UNIVERSIDADE DA CORUÑA

Teaching Guide				
Identifying Data				2014/15
Subject (*)	Xenética		Code	610G02019
Study programme	Grao en Bioloxía			
Descriptors				
Cycle	Period	Year	Type	Credits
Graduate	2nd four-month period	Second	Obligatoria	6
Language	SpanishGalicianEnglish			
Prerequisites				
Department	Bioloxía Celular e Molecular			
Coordinador	Gonzalez Tizon, Ana Maria	E-mail	ana.gonzalez.tizon@udc.es	
Lecturers	Gonzalez Tizon, Ana Maria Insua Pombo, Ana Maria Martinez Lage, Andres Vila Taboada, Marta	E-mail	ana.gonzalez.tizon@udc.es ana.insua@udc.es andres.martinez@udc.es marta.vila.taboada@udc.es	
Web				
General description	Esta materia proporciona os coñecementos básicos sobre a herdanza e a variación dos seres vivos, así como a base metodolóxica propia da análise xenética mendeliana. Complementa outras materias do grao e aporta a base conceptual necesaria para profundar no estudo da Xenética, contemplado nas materias Xenética Molecular (obrigatoria de 3º curso), Xenética Evolutiva e de Poboacións (obrigatoria de 3º curso), e Citoxenética (optativa).			

Study programme competences	
Code	Study programme competences
A1	Recoñecer distintos niveis de organización nos sistemas vivos.
A2	Identificar organismos.
A4	Obter, manexar, conservar e observar especímenes.
A11	Identificar e analizar material de orixe biolóxica e as súas anomalías.
A12	Manipular material xenético, realizar análises xenéticas e levar a cabo asesoramento xenético.
A20	Muestrear, caracterizar e manexar poboacións e comunidades.
A26	Deseñar experimentos, obter información e interpretar os resultados.
A29	Impartir coñecementos de Bioloxía.
A30	Manexar adecuadamente instrumentación científica.
A31	Desenvolverse con seguridade nun laboratorio.
B1	Aprender a aprender.
B2	Resolver problemas de forma efectiva.
B3	Aplicar un pensamento crítico, lóxico e creativo.
B4	Traballar de forma autónoma con iniciativa.
B5	Traballar en colaboración.
B6	Organizar e planificar o traballo.
B8	Sintetizar a información.
B9	Formarse unha opinión propia.
C1	Expresarse correctamente, tanto de forma oral coma escrita, nas linguas oficiais da comunidade autónoma.
C2	Dominar a expresión e a comprensión de forma oral e escrita dun idioma estranxeiro.
C3	Utilizar as ferramentas básicas das tecnoloxías da información e as comunicacións (TIC) necesarias para o exercicio da súa profesión e para a aprendizaxe ao longo da súa vida.

Learning outcomes	
Subject competencies (Learning outcomes)	Study programme competences

Mendelian genetic analysis: the gene as unit of inheritance	A1 A12 A26 A29 A30 A31	B1 B2 B3 B5	C1 C2 C3
To study the chromosomal basis of inheritance, sex determination, extranuclear inheritance as well as genetic linkage and recombination.	A1 A4 A12 A26 A29 A30 A31	B1 B2 B3 B4 B5 B6 B9	C1 C2 C3
To learn about changes in the genetic material	A2 A11 A26 A29	B1 B2 B3 B5 B9	C1 C2 C3
To set the basis of quantitative and population genetics	A1 A20 A26 A29 A30 A31	B1 B2 B3 B5 B6 B8	C1 C2 C3

Contents	
Topic	**Sub-topic**
1. Introduction to Genetics	Definition of Genetics History of Genetics Genetics and other sciences Genetics and society
2. Mendelian Genetics	Mendel?s experiments: mono and dihibrid crosses Concept of geno and phenotype Terms and symbols Pedigree analysis
3. Chromosomal Basis of Inheritance and Sex Determination	Genetic implications of mitosis and meiosis Chromosomal theory of inheritance Sex determination Sex-linked inheritance Sex-limited and sex-influenced traits Gene dosage compensation
4. Extensions of and Deviations from Mendelian Genetic Principles	Modification of dominante relationships Multiple alleles Lethality Penetrance and expressivity Pleiotropy Gene interaction and epistasis Position effect Environmental interactions

5. Extranuclear Inheritance	Maternal effect Maternal inheritance General features of mitochondrial and chloroplast genomes Heteroplasmy Infectious heredity
6. Genetic Mapping in Eukaryotes	Linkage, recombination and mapping of genes on chromosomes Interference and coincidence Genetic map function: connecting recombination fractions and genetic map distances
7. Genetic Analysis and Mapping in Bacteria and Bacteriophages	Bacterial transformation Bacterial conjugation: plasmids and episomes Generalized and specialized transduction Genetic recombination in bacteriophages. Fine structure of the gene: rII system of phage T4
8. Quantitative Genetics	Quantitative traits Genes and environment Phenotypic distribution and norms of reaction Genetic basis of quantitative traits: Johannsen?s experiment Polygenic inheritance: Nilsson-Ehle?s experiment Heritability
9. Population Genetics	Mendelian population Genetic variation Allele and genotype frequencies Random mating and Hardy-Weinberg equilibrium Evolutionary forces: mutation, migration, random drift, and selection
10. The Nature of Genetic Material	Discovery of bacterial transformation DNA as source of genetic information: Hershey & Chase?s experiment RNA as genetic material in viruses Structure and properties of nucleic acids
11. DNA Organization in Chromosomes	Genome size: the C-value paradox Bacterial chromosomes Eukaryote chromosomes DNA packaging: Nucleosomes and Chromatin Centromeres and Telomeres Lampbrush and polytene chromosomes Karyotype
12. DNA Mutation	Random and adaptive mutation Mutant types Spontaneous and induced mutation Detecting mutagens: the Ames test
13. Variations in Chromosome Structure	Deletions Duplications Inversions Translocations Robertsonian fusions/dissociations
14. Variations in Chromosome Number	Euploidy and aneuploidy Monoploidy Polyploidy: Autopolyploidy and Allopolyploidy Aneuploidy: meiotic nondisjunction, monosomy, trisomy Somatic aneuploidy: mitotic nondisjunction, sexual mosaics B chromosomes

