

**COURSE DATA****DATA SUBJECT**

Code: 33167
Name: Genetics
Cycle: Undergraduate Studies
ECTS Credits: 6
Academic year: 2025-26

STUDY (S)

Degree	Center	Acad. year	Period
1111 - Grado en Biotecnología	Facultat de Ciències Biològiques	2	First quarter

SUBJECT-MATTER

Degree	Subject-matter	Character
1111 - Grado en Biotecnología	Foundations of functional biology	COMPULSORY

COORDINATION

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SUMMARY

The course on Genetics is in the second year of the Degree in Biotechnology (Plan 2009). This is a mandatory course, which together with the courses on Molecular Genetics, Methods in Molecular Biology and Genetic Engineering, and Practical Course on Methods in Molecular Biology and Genetic Engineering (courses mandatory in the second year), they share the collective goal of providing students with basic knowledge on the biological inheritance and the conceptual and methodological tools which enable them to carry out, in their professional work, tasks related to genetic analysis and genetic modification of organisms.

The student will receive this course at the same time that he/she is taking the courses on Biochemistry, Methods in Biochemistry, Animal Biology and Cell Biology, which will complement the skills and basic knowledge related to the fundamentals of molecular and cell biology, especially on the structure of nucleic acids, replication, transcription, translation, cell cycle, chromosomes, and phenomena of so great importance from the genetic perspective such as mitosis and meiosis, the two mechanisms responsible for the transmission of hereditary information.

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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Actuar con autonomía en el aprendizaje, tomando decisiones fundamentadas en diferentes contextos, emitiendo juicios en base a la experimentación y el análisis y transfiriendo el conocimiento a nuevas situaciones

Apply analytical, synthetic and critical thinking skills in the application of the scientific method.

Aprender a trabajar de forma adecuada en un laboratorio con material biológico (microorganismos, plantas y animales) incluyendo seguridad, manipulación y eliminación de residuos biológicos, y con registro anotado de actividades.

Be able to determine the type of inheritance of a certain character.

Be able to observe and interpret the results obtained through optical microscopes.

Be able to solve practical problems in genetics(including population genetics).

Colaborar eficazmente en equipos de trabajo, asumiendo responsabilidades y funciones de liderazgo y contribuyendo a la mejora y desarrollo colectivo

Conocer y comprender, desde el propio ámbito de la titulación, las desigualdades por razón de sexo y género en la sociedad; integrar las diferentes necesidades y preferencias por razón de sexo y de género en el diseño de soluciones y resolución de problemas

Conocer y comprender las bases moleculares de la información genética y los mecanismos de transmisión y variación y su posible manipulación

Contribuir en el diseño, desarrollo y ejecución de soluciones que den respuesta a demandas sociales, teniendo en cuenta como referente los Objetivos de Desarrollo Sostenible

Demostrar razonamiento crítico y autocrítico en el ámbito de la titulación, considerando aspectos tales como la ética profesional, los valores morales y las implicaciones sociales de las diferentes actividades realizadas

Disseminate and engage in public debate on issues related to biotechnology and its applications.

Learn, develop and apply the main techniques for the preparation, staining and observation of biological samples.

Participate in multidisciplinary teams, engaging in teamwork and collaboration.



Propose creative and innovative solutions to complex situations or problems, typical of the area of connection, to donate responses to the various professional and social needs

Que el estudiantado demuestre su capacidad para reconocer la diversidad biológica y conocer la organización de los seres vivos y la ubicación del ser humano y de los organismos modelo en experimentación biotecnológica en dicha diversidad

Que el estudiantado demuestre su capacidad para utilizar las diferentes fuentes bibliográficas y bases de datos biológicos y usar las herramientas bioinformáticas

Saber comunicarse de manera efectiva, tanto de forma oral como escrita, adaptándose a las características de la situación y de la audiencia

Ser capaz de determinar el tipo de herencia de un determinado carácter

Ser capaz de resolver problemas prácticos de genética (incluyendo genética de poblaciones)

Ser capaz de situar los distintos seres vivos en el árbol filogenético

Understand evolutionary relationships among organisms.

Understand the biological foundations of human diversity and its cultural implications, including gender differences.

Use English to write reports and to interpret information from protocols, manuals and databases.

Work in laboratories, including safety procedures, waste management and accurate activity logging.

