COURSE DATA

DATA SUBJECT

Code: 33140
Name: Genetic analysis techniques
Cycle: Undergraduate Studies
ECTS Credits: 4.5
Academic year: 2025-26

STUDY (S)

Degree	Center	Acad. year	Period
1109 - Degree in Biochemistry and Biomedical Sciences	Facultat de Ciències Biològiques	3	Second quarter

SUBJECT-MATTER

Degree	Subject-matter	Character
1109 - Degree in Biochemistry and Biomedical Sciences	Métodos instrumentales	COMPULSORY

COORDINATION

HERNANDEZ MARTINEZ PATRICIA

SUMMARY

The subject of Genetic Analysis Techniques is taught in the third year of the Degree in Biochemistry and Biomedical Sciences (Plan 2009), in the second quarter of the year. This is a compulsory subject. Together with the Genetics-Cytogenetics, Genomics-Genetic Engineering (all mandatory subjects), Genetic Analysis Techniques aims to provide to students the basic knowledge about biological inheritance, as well as the conceptual and methodological tools that enable students to carry out, in a professional work, genetic analysis and genetic modification of organisms.

Students take this course after attending the subjects mentioned above; consequently they already have basic understanding of the biological inheritance and the genome structure and knowledge of molecular tools for genetic analysis.

PREVIOUS KNOWLEDGE

RELATIONSHIP TO OTHER SUBJECTS OF THE SAME DEGREE

There are no specified enrollment restrictions with other subjects of the curriculum.

OTHER REQUIREMENTS

COMPETENCES / LEARNING OUTCOMES

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Capacidad para diseñar experimentos y aproximaciones multidisciplinares para la resolución de problemas concretos.

Capacidad para presentar, discutir y extraer conclusiones de los resultados de los experimentos científicos.

Capacidad para trabajar correctamente en los laboratorios de bioquímica, genética, biología molecular y celular incluyendo seguridad, manipulación, eliminación de residuos y registro anotado de actividades.

Capacidad para utilizar la instrumentación básica en experimentación molecular y celular.

Tener una visión integrada de las técnicas y métodos utilizados en biociencias moleculares y biomedicina.

DESCRIPTION OF CONTENTS

1. LESSON 1. SEGREGATION AND RECOMBINATION MAPPING IN HAPLOIDS.

Segregation in haploids. Calculating gene-to-centromere distances. Calculating the distance between two loci. Three-point mapping in haploids. Problem solving.

2. LESSON 2. COMPLEMENTATION AND DELETION MAPPING.

Complementation test Mapping using deletions in species with giant chromosomes. Combined use of deletions and in situ hybridization for mapping human genes. Problem solving.

3. LESSON 3. ASSIGNING LOCI TO SPECIFIC CHROMOSOMES.

Use of linkage group markers in model species. Procedure in species with crossing-over limited to one of the two sexes. Procedure in species with crossing-over in both sexes. Problem solving.

4. LESSON 4. TYPES OF GENETIC MARKERS.

Importance of biological variability in the genetic analysis. Morphological, biochemical and molecular markers. Identification of a molecular marker linked to a mutant phenotype. Problem solving.

5. LESSON 5. GENETIC IDENTITY.

Use of molecular markers to obtain genetic fingerprints. Probability assignment in forensic genetics. Probability assignment in paternity testing. Problem solving.

6. LESSON 6. LINEAGE MARKERS.

What are lineage markers. The use of Y-chromosome markers. The use of mitochondrial markers. Problem solving.

7. LESSON 7. LINKAGE DETECTION IN HUMANS.

Linkage analysis in pedigrees. LOD score. Human-mouse somatic cell hybrids. Problem solving.

8. LESSON 8. OBTAINING RESTRICTION MAPS.

Restriction maps. The use of probes. Circular maps. Linear maps. Problem solving.

9. LABORATORY PRACTICALS

LAB PRACTICAL 1. USE OF MOLECULAR MARKERS. Linkage of a mutant phenotype to a molecular marker

using the RAPDs technique.
LAB PRACTICAL 2. SEGREGATION IN HAPLOIDS. Ordered tetrad analysis (estimate the gene-centromere distance in Sordaria fimicola).
LAB PRACTICAL 3. GENE LOCALIZATION BY DELETION MAPPING. Precise gene localization using chromosome deletions in Drosophila melanogaster.
LAB PRACTICAL 4. GENETIC IDENTITY. Obtaining a genetic fingerprint from saliva and blood DNA, by means of genetic and biochemical markers.

