COURSE DATA

Data Subject	
Code	33167
Name	Genetics
Cycle	Grade
ECTS Credits	6.0
Academic year	2019 - 2020

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
FERRE MANZANERO, JUAN	194 - Genetics
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, 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 used in the theoretical sessions will be evaluated by performing a final written test (on the content of the whole course) and three written tests in the group tutorials (on part of the subject). The value of the final test will be 45% of the total, and that of the three subtests of 10%. The score in this section shall be obtained by the weighted average of the final theory exam and the average score of the group tutorials, provided that the final exam score is lower than that of group tutorials. Otherwise, the score in this paragraph shall be that of the final exam.
- **Problems**: An evaluation of the student's ability to confront and solve genetic problems will be conducted by a written test at the end of the course. The value of this test shall be 35% of total.
- **Laboratory**: There will be an evaluation of learning achievement in the laboratory. This will be done by evaluating the attendance and by presenting a summary of the results obtained in the laboratory with the analysis of results (5% of the total) and a laboratory examination which will consist in performing a cross between two strains of *Drosophila* and the preparation of polytene chromosomes (5% of the total). The value of the laboratory note shall be 10% of total.
- **Student portfolio**: In addition, the student will be able to increase the final score of the theory mark with his/her "portfolio". The score in this section shall be obtained from tests performed during the group tutorials, possible optional paprs, etc. The portfolio is only applicable if the score obtained in theory equals or exceeds 4, and only if the score in the portfolio is equal to or greater than 7. Given these conditions, the score in Theory will be multiplied by the factor of 1.1 if the score of the portfolio is 7 or 8, and by 1.2 if it is 9 or 10.

Other considerations:

The final score is the sum of the scores obtained in the different sections. To pass the course there will be necessary to obtain an overall score equal or higher than 5 out of 10, provided the theory score (upon addition of the "portfolio") and the score of the problems and laboratory is, independently, equals or higher than 4 out of 10.

For students who have not passed the subject in the first call, the score obtained in the theoretical part or in the practical part (problems and laboratory) obtained in the first call will be saved for the second call, if it is greater than 5 out of 10, unless the student waives them (performing and presenting the corresponding section in the examination in the second call). The score obtained from the laboratory practical work will be saved for the second call if necessary, and also for subsequent years.

Students who do NOT show up in one or both parts of the final exam on the first call (theory and / or problems) will appear in the records as NOT PRESENTED.

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

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.

ADDENDUM COVID-19

This addendum will only be activated if the health situation requires so and with the prior agreement of the Governing Council

English version is not available