DESCRIPTION OF CONTENTS

1. Topics of Theoretical Classes



1. Introduction to Genetics
2. Basic principles of inheritance
3. Sex determination and sex-linked traits
4. Extensions and modifications of basic principles
5. Pedigree analysis and genetic testing
6. Linkage, recombination, and mapping of eukaryotic genes
7. Bacterial and viral genetic systems
8. Structural chromosomal variations
9. Numerical chromosomal variations
10. Quantitative genetics
11. The chemical nature of genes
12. Gene mutations and DNA repair

2. Topics of Problem-Solving Practical Classes

1. Monohybridism, dihybridism, binomial distribution, chi-square test
2. Sex linkage
3. Extension of basic principles
4. Pedigree analysis
5. Linkage and recombination
6. Chromosomal mutations
7. Quantitative genetics

3. Topics of Laboratory Practical Classes

1. Character segregation I: Parental generation (P)
2. Polytene chromosomes I: Observation
3. Character segregation II: First filial generation (F1)
4. Polytene chromosomes II: Preparation
5. Character segregation III: Second filial generation (F2)
6. Practical exam

WORKLOAD

PRESENCIAL ACTIVITIES

Activity	Hours
Tutorials	6,00
Theory	28,00
Laboratory	12,00
Classroom practices	14,00
Total hours	60,00

NON PRESENCIAL ACTIVITIES



Activity	Hours
Attendance at other activities	0,00
Individual or group project	0,00
Independent study and work	30,00
Preparation of lessons	30,00
Preparation for assessment activities	30,00
Resolution of case studies	0,00
Total hours	90,00

TEACHING METHODOLOGY

The development of the course, in terms of in-person work, is structured as follows:

A. Two weekly one-hour theory classes. These sessions aim to present and analyze the basic concepts of the course, with a special focus on highlighting their practical aspects. Prior reading of the topics is highly recommended. A total of 24 lecture sessions by the professor, plus 3 collective tutoring sessions, are needed to cover this teaching component.

B. Three group tutoring sessions, each two hours long. These three collective tutorials (a total of 6 hours), in groups of 16 students, are intended for reviewing and discussing the concepts covered so far. Additionally, the final half hour will be dedicated to a written test to objectively assess the knowledge acquired by the students up to that point. These tutorials are designed to encourage steady study of the course content.

C. Two-hour practical class sessions. These include six laboratory sessions in groups of 16 students (12 hours, including the exam), and seven problem-solving sessions in groups of 32 students (14 hours), spread throughout the course.

D. Availability of personalized tutoring. Students will be encouraged to use this resource to seek guidance and discuss with the professor any issues related to the syllabus, the course, or the degree program.

EVALUATION

Theory: The evaluation of the concepts worked on in the theoretical sessions will be carried out continuously during the classes, by means of tests on the specific subject that has been dealt with. In addition, three written tests will be taken during the group tutorials (also on partial content of the subject) and a final written test (on the content of the whole subject). The value of the final test will be **30%** of the total, that of the three partial written tests **20%** and the rest of the tests **5%**. Then, the mark on theoretical knowledge will represent **55%** of the overall mark of the subject and will be obtained by the weighted average of all the sections.

Problems: An evaluation of the student's ability to face and solve genetic problems will be made by means of a written test at the end of the course. The value of this test will be **35%** of the total.



Laboratory: An evaluation of the learning achievement will be made in the laboratory. This will be done by evaluating the attendance and presentation of a summary of the results of the practices and analysis of the results (5% of the total grade) and a laboratory test that will consist of a cross between two strains of *Drosophila* and a preparation of polytene chromosomes (5% of the total grade). The value of the laboratory will therefore be 10% of the total mark.

Student's portfolio: In addition, the student will be able to increase the final grade of the theoretical knowledge note with his \"portfolio\". The score in this section will be obtained from the tests made during the theory classes and in the group tutorials. The portfolio will only be applicable if the mark obtained in the theory tests and tutorials is equal to or higher than 4 out of 10, and only if the average mark of the tutorials is equal to or higher than 7. Given these two conditions, the theoretical knowledge mark shall be multiplied by a factor of 1.1 if the average mark of the tutorials is between 7 and 8, and by 1.2 if it is between 9 and 10.

Other considerations:

The final mark will be the sum of the marks reached in the different sections, but it can never be higher than 10. To pass the course it will be necessary to obtain an overall mark equal to or higher than 5 out of 10, provided that the marks of the final theory exam, the average of the tutorials, of the problems and of the laboratory are, independently, equal to or higher than 4 out of 10.

