



IDENTIFYING DATA

Genetics II

| | | | | |
|-------------------|---|-----------|------|------------|
| Subject | Genetics II | | | |
| Code | V02G030V01505 | | | |
| Study programme | Grado en Biología | | | |
| Descriptors | ECTS Credits | Choose | Year | Quadmester |
| | 6 | Mandatory | 3rd | 1st |
| Teaching language | Spanish English | | | |
| Department | | | | |
| Coordinator | Carvajal Rodríguez, Antonio Caballero Rúa, Armando | | | |
| Lecturers | Arenas Busto, Miguel Caballero Rúa, Armando Canchaya Sanchez, Carlos Alberto Carvajal Rodríguez, Antonio Galindo Dasilva, Juan Novo Giménez, Irene Pérez Diz, Ángel Eduardo Pérez Pereira, Noelia Rolán Álvarez, Emilio | | | |
| E-mail | acraaj@uvigo.es armando@uvigo.es | | | |
| Web | | | | |

General description The subject Genetics II is an extension of the specific contents of Genetics taught in Genetics I. The topics covered in this subject include the structure of genomes, mutation and repair of genetic material, recombinant DNA technology, population genetics, evolution and the inheritance of quantitative traits. The lectures will be complemented with practical sessions in which the students will be able to exercise the knowledge acquired in the theoretical classes. As a complement to face-to-face training, this course has an online learning platform that implements the new technologies of learning and knowledge with the functioning of the subject, facilitating the personalized work and the integration of different sources of information.

Skills

| | |
|------|--|
| Code | |
| A1 | Students should prove understanding and knowledge in this study field that starts in the Secondary Education and with a level that, even though it is supported in advanced books, also includes some aspects that involve knowledge from the vanguard of the study field. |
| A2 | Students should know how to apply their knowledge to their work or vocation in a professional way. They also should have the competences that are usually proved through the elaboration and defence of arguments and the resolution of problems within their study field. |
| A3 | Students should prove ability for information-gathering and interpret important data (usually within their study field) to judge relevant social, scientific or ethical topics. |
| A4 | Students should be able to communicate information, ideas, issues and solutions to all audiences (specialist and unskilled audience). |
| B2 | Ability of reading and analyzing scientific papers and having critical assessment skills to understand data collection, deducing the main idea from the least relevant ones and basing on the corresponding conclusions. |
| B3 | Acquisition of general knowledge about the basic subjects of biology, both at theory and experimental level, without dismissing a higher specialization in subjects that are oriented to a concrete professional area. |
| B4 | Ability in handling experimental tools, both scientific and computer technology equipment that support the search for solutions to problems related to the basic knowledge of biology and with those of a concrete labour context. |
| B5 | Understanding of the levels of organization of living beings from a structural (molecular, cellular and organic) and functional point of view by observing their relations with the environment and other organisms, as well as their appearances in situations of environmental alteration. |
| B7 | Collection of information about issues of biologic interest, analysis and emission of critical opinions and reason them including the reflection about social and/or ethical aspects related to the issue. |

| | |
|-----|--|
| B10 | Development of analytic and abstraction skills, the intuition and the logical and rigorous thought through the study of biology and its uses. |
| B11 | Ability to communicate in detail and clearly: knowledge, methodology, ideas, issues and solutions to all audiences (not only qualified but unskilled in Biology). |
| B12 | Ability to identify their own educational necessities in the biology field and in concrete labour areas and to organize their learning with a high grade of autonomy in any context. |
| C2 | Recognizing different levels of Living systems organization. Performing phylogenetic analysis and identifying evidence of evolution. |
| C3 | Identifying, analysing and characterizing biological samples, including those of human origin, and possible anomalies. |
| C4 | Isolating, analysing and identifying biomolecules, viruses, cells, tissues and organs. |
| C7 | Manipulating and analysing genetic data and carrying out genetic counseling |
| C10 | Analysing and assessing the adaptation of living beings to the environment. |
| C11 | Sampling, characterizing, managing, preserving and restoring Populations, Communities and Ecosystems. |
| C16 | Growing, producing, transforming, improving biological resources as well as getting profits. |
| C20 | Designing, using and supervising biotechnological processes. |
| C21 | Processing and interpreting bioassays and biological diagnoses. |
| C24 | Designing biological process models. |
| C25 | Gathering background information, develop experimental work and analysing data results |
| C31 | Knowing and handling technical and scientific apparatus. |
| C32 | Knowing and handling basic or specific key concepts and terminology |
| C33 | Understanding the social projection of Biology. |
| D1 | Development of capacity of analysis and synthesis |
| D2 | Acquisition of the organization and planning capacity for tasks and time |
| D3 | Development of oral and writing communication abilities |
| D4 | Acquisition of foreign language knowledge related to the study field |
| D5 | Use of computer resources related to the study field |
| D6 | Research and interpreting of information from different sources |
| D7 | Resolution of issues and decision making in an effective way |
| D8 | Development of the ability of independent learning |
| D9 | Ability to work in collaboration or creating groups with an interdisciplinary character |
| D10 | Development of the critical thinking |
| D11 | Adquisition of an ethical agreement with the society and the profession |
| D12 | Respectful behaviour to diversity and multiculturalism |
| D13 | Sensitivity for environmental issues |
| D14 | Adquisition of abilities in the interpersonal relationships |
| D15 | Development of creativity, initiative and enterpreneurial spirit |
| D16 | Acceptance of a quaility commitment |
| D17 | Development of the self-criticism ability |
| D18 | Development of negotiating power |

