Teaching Guide				
Identifying Data				2020/21
Subject (*)	Genetic Variation Mechanisms		Code	610441005
Study programme	Mestrado Universitario en Bioloxía Molecular , Celular e Xenética			
Descriptors				
Cycle	Period	Year	Type	Credits
Official Master's Degree	1st four-month period	First	Obligatory	3
Language	SpanishEnglish			
Teaching method	Face-to-face			
Prerequisites				
Department	Bioloxía			
Coordinador	Gonzalez Tizon, Ana Maria	E-mail	ana.gonzalez.tizon@udc.es	
Lecturers	Gonzalez Tizon, Ana Maria Vila Sanjurjo, Antón	E-mail	ana.gonzalez.tizon@udc.es anton.vila@udc.es	
Web	cie48.udc.es			
General description	It aims to deepen the knowledge of the various mechanisms that generate genetic variation, both in the aspect of their molecular basis and in their impact on genomes.			
Contingency plan	1. Modifications to the contents No variations 2. Methodologies Guest lectura CONTINGENCY PLAN: Students who attend the course will be treated in the same way as semi-attendants, in the case of confinement. Long answer / essay questions CONTINGENCY PLAN: Students who attend the course will be treated in the same way as semi-attendants, in the case of confinement. Document analysis CONTINGENCY PLAN: the face-to-face students will be treated in the same way as semi-face-to-face students, in the case of confinement. All works will be uploaded to the Moodle platform, after review by the teachers of the subject. Laboratory practices CONTINGENCY PLAN: in the case of confinement the practices will be reconverted or replaced in computer analysis working with different genomic sequences. 3. Mechanisms for personalized attention to students CONTINGENCY PLAN: in the case of confinement, students will request tutoring and this will be done via TEAMS or e-mail, both for PRESENT and SEMI-PRESENT students. 4. Modifications in the evaluation There is no variation 5. Modifications to the bibliography or webgraphy CONTIXITY PLAN: the same treatment will be applied (we will provide suitable webography) in the Moodle platform.			

Study programme competences / results	
Code	Study programme competences / results
A3	Skills of understanding the functioning of cells through the structural organization, biochemistry, gene expression and genetic variability.
A6	Skills of understanding the functioning of cells through the structural organization, biochemistry, gene expression and genetic variability.

A11	Skills of understanding the structure, dynamics and evolution of genomes and to apply tools necessary to his study.
A12	Skills to understand, detect and analyze the genetic variation, knowing genotoxicity processes and methodologies for its evaluation, as well as carrying out diagnosis and genetic risk studies.
A13	Skills to become a professional in health, pharmacy, veterinary, animal production, biotechnology or food sectors.
B1	Analysis skills to understand biological problems in connection with the Molecular and Cellular Biology and Genetics.
B2	Skills of decision making for the problem solving: that are able to apply theoretical knowledges and practical acquired in the formulation of biological problems and the looking for solutions.

Learning outcomes			
Learning outcomes	Study programme competences / results		
Comprehensive reading of scientific texts related to the module subjects	AR3	BR1	
Ability to expose the current state of knowledge within this field	AR6	BR2	
Critical ability to evaluate hypotheses and interpret results	AR11		
Understanding cell structure and function from an interdisciplinary vision in which Cell Biology, classical Cytology, Genetics and Molecular Biology converge	AR12		
Understanding of the biochemical and physiological processes that allow signaling between cells and with structural elements, as well as the causative aspects of pathologies related to alterations in cell signaling and the tools used for your study	AR13		
Know the experimental techniques to access the study of the molecular mechanisms of regulation of gene expression as well as the molecular machinery involved and their regulatory systems			
To know the characteristics of the proteins and complexes involved in the regulation of gene expression, their interaction with genetic material and the enzymatic reactions that modulate their activity.			
To know the mechanisms that cause genetic variability			

Contents	
Topic	Sub-topic
Unit 1. Genetic variation: mutation	Genetic variation and its significance. Origin and consequences of mutation. Chromosome rearrangements. Mutation rates. Reversion and supression.
Unit 2. Mobile DNA	Abundance in the genomes. Classification of transposable elements. Proliferation Molecular evolution. Impact on the genomes. Domestication
Unit 3.Genetic recombination	Recombination rates. Gene conversion. Sexual dimorphism and recombination rate, crossing-over and gene conversion. Gene conversion bias.
Unit 4. Evolution of scientific thought regarding the origin of genetic variability. Woese's contribution.	Cellular evolution: the path "bumpy" to "who knows where." History of evolutionary thought. State of Microbiology (and Virology) during most of the 20th century. Carl Woese. LUCA. Generation of genetic variability in the beginning of life.
Unit 5. Microbial evolution in the genomics era.	The turbulent dynamics of microbial evolution. Damned concepts of classical genetics: genetic elements with a Lamarckian flavor? Evolution of Evolvability?
Unit 6. The mysterious world of viruses.	Are viruses alive? Evolution of viruses and viral replicons. Viral Population Dynamics Models

Planning				
Methodologies / tests	Competencies / Results	Teaching hours (in-person & virtual)	Student?s personal work hours	Total hours
Guest lecture / keynote speech	A6 A11 A12 A13 B1	10	20	30
Long answer / essay questions	B1 B2	2	8	10
Document analysis	A3 A6 A11 A12 B1	4	10	14
Laboratory practice	A3 A11	10	10	20
Personalized attention		1	0	1
(*)The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.				

