COURSE DATA

Data Subject	
Code	33167
Name	Genetics
Cycle	Grade
ECTS Credits	6.0
Academic year	2023 - 2024

Study (s)

Degree	Center	Acad. year	Period
1102 - Degree in Biotechnology	Faculty of Biological Sciences	2	First term

Subject-matter

Degree	Subject-matter	Character
1102 - Degree in Biotechnology	81 - Foundations of functional biology	Obligatory

Coordination

Name	Department
GONZALEZ CABRERA, JOEL	30 - Biochemistry and Molecular Biology
HERRERO SENDRA, SALVADOR	194 - Genetics

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

OUTCOMES

1102 - Degree in Biotechnology

- 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.
- Learn, develop and apply the main techniques for the preparation, staining and observation of biological samples.
- Be able to observe and interpret the results obtained through optical microscopes.
- Be able to determine the type of inheritance of a certain character.
- Be able to solve practical problems in genetics(including population genetics).

LEARNING OUTCOMES

- Understand and correctly apply the basic genetic concepts. Thus, the student will have to be able to:

1. Understand the importance (and use) of the mutants in the genetic analysis.
2. Calculate the possible gametic types-and their frequencies- from a genotype.
3. Distinguish and analyze the different types of Mendelian segregation based on allelic and / or gene relationships involved.
4. Correctly apply the test of allelism and the concept of gene complementation.
5. Correctly apply the concept of test-cross.
6. Understanding the structure and function of the eukaryotic chromosome.
7. Build genetic maps based on the recombination frequency, as well as other mechanisms.
8. Recognize different types of chromosomal mutations and their effect on the phenotype.

9. Understand the genetic implications of the double helix model of DNA.
10. Understand the molecular basis of mutation and DNA repair.
11. Understand the operation and the inheritance of additive genes.

- Foster in the student the habit of the planned study and independent and continuous learning.
- Develop in students the habit of critical study of different genetic aspects discussed during the program, emphasizing the capacity for synthesis and relationship between various genetic concepts.
- Develop in students the ability and skills to design, plan and carry out laboratory experiments.
- Develop the ability to extend knowledge through the use of bibliographic sources, both from books and journals and web searches.
- Ability to argue based on rational criteria, clearly distinguishing what is arguable from what are accepted scientific facts or evidence.
- Ability to interact with both the teacher and with peers.
- Ability to build a comprehensive written and organized text.
- Acquisition of social and professional awareness on environmental issues and the importance of biodiversity and its conservation.
- Professional training. In this aspect, from the subject of Genetics one tries to develop in students the ability and skills to confront and solve problems of biological nature, especially related to the transmission and functioning of hereditary material.

DESCRIPTION OF CONTENTS

1. Theoretical classes

1 Introduction to Genetics.
2 Basic principles of inheritance.
3 Determination of sex and sex-linked traits.
4 Extensions and modifications of the basic principles.
5 Analysis of pedigrees and genetic testing.
6 Linkage, recombination and mapping of eukaryotic genes.
7 Bacterial and viral genetic systems.
8 Chromosome structural variations.
9 Chromosome numerical variations.
10 Quantitative Genetics.
11 The chemical nature of genes.
12 Gene mutations and DNA repair.

2. Practical classes of problems

1 Mono, dihibridism, binomial distribution, chi-square test
2 Sex linkage
3 Extension of the basic principles
4 Analysis of pedigrees
5 Linkage and recombination
6 Chromosomal mutations
7 Quantitative genetics

3. Practical classes of laboratory

1 Segregation of traits I: Generation P
2 Polytene chromosomes: Observation
3 Segregation of traits II: Generation F1
4 Polytene chromosomes II: Preparation
5 Segregation of traits III Generation F2
6 Practical examination

WORKLOAD

ACTIVITY	Hours	% To be attended
Theory classes	28,00	100
Classroom practices	14,00	100
Laboratory practices	12,00	100
Tutorials	6,00	100
Study and independent work	30,00	0
Preparation of evaluation activities	30,00	0
Preparing lectures	12,00	0
Preparation of practical classes and problem	18,00	0
TOTAL	**150,00**	

TEACHING METHODOLOGY

The development of the course, as to-face work, is structured as follows:

1. Two weekly sessions of theory clases of one hour each.

The aim of these sessions is to present and analyze the basic concepts of the subject with a special interest in highlighting the practical aspects of the same. Prior reading of the chapters by the student is highly recommended. To cover this aspect teaching it is necessary a total of 24 sessions of expositive classes by the teacher, plus 3 group tutoring sessions.