Learning outcomes

| Expected results from this subject | Training and Learning Results | | | |
|---|-------------------------------|-----|-----|-----|
| (*) | | | | |
| To know and understand the evolutionary mechanisms and models | A1 | B2 | C2 | D1 |
| | A2 | B3 | C3 | D2 |
| | A3 | B4 | C4 | D3 |
| | A4 | B5 | C7 | D4 |
| | | B7 | C10 | D5 |
| | | B10 | C11 | D6 |
| | | B11 | C16 | D7 |
| | | B12 | C20 | D8 |
| | | | C21 | D9 |
| | | | C24 | D10 |
| | | | C25 | D11 |
| | | | C31 | D12 |
| | | | C32 | D13 |
| | | | C33 | D14 |
| | | | | D15 |
| | | | | D16 |
| | | | | D17 |
| | | | | D18 |

To know and understand the genetic basis of systematics and phylogeny

| | | | |
|----|-----|-----|-----|
| A1 | B2 | C2 | D1 |
| A2 | B3 | C3 | D2 |
| A3 | B4 | C4 | D3 |
| A4 | B5 | C7 | D4 |
| | B7 | C10 | D5 |
| | B10 | C11 | D6 |
| | B11 | C16 | D7 |
| | B12 | C20 | D8 |
| | | C21 | D9 |
| | | C24 | D10 |
| | | C25 | D11 |
| | | C31 | D12 |
| | | C32 | D13 |
| | | C33 | D14 |
| | | | D15 |
| | | | D16 |
| | | | D17 |
| | | | D18 |

To know and understand the genetic diversity

| | | | |
|----|-----|-----|-----|
| A1 | B2 | C2 | D1 |
| A2 | B3 | C3 | D2 |
| A3 | B4 | C4 | D3 |
| A4 | B5 | C7 | D4 |
| | B7 | C10 | D5 |
| | B10 | C11 | D6 |
| | B11 | C16 | D7 |
| | B12 | C20 | D8 |
| | | C21 | D9 |
| | | C24 | D10 |
| | | C25 | D11 |
| | | C31 | D12 |
| | | C32 | D13 |
| | | C33 | D14 |
| | | | D15 |
| | | | D16 |
| | | | D17 |
| | | | D18 |

To know and understand the genetic basis of adaptation to the environment

| | | | |
|----|-----|-----|-----|
| A1 | B2 | C2 | D1 |
| A2 | B3 | C3 | D2 |
| A3 | B4 | C4 | D3 |
| A4 | B5 | C7 | D4 |
| | B7 | C10 | D5 |
| | B10 | C11 | D6 |
| | B11 | C16 | D7 |
| | B12 | C20 | D8 |
| | | C21 | D9 |
| | | C24 | D10 |
| | | C25 | D11 |
| | | C31 | D12 |
| | | C32 | D13 |
| | | C33 | D14 |
| | | | D15 |
| | | | D16 |
| | | | D17 |
| | | | D18 |