Teaching labs	Lab 1. GENETIC ANALYSIS IN CORN (Zea mays): INTERACTION AND EPISTASIS. Description of shape and colour of F2 seeds (kernel) obtained from different crosses Hypothesis testing (chi-square) Inference of genotype and phenotype of generations P and F1 Genetic and Biochemistry basis of the observed phenotypes Lab 2. SETTING UP EXPERIMENTS USING Drosophila. Raising and handling Drosophila in the lab Life cycle Analysing fruit flies: distinguishing sex, why isolating virgin females, observation of some mutant phenotypes Lab 3. LINKAGE MAPPING IN D. melanogaster. Reciprocal crosses between wild and three-factor mutant (yellow, white y miniature) Analysis of Offspring (F1) Testcrosses, analysis of offspring (F2) and statistical approach to determine the linkage order and map distances between the three loci on Drosophila chromosomes (calculation of frequencies of recombination, coincidence coefficient and interference) Lab 4. POLYTENE CHROMOSOME OF THE SALIVARY GLANDS OF D. buzzatii. Extraction of larval salivary glands Staining with orcein Identification of polytene chromosomes and the sex of larva Chromosome puffing Lab 5. COMPUTER LAB. Introduction to bioinformatics databases and resources offered through the NCBI Getting familiar with the following databases: PUBMED, BOOKS, TAXONOMY, OMIM.

Planning			
Methodologies / tests	Ordinary class hours	Student?s personal work hours	Total hours
Laboratory practice	15	22.5	37.5
Mixed objective/subjective test	2.5	0	2.5
Supervised projects	8	16	24
Guest lecture / keynote speech	24	60	84
Personalized attention	2	0	2
(*)The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.			

Methodologies	
Methodologies	Description
Laboratory practice	The teaching labs are designed to allow groups of students to work side by side in order to (i) better comprenhend certain issues of the syllabus and (ii) see ?real? science as approachable, accessible and exciting. Each lab relies on a theoretical basis (teacher explanation + reading assignment) and a hands-on activity.
Mixed objective/subjective test	The final exam is usually composed by a multiple choice/true-false set, short-answer questions, and a set of genetic problems.

Supervised projects	Group work: students will be assigned a maximum of four sets of genetic problems, whose written solutions have to be handed in for evaluation by certain deadlines. Additional group activities may be assigned for the sake of a better comprehension of particular issues.
Guest lecture / keynote speech	Master class and reading groups: the teacher will explain the main contents of each lesson and will assign texts for further reading. Working with small groups will allow the exchange of ideas among students, under direct supervision of the lecturer.

Personalized attention	
Methodologies	**Description**
Supervised projects	All students are welcome to receive regular tuition in both theory and practical issues of the subject. Individual or group appointments may be arranged with the teacher.

Assessment		
Methodologies	**Description**	**Qualification**
Mixed objective/subjective test	The final exam (test, short-answer, set of problems) aims at evaluating student's performance by (i) showing his/her understanding of theoretical concepts and (ii) developing problem-solving strategies. Evaluation of this activity aims at checking the acquisition of the following competencies: A1, A11, A12, A20, A26, A29	60
Laboratory practice	Laboratory attendance is mandatory. Pass mark of 50% in the corresponding lab test. Evaluation of this activity aims at checking the acquisition of the following competencies: A1, A2, A4, A11, A12, A26, A29, A30, A31.	15
Supervised projects	Group work is not mandatory in order to pass the subject. Grading will reflect the students' comprehension of the topic, their analytical skills, as well as how well the assignment is written and presented. Evaluation of this activity aims at checking the acquisition of the following competencies: A1, A2, A11, A12, A20, A26, A29	25

Assessment comments
To pass the subject, students must score at least 50% pass in Laboratory Practice as well as 50% in Mixed objective/subjective test. Marks obtained in Laboratory Practice or Mixed objective/subjective test will be kept for the July examination session if scored at least 50% pass. Marks obtained in Mixed objective/subjective test will be kept for the next two years (i.e., four consecutive examination sessions) if scored at least 50% pass. The course will appear as "Not attended" only if the student did not attended/handed in any of the labs, examinations, and/or supervised projects. Students scoring the maximum mark in both the mixed objective/subjective test and the supervised projects (6 and 2.5 points, respectively), but failing in laboratory practice, will obtain a final grading of 4.5 (fail).

Sources of information	
Basic	
Complementary	

Recommendations
Subjects that it is recommended to have taken before
Xenética molecular/610G02020 Xenética de poboacións e evolución/610G02021 Citoxenética/610G02022

Subjects that are recommended to be taken simultaneously
Subjects that continue the syllabus
Estatística/610G02005 Citoloxía/610G02007 Histoloxía/610G02008 Bioquímica: Bioquímica I/610G02011
Other comments
Attending class regularly is one strategy to maintain satisfactory academic progress. Relying on Moodle notes is not enough to pass at the higher education level!Asking questions in class if you do not understand the material presented.The more you read, do homework, participate in class, the more familiar you will become with content, which is a strategy to help you pass.You will also be expected to read other materials in addition to the textbook to give you differing viewpoints and to develop your critical thinking.You are most welcome to set up meetings with your instructors to discuss any issue about the subject.