Methodologies	
Methodologies	Description
Guest lecture / keynote speech	In the case of the FULLY ATTENDING students, the contents of the program will be lectured during each master session. In the case of SEMI-ATTENDING students, the content of master sessions (exactly the same content) will be uploaded to Moodlem, either in recorded or written form. CONTINGENCY PLAN: FULLY ATTENDING students will have the same treatment as SEMI-ATTENDING students, in case of confinement.
Long answer / essay questions	Written test that will cover any aspect addressed in Theory and Lab classes. FULLY ATTENDING students, the test will take place in a regular classroom at the "Fcultade de Ciencias". SEMI-ATTENDING students, the written test will be done through Moodle or TEAMS, the same day and at he same time as the FULLY ATTENDING students CONTINGENCY PLAN: FULLY ATTENDING students will be treated in the same way as SEMI-ATTENDING students, in case of confinment.
Document analysis	FULLY ATTENDING and SEMI-ATTENDING students will read a series of research articles related to the topic. This work will be reflected in a power point preparation that will be presented and presented in the classroom (in the case of FULLY ATTENDING students), or in writing (in the case of SEMI-ATTENDING students). CONTINGENCY PLAN: FULLY ATTENDING students will have the same treatment as SEMI-ATTENDING students, in case of internment. All the works will be uploaded to the Moodle platform, after review by the teachers of the subject.
Laboratory practice	The laboratory practices are as follows: Practice 1: PCR amplification of DNA sequences Practice 2: electrophoresis of PCR products Practice 3: Work with bioinformatic tools for the analysis of PCR product CONTINGENCY PLAN: in case of confinement, the practices will be reconverted or replaced in computer analysis working with different genomic sequences.

Personalized attention	
Methodologies	Description
Document analysis	STUDENT ATTENDANCE: Students will be able to attend the teachers' tutorials at the times previously established or agreed SEMI-ATTENDING STUDENTS: they will request tutoring sessions which they will receive via Teams, email or Moodle platform. CONTINGENCY PLAN: in case of confinement, students will request tutoring sessions which they will receive via Teams, email or Moodle platform.

Assessment			
Methodologies	Competencies / Results	Description	**Qualification**

Laboratory practice	A3 A11	Attendance to lab sessions and execution of exercises proposed by the teacher will be graded. For the monitoring and grading of learning, students must prepare and present a practical notebook with its introduction, materials and methods, description of results and conclusions. In this activity the acquisition of competence A5 will be evaluated.	15
Document analysis	A3 A6 A11 A12 B1	Os estudantes leerán varios artigos de investigación e realizarán unha presentación en power point de 10-12 minutos de duración	15
Long answer / essay questions	B1 B2	Test de resposta múltiple sobre os contenidos teóricos e prácticos. Cando menos o 50% da proba será en inglés. Nesta actividade avaliarase a adquisición das competencias A5, A9, A16.	70

Assessment comments

Sources of information	
Basic	- E.C. Friedberg et al. (2006). DNA repair and mutagenesis. Second edition. ASM Press - N L Craig et al. (2002). Mobile DNA II. ASM Press - Gibson, G. (2009). A primer of genome science. Sinauer Associates - Meyers, R. A. (2007). Genomics and genetics: from molecular details to analysis and techniques. Wiley-VCH - Weiner, M. P., Gabriel, S., and Claibo, J. (2007). Genetic variation: a laboratory manual. Cold Spring Harbor Laboratory Press
Complementary	- Watson et al. (2004). Molecular Biology of the gene. Fifth edition. Pearson-Cummings - R Scott Hawley, MY Walker (2003). Advanced genetic analysis. Finding meaning in a genome. . Blackwell Publishing - J. M. Coffin et al. (1997). Retroviruses. Cold Spring Harbor Laboratory Press - Hartl, D. L. (2009). Genetics: analysis of genes and genomes. Jones and Bartlett

Recommendations
Subjects that it is recommended to have taken before
Genomics /610441014 Human Genetics/610441016 Genetic Toxicology /610441017
Subjects that are recommended to be taken simultaneously
Subjects that continue the syllabus
Other comments

(*)The teaching guide is the document in which the URV publishes the information about all its courses. It is a public document and cannot be modified. Only in exceptional cases can it be revised by the competent agent or duly revised so that it is in line with current legislation.