOSOME INACTIVATION
   - The Lyon hypothesis
   - Barr body
7. SEX-LIMITED AND SEX-INFLUENCED AUTOSOMAL INHERITANCE
   - Characteristics and examples
8. GENE INTERACTION
   - Epistasis
9. MOLECULAR BASIS OF HEREDITARY
   - DNA as genetic material
   - Chemical nature and structure
10. MECHANISM OF DNA REPLICATION
    - In vitro amplification of DNA: PCR
11. ORGANIZATION OF THE GENOME
    - Nuclear genome
    - Extranuclear inheritance
12. ANALYSIS OF THE GENOME
    - Methods for the study of DNA
    - Molecular analysis of genetic variability
13. MUTATIONS
    - Types of mutations
    - Mechanisms of DNA repair
14. VARIATIONS IN CHROMOSOME STRUCTURE
    - Deletions, duplications, inversions, translocations
15. VARIATIONS IN CHROMOSOME NUMBER
    - Polyploidy
    - Aneuploidy
16. GENETIC LINKAGE AND CROSSING-OVER
    - Chromosome mapping
17. POPULATION GENETICS
    - Hardy-Weinberg principle.
    - Changes in phenotype frequencies
18. QUANTITATIVE GENETICS
    - Genotypic and environmental variance
19. APPLICATIONS OF GENETIC: GENETIC ENGINEERING
    - Applications to livestock, industry and agriculture
    - Methods and techniques of genetic transformation

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Recommended reading

1. Griffiths AJF, Wessler SR, Carroll SB, Doebley J, 2015. Introduction to Genetic Analysis. 11th Edition. W. H. Freeman and Company
2. Klug WS, Cummings MR, Spencer C, Palladino MA, 2015. Concepts of Genetics. 11th Edition. Pearson Education
3. Snustad DP, Simmons MJ, 2011. Principles of Genetics. 6th Edition. John Wiley & Sons

Teaching and learning methods

Theoretical Classes: Lectures of theoretical contents. Practical laboratorial Classes: Realization of experimental protocols in the genetics area.

Assessment methods

1. Alternative 1 - (Regular, Student Worker) (Final)
   - Intermediate Written Test - 30% (Theoretical evaluation)
   - Intermediate Written Test - 40% (Practical evaluation, which final classification must be equal or higher than 9. 5 val (0-20))
   - Final Written Exam - 30% (Average of the two theoretical exams, should be equal or higher than 8 val (0-20))
2. Alternative 2 - (Regular, Student Worker) (Supplementary, Special)
   - Final Written Exam - 40% (Practical evaluation, which final classification must be equal or higher than 9. 5 val (0-20))
   - Final Written Exam - 60% (Theoretical evaluation, which final classification must be equal or higher than 8 val (0-20))

Language of instruction

Portuguese, with additional English support for foreign students.

Electronic validation

Paula Cristina Santos Baptista	Maria Lurdes Antunes Jorge	Marieta Amélia Martins Carvalho	Paula Cristina Azevedo Rodrigues
20-12-2022	20-12-2022	21-12-2022	21-12-2022

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