B. Three sessions of group tutoring of two hours each. These three group tutorials (6 hours total), in groups of 16 students, are intended to make a review-discussion of the concepts seen so far. In addition, the final half hour may be devoted to the completion of a written test to objectively evaluate the knowledge acquired by students so far. It is intended that these tutorials will stimulate the sustained study of the subject.

C. Sessions of practical clases of two hours duration. Here are six laboratory sessions in groups of 16 students (12 hours, including examination) and seven sessions of problems in groups of 32 students (14 hours), spread throughout the course.

D. The availability of personal tutorials. Students will be encouraged to utilize this resource to seek advice and to discuss with the teacher any topic about the program, the subject, or the degree.

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

- Para teoría:

Pierce, B.A. (2009). Genética, un enfoque conceptual. 3ª edición. Ed. Médica Panamericana. ISBN: 978-84-9835-216-0

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

Klug, W., Cummings, M.R., Spencer C. A. y Palladino, M.A. (2013). Conceptos de Genética. Prentice Hall. (Traducción de la 10ª ed.). ISBN: 978-84-1555-249-9

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

Para problemas:

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

Pierce, B.A. (2009). Genética, un enfoque conceptual. 3ª edición. Ed. Médica Panamericana. ISBN: 978-84-9835-216-0

Griffiths, A.J.F., Miller, J.H., Suzuki, D.T., Lewontin, R.C. y Gelbart, W.M. (2002). Genética, 7a edición. McGraw-Hill-Interamericana. ISBN: 84-486-0368-0

Klug, W., Cummings, M.R. y Spencer C. A. (2006). Conceptos de Genética. Prentice Hall. (Traducción de la 8ª ed.). ISBN: 84-205-5014-0

Additional

- Atherly, A.G., Girton, J.R. y McDonald, J.F. (1999). The Science of Genetics. Saunders College Publishing.

Gardner, E.J, Simmons, M.J. y Snustad, D.P. (2000). Principios de Genética, Alamex, S.L.

Griffiths, A.J.F., Gelbart, W.M., Miller, J.H. y Lewontin, R.C. (2000). Genética moderna. McGraw-Hill-Interamericana.

Hartewell, L., Hood, L., Goldberg, M.L., Reynolds, A.E., Silver, L.M. y Veres, R.C. (2000). Genetics: from genes to genomes. Ed. McGraw-Hill.

Lacadena, J.R., (1999) Genética General. Conceptos fundamentales. Ed. Síntesis.

Puertas, M.J. (1999). Genética. Fundamentos y Perspectivas. 2ª edición. Ed. Interamericana, McGraw-Hill.

Russell, P.J. (1998). Genetics. 5th ed. Addison Wesley Longman Inc.

Snustad, D.P., y Simmons, M.J. (2000). Principles of Genetics. 2nd edition. John Wiley & Sons, Inc.

- Recursos informáticos:

1. Departamento de Genética
http://www.uv.es/genetica/
2. Sociedad Española de Genética
http://www.segenetica.es/
Se recomienda visitar el apartado de docencia: hay lecciones, problemas y recursos multimedia

3. Página web del PIE (Plan de Innovación Educativa) de la asignatura Genética
http://bioweb.uv.es/cursopiloto/genetica
Entre otras cosas, contiene un cuadernillo con 170 problemas con sus soluciones, un enlace a un vídeo sobre el manejo de Drosophila y un enlace a un vocabulario terminológico de Genética.
4. 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.
5. DNA from the beginning. En inglés.
http://www.dnaftb.org/
6. Uso de Drosophila en el laboratorio
http://www.youtube.com/
7. 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.