WORKLOAD

PRESENCIAL ACTIVITIES

Activity	Hours
Tutorials	3,00
Theory	3,00
Laboratory	18,00
Classroom practices	21,00
Total hours	**45,00**

NON PRESENCIAL ACTIVITIES

Activity	Hours
Attendance at other activities	0,00
Individual or group project	5,00
Independent study and work	27,00
Preparation of lessons	10,00
Preparation for assessment activities	16,00
Resolution of case studies	9,50
Total hours	**67,50**

TEACHING METHODOLOGY

The following teaching methods will be used to develop this subject:

1. Theory and problem classes. A total of 16 sessions of one-hour and a half will be needed to cover this teaching activity in groups of 40 students. The professor will show the most relevant concepts needed to solve the different questions related to each topic. After that several practical problems will be solved.

2. Laboratory classes. Five sessions of 3 hours long will be held in groups of 16 students. Attendance is compulsory for laboratory classes.

3. Group mentoring. Two sessions of one hour and a half are organized in groups of 16 students. Its aim is to review and discuss the concepts taught during the course. In addition, the final half hour of each session will be devoted to the completion of a written test to evaluate the knowledge acquired by the students. It is intended that these tutorials will stimulate the sustained study of the subject.

4. Personalized tutoring. Students will be encouraged to use this resource for advice and discussion with the teacher any topic about the program, the course, or the degree studies.

EVALUATION

Application of the concepts acquired in solving problems: The evaluation of the concepts worked on in the theoretical-practical problem sessions will be carried out by means of a final written exam, which will consist of solving problems and/or questions about any of the aspects treated in the classes of problems and tutorials; and two written tests during the group tutorials (on partial subjects of the course). The value of the final test will be 70% of the total, but the grade obtained in the exam may be increased by the two partial tests of the group tutorials. In the event that the grade of the final exam is higher than 4.0 and the average of the tutorial grade is higher than that of the final exam (that is, only if it benefits the student), the weighted average will be used (6:1, exam: tutorials) to obtain the grade for this section.

Student's portfolio: In addition, the student can increase the grade of the theoretical-practical part by means of his "portfolio". This consists of having obtained a score of 8.5 or higher in the set of the two partial tests in the group tutorials. The application of the portfolio will consist of multiplying by 1.1 the score obtained in the theoretical-practical section. However, the final score cannot exceed 10 points.

Laboratory: The evaluation of the use of the learning in the laboratory, the results obtained, the attendance, as well as the presentation of a questionnaire on the results of the practices and the analysis of them will be carried out. The value of the laboratory grade will be 30% of the total. Attendance at laboratory classes is mandatory and essential to pass the subject.

Other considerations:

The final grade results from the sum of the grades achieved in the different sections. To pass the course is necessary to obtain an overall rating equal to or higher than 5 points out of 10, taking into account that the score of theoretical and practical knowledge (upon addition of the "portfolio") and laboratory skills are either, independently, 4,5 or more out of 10.

The score obtained from the laboratory skills is saved for the second call if necessary and for the next year, as well as for subsequent years.

Students who do not assist to the final exam will have NOT EVALUATED in the records.

To apply for an advance of the examination of this course the student must have completed (in any of the previous years) the laboratory classes of this subject.

REFERENCES

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Ménsua, J.L. (2003). Genética. Problemas y ejercicios resueltos. Ed. Pearson Prentice Hall. ISBN: 84-205-3341-6.

Complementarias
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Dieffenbach, C. L. and Dveksler, G. S. (2003) PCR primer. A laboratory manual. Cold
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Recursos informáticos:
1. Sociedad Española de Genética, http://www.segenetica.es/ Se recomienda visitar el apartado de docencia: hay lecciones, problemas y recursos multimedia.
2. Página web del libro Genética, un enfoque conceptual. En inglés. http://www.whfreeman. com/pierce3e/ Se encuentran recursos complementarios a los del libro, tales como animaciones, resolución de problemas

y enlaces de interés.
3. DNAi.org (DNA interactive) En inglés, http://www.dnai.org/index.htm
4. DNA from the beginning. En ingles, http://www.dnaftb. org/
5. Libro de texto de Genética disponible como libro electrónico en la Biblioteca de Ciencias: Griffiths, A.J.F., Wessler, S.R., Lewontin, R.C. y Carroll, S.B. (2013). Genética, 9a edición. McGraw- Hill-Interamericana. ISBN: 978-84-481-9090-3.