To know and understand the genetic structure and population dynamics

| | | | |
|----|-----|-----|-----|
| A1 | B2 | C2 | D1 |
| A2 | B3 | C3 | D2 |
| A3 | B4 | C4 | D3 |
| A4 | B5 | C7 | D4 |
| | B7 | C10 | D5 |
| | B10 | C11 | D6 |
| | B11 | C16 | D7 |
| | B12 | C20 | D8 |
| | | C21 | D9 |
| | | C24 | D10 |
| | | C25 | D11 |
| | | C31 | D12 |
| | | C32 | D13 |
| | | C33 | D14 |
| | | | D15 |
| | | | D16 |
| | | | D17 |
| | | | D18 |

Contents

| Topic | |
|----------------------------|--|
| Mutation and recombination | Molecular basis of mutation and repair Chromosomal mutations Recombination Transposable elements |
| Genetic engineering | Cloning Molecular markers Applications of recombinant DNA |
| Genomics | Genome organization and structure Genome evolution Functional genomics |
| Population genetics | Hardy-Weinberg equilibrium Linkage disequilibrium Genetic drift and inbreeding Mutation and migration |
| Evolutionary genetics | Natural selection Molecular evolution Speciation |
| Quantitative genetics | Quantitative trait analysis Artificial selection |

Planning

| | Class hours | Hours outside the classroom | Total hours |
|----------------------------|-------------|-----------------------------|-------------|
| Introductory activities | 1 | 0 | 1 |
| Lecturing | 25 | 40 | 65 |
| Problem solving | 8 | 24 | 32 |
| Practices through ICT | 15 | 6 | 21 |
| Autonomous problem solving | 0 | 31 | 31 |

*The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.

Methodologies

| | Description |
|-------------------------|---|
| Introductory activities | The objective is to define and focus the Genetics II subject describing the working method to be followed |
| Lecturing | The master sessions of the program are organized in 50-minute classes. In most cases they will be devoted to explain and develop basic concepts and methodologies, but due to the time constraints students must work autonomously |
| Problem solving | Classes of problems and exercises have as a basic mission to integrate and apply knowledge acquired in the theoretical classes. In an experimental science such as genetics learning using a problem-based approach is an essential didactic resource |
| Practices through ICT | The aim of the practices in the computer classroom is to obtain an overview of the different contents of the subject. There will be 5 practical sessions of 3 hours each, in which activities will be carried out with the following contents: Mutation: Luria-Delbrück fluctuation experiment. Sequence search by similarity and annotation. Searches in Genome Databases. Genetic drift. Estimates of diversity in a population. Selection and differentiation. |

| | |
|----------------------------|--|
| Autonomous problem solving | One of the competences that the student should achieve throughout their training is the ability to work autonomously. It is necessary to provide non-presential activities to guide them in this learning. The teledocencia platform MooVi will be used. |
|----------------------------|--|

Personalized assistance

| Methodologies | Description |
|----------------------------|---|
| Autonomous problem solving | The student's learning process that complements the lectures and practices will take place through the development of autonomous activities through the platform MooVi. In this platform the student will find the material with the presentations of the classes of theory, complementary reading, useful documents for studying and completing theoretical classes, practice lists, lists of problems and exercises to be performed within a given period, and self-evaluation. The lecturers will reserve a time to attend and solve the students' doubts, both for the master classes, as for the seminars and practical classes. In these activities the lecturer will guide the learning process of the students and help them to successfully carry out the corresponding autonomous work. Lecturers will indicate the first days of class the procedure to carry out that personalized attention. |

Assessment

| | Description | Qualification | Training and Learning Results | | | |
|----------------------------|---|---------------|-------------------------------|-----|-----|-----|
| Lecturing | - Two tests during the course | 45 | A1 | B2 | C2 | D1 |
| | - Final examination | | A2 | B3 | C3 | D3 |
| | - Assistance to the face-to-face activities | | A3 | B5 | C4 | D4 |
| | | | | B7 | C10 | D6 |
| | | | | B10 | C11 | D10 |
| | | | | | C16 | D11 |
| | | | | | C20 | D12 |
| | | | | | C21 | D13 |
| | | | | | C24 | D15 |
| | | | | | C25 | D16 |
| | | | | | C32 | D17 |
| | | | | | C33 | D18 |
| Problem solving | - Two tests during the course | 30 | A1 | B3 | C2 | D1 |
| | - Final examination | | A2 | B4 | C3 | D2 |
| | - Assistance to the face-to-face activities | | A3 | B11 | C10 | D6 |
| | - Resolution of problems | | A4 | B12 | C11 | D7 |
| | | | | | C16 | D8 |
| | | | | | C20 | D9 |
| | | | | | C21 | D10 |
| | | | | | C24 | D14 |
| | | | | | C25 | D16 |
| | | | | | C32 | D17 |
| Practices through ICT | - Assistance and performance | 15 | A1 | B4 | C7 | D1 |
| | - Written examination | | A2 | B12 | C10 | D5 |
| | | | A3 | | C24 | D6 |
| | | | | | C25 | D7 |
| | | | | | C31 | D8 |
| | | | | | C32 | D9 |
| | | | | | C33 | D10 |
| Autonomous problem solving | - Online and other evaluations | 10 | A1 | B2 | C2 | D1 |
| | - Presentation of exercises within the established deadline | | A2 | B3 | C10 | D2 |
| | | | A3 | B4 | C24 | D3 |
| | | | | B7 | C32 | D4 |
| | | | | B10 | C33 | D5 |
| | | | | B12 | | D6 |
| | | | | | | D7 |
| | | | | | | D10 |
| | | | | | | D11 |
| | | | | | | D17 |

