27105 - Genetics

Información del Plan Docente

Academic Year	2017/18
Faculty / School	100 - Facultad de Ciencias
Degree	446 - Degree in Biotechnology
ECTS	6.0
Year	1
Semester	Second semester
Subject Type	Basic Education
Module	---

1.General information

1.1.Introduction

1.2.Recommendations to take this course

1.3.Context and importance of this course in the degree

1.4.Activities and key dates

2.Learning goals

2.1.Learning goals

2.2.Importance of learning goals

3.Aims of the course and competences

3.1.Aims of the course

3.2.Competences

4.Assessment (1st and 2nd call)

4.1.Assessment tasks (description of tasks, marking system and assessment criteria)

5.Methodology, learning tasks, syllabus and resources

5.1.Methodological overview

The learning process is based on the following activities: 1) Participatory theorical classes taught in whole group. The material will be available on the website of the ADD of the University of Zaragoza. http://add.unizar.es:800/newweb/web/index.html. 2) Problems resolution classes taught in whole group. Cases and problems will be delivered in advance so that students could work them particularly. 3) Laboratory practices: attendance is compulsory unless exceptional cases. They will be held in small groups in 2 sessions of 3 hours each 4) Computer practices: attendance is compulsory unless exceptional cases. They will beonducted in small groups in 1 session of 4 hours 5) Problems solving individually. Students will be provided with a collection of problems at the beginning of the

semester. Each student will have to solve one of the problems of the collection in public session and chosen at random by the teachers of the subject. 6) Complementary activities related to the theme of the course include: presentation of news, debates and play trivial to learn genetics 7) Tutorials in small groups for preparation of seminars and troubleshooting 8) Individualized tutorials for solving doubts. The tutorial hours will be flexible and agreed in advance with the group depending on which is the most convenient schedule. In addition teachers can answer questions across different systems, including Moodle or email, always respecting rules and schedules that will be established with the group.

5.2.Learning tasks

The program offered ti the students to help to help them to achieve the expected results includes the following activities ...
1) Participatory theorical classes taught whole group 2) Problems resolution taught whole group 3) Laboratory practices
4) Computer practices 5) Problems resolution individually
6) Complementary activities
7) individualized or small groups tutorial
8) Support for traini ng using available resources in the ADD of the University of Zaragoza
http://add.unizar.es:800/newweb/web/index.html

5.3.Syllabus

SUBJECT: GENETICS

PROGRAM
SECTION I. NATURE AND ORGANIZATION OF HEREDITARY MATERIAL

Lesson 1. DNA, genes and genomes.

Nature and structure of DNA. DNA replication. Transcription. Genetic code and translation. Genes, introns and exons. Types of eukaryotic DNA. Genomes: size and number of genes.

Lesson 2. Organization of the hereditary material in eukaryotes

Structure of eukaryotic chromosome. Levels of chromosome packing. Heterochromatin and euchromatin. Chromosomal bands. External structure of the chromosome. Centromere position, size and number. Extranuclear genetic material.

Lesson 3. Organization of the hereditary material in prokaryotes

Introduction. Hereditary material in viruses and bacteria. RNA viruses. DNA viruses. Bacterial chromosome. Plasmids

SECTION II. TRANSMISSION OF HEREDITARY MATERIAL

Lesson 4. Chromosomal theory of inheritance

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Introduction. Cell cycle. Mitosis and hereditary material. Variations in the process of cell division. Meiosis. Biological and genetic significance of meiosis. Atypical meiosis. Differences between mitosis and meiosis.

Lesson 5. Chromosome mutations

Basic concepts. Classification of mutations. Change in chromosome number. Aneuploidy. Euploidy. Chromosomal rearrangements. Human karyotype

Lesson 6. Mendelian inheritance as genetic consequence of meiosis and fertilization.

Rules of inheritance. Monohybrids: uniformity and segregation rules. Dihybrids: rule of independent combination. Polihybrids.

Lesson 7. Gene interactions

Interactions between the alleles. Variations in dominance. Allelic series. Several genes affecting the same character. Lethal genes. Penetrance and expressivity

Lesson 8. Sex determination and sex-linked characteristics

Genetic sex determination. X-linked inheritance. Y- linked inheritance. Influence of sex on the inheritance of certain characters. Dosage compensation.
SECTION III. LINKAGE AND RECONBINATION
Lesson 9. Linked genes

Linkage discovery. Types of crosses to explain gene linkage. Cis and trans dihybrid. Complete and incomplete linkage. Crosslinking and chiasmata.

Lesson 10. Genome mapping in eukaryotes. I. Linkage maps

Basic concepts for the construction of a linkage map. Mapping using a dihybrid testcross. Frequency of recombinants.. Trihybrid testcross. Interference and coincidence. Relationship between genetic distance and frequency of recombination. Map unit and function map.

Lesson 11 . **Genome mapping in eukaryotes** . **II. Physical maps.**

Interspecific somatic hybridization. *In situ* hybridization. Comparative mapping. DNA sequencing.
SECTION IV. POPULATION GENETICS

Lesson 12. Basic concepts of population genetics

Gene and genotypic frequencies estimation. Hardy-Weinberg equilibrium in autosomal and sex-linked genes.

Lesson 13. Changes in Hardy-Weinberg equilibrium I.

Migration effect. Effect of mutation. Effect of selection in cases of complete dominance incomplete dominance and heterozygote selection. Mutation - selection balance.

Lesson 14 . **Changes in Hardy-Weinberg equilibrium II**

Small populations. Genetic drift. Effective population size. Inbreeding and its effects. Inbreeding coefficient calculation.

5.4.Course planning and calendar

The period of lectures and problems will be the officially established . See : https://ciencias.unizar.es/grado-en-biotecnologia . Places of delivery of sessions, timing and practice groups will be established in coordination with the other subjects in the early going . The coordinator draw up practice groups in the early going in order to not produce overlaps with other subjects . The dates for the other activities will be agreed with enough time in advance and once agreed they will communicated through Moodle.

5.5.Bibliography and recommended resources

BB	Benito Jiménez, César. Genética : conceptos esenciales / César Benito Jiménez, Francisco Javier Espino Nuño . Madrid : Médica Panamericana, D.L. 2012
BB	Genética / Anthony J. F. Griffiths ... [et al.] . - 9ª ed. Madrid [etc.] : McGraw-Hill Interamericana de España, cop. 2008
BB	Klug, William S.. Conceptos de genética / William S. Klug, Michael R. Cummings, Charlotte A. Spencer ; traducción y revisión técnica, José Luis Ménsua, David Bueno i Torrens . - 8ª ed. Madrid [etc.] : Pearson, cop. 2006
BB	Pierce, Benjamin A.. Genética : un enfoque conceptual / Benjamin A. Pierce . - 3ª ed. Madrid [etc.] : Editorial Médica Panamericana, D.L. 2009

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LISTADO DE URLs:

OMIM is a comprehensive, authoritative compendium of human genes and genetic phenotypes - [https://www.ncbi.nlm.nih.gov/omim]
Online Mendelian Inheritance in Animals (OMIA) is a catalogue/compendium of inherited disorders, other (single-locus) traits, and genes in 218 animal species - [http://omia.angis.org.au/home/]
Sociedad Española de Genética - [http://www.segenetica.es/]