For those students who have not passed the subject in the first call, the mark of theoretical knowledge (once the portfolio has been added) or that of the practical part (problems and laboratory) obtained in the first call will be kept for the second call, as long as this is higher than 5 out of 10. The mark obtained from the practical laboratory work is unique and will be kept for the second call and for the following two years if necessary.

Those students that do NOT sit for any of the parts of the final exam in the first call (theory and/or problems), will appear with the grade of NOT PRESENTED.

In order to apply for an advance call of this subject, it is necessary to have done (in any of the previous courses) the laboratory practices of this subject.

REFERENCES

Basic Reading

For theory:

- Pierce, B.A. (2009). *Genetics: A Conceptual Approach*. 3rd edition. Ed. Médica Panamericana. ISBN: 978-84-9835-216-0
- Griffiths, A.J.F., Wessler, S.R., Lewontin, R.C., & Carroll, S.B. (2013). *Genetics*, 9th edition. McGraw-Hill Interamericana. ISBN: 978-84-481-9090-3
- Klug, W., Cummings, M.R., Spencer, C.A., & Palladino, M.A. (2013). *Concepts of Genetics*.



Prentice Hall. (Spanish translation of the 10th edition). ISBN: 978-84-1555-249-9

- Pascual, L. & Moltó, M.D. (1999). *Però, què és això de la Genètica?* Universitat de València. ISBN: 84-370-4157-0

For problem-solving:

- Ménsua, J.L. (2003). *Genetics: Solved Problems and Exercises*. Pearson Prentice Hall. ISBN: 84-205-3341-6
- Pierce, B.A. (2009). *Genetics: A Conceptual Approach*. 3rd edition. Ed. Médica Panamericana. ISBN: 978-84-9835-216-0
- Griffiths, A.J.F., Miller, J.H., Suzuki, D.T., Lewontin, R.C., & Gelbart, W.M. (2002). *Genetics*, 7th edition. McGraw-Hill Interamericana. ISBN: 84-486-0368-0
- Klug, W., Cummings, M.R., & Spencer, C.A. (2006). *Concepts of Genetics*. Prentice Hall. (Spanish translation of the 8th edition). ISBN: 84-205-5014-0

Supplementary Reading

- Atherly, A.G., Girton, J.R., & McDonald, J.F. (1999). *The Science of Genetics*. Saunders College Publishing
- Gardner, E.J., Simmons, M.J., & Snustad, D.P. (2000). *Principles of Genetics*, Alamex, S.L.
- Griffiths, A.J.F., Gelbart, W.M., Miller, J.H., & Lewontin, R.C. (2000). *Modern Genetics*. McGraw-Hill Interamericana
- Hartwell, L., Hood, L., Goldberg, M.L., Reynolds, A.E., Silver, L.M., & Veres, R.C. (2000). *Genetics: From Genes to Genomes*. McGraw-Hill
- Lacadena, J.R. (1999). *General Genetics: Fundamental Concepts*. Ed. Síntesis
- Puertas, M.J. (1999). *Genetics: Fundamentals and Perspectives*, 2nd edition. McGraw-Hill Interamericana
- Russell, P.J. (1998). *Genetics*, 5th edition. Addison Wesley Longman Inc.
- Snustad, D.P., & Simmons, M.J. (2000). *Principles of Genetics*, 2nd edition. John Wiley & Sons, Inc.

Online Resources

- Department of Genetics: <http://www.uv.es/genetica/>
- Spanish Genetics Society: <http://www.segenetica.es/>
It is recommended to visit the teaching section: it includes lessons, problems, and multimedia resources.
- Educational Innovation Plan (PIE) website for the Genetics course: <http://bioweb.uv.es/cursopiloto/genetica>
Among other resources, it contains a booklet with 170 problems and their solutions, a link to a video on handling *Drosophila*, and a link to a Genetics terminology glossary.
- Companion website for *Genetics: A Conceptual Approach*: <http://www.whfreeman.com/pierce3e/>
Includes additional resources such as animations, problem solving, and links of interest.
- *DNA from the Beginning*: <http://www.dnafb.org/>
- Use of *Drosophila* in the laboratory: <http://www.youtube.com/>



- Genetics textbook available as an e-book in the Science Library:
Griffiths, A.J.F., Wessler, S.R., Lewontin, R.C., & Carroll, S.B. (2013). *Genetics*, 9th edition.
McGraw-Hill Interamericana. ISBN: 978-84-481-9090-3