Other comments on the Evaluation

The subject will be evaluated in the following way:

- Final examination, that will imply 55% of the final qualification. To pass the subject it will be necessary to obtain a minimum of 5 points (out of 10) in that final examination. If this minimum is not obtained, the final qualification of the subject will be that obtained with the whole of qualifications, if that is lower than 5, or 4.5 if higher than 5. The examination

will consist of questions about theory and problems. Final exam date can be checked in the following link: <http://bioloxia.uvigo.es/en/teaching/exams>.

- Two tests carried out during the course, that will imply 20% of the final qualification and will consist of questions of theory and problems.

- Assistance and performance during the realisation of the practices in the classroom of computers. Written examination on the practices. This complete activity will be 15% of the final qualification.

- On-line and other type of activities and required exercises, that will imply 10% of the final qualification. At the end of each subject there will be a deadline to handle exercises via platform TEMA.

To pass the subject it will be necessary to obtain 5 points of 10 in the global qualification.

All qualifications, except that of the final exam, will be saved for the second opportunity in July, and indefinitely for later courses.

The students not attending the final examination will be marked as "No Presentado".

Any attempt to carry out illegal activities in the examinations (copy, etc.), as well as the plagiarism in the activities will imply a failure of the subject.

TEACHING SCHEDULE: <http://bioloxia.uvigo.es/en/teaching/schedules>

EXAMS SCHEDULE: <http://bioloxia.uvigo.es/en/teaching/exams>

Sources of information

Basic Bibliography

Benito, C., Espino, F. J., **Genética: Conceptos esenciales**, Médica Panamericana, 2013

W.S. Klug, M.R. Cummings, C.A. Spencer, M.A. Palladino, **Concepts of Genetics**, Pearson, 2014

A.J.F. Griffiths, S.R. Wessler, S.B. Carroll, J. Doebley, **Introduction to Genetic Analysis**, W. H. Freeman, 2010

Complementary Bibliography

Caballero, A., **Genética Cuantitativa**, Síntesis, 2017

Fontdevila, A., Moya, A., **Introducción a la Genética de Poblaciones**, Síntesis, 2017

Caballero, A., **Quantitative Genetics**, Cambridge University Press, 2020

Recommendations

Subjects that it is recommended to have taken before

Biochemistry I/V02G030V01301

Biochemistry II/V02G030V01401

Genetics I/V02G030V01404

Contingency plan

Description

=== EXCEPTIONAL PLANNING ===

Given the uncertain and unpredictable evolution of the health alert caused by COVID-19, the University of Vigo establishes an extraordinary planning that will be activated when the administrations and the institution itself determine it, considering safety, health and responsibility criteria both in distance and blended learning. These already planned measures guarantee, at the required time, the development of teaching in a more agile and effective way, as it is known in advance (or well in advance) by the students and teachers through the standardized tool.

=== ADAPTATION OF THE METHODOLOGIES ===

* Teaching methodologies modified

If necessary, both theoretical and practical lessons will be followed face-to-face by a reduced group of students and at distance by the remaining students. The face-to-face group will rotate.

* Non-attendance mechanisms for student attention (tutoring)

Tutoring will be performed via telematics, individually or in groups, using the virtual campusm("campus remoto") following the schedule defined by the Center as well as the date and hours previously agreed with the students by email.

=== ADAPTATION OF THE TESTS ===

Mixed mode: No changes.
