Teaching Guide				
Identifying Data				2023/24
Subject (*)	Genetic Variation Mechanisms		Code	610441005
Study programme	Máster 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	Spanish			
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	Pretende profundizar en el conocimiento de los diversos mecanismos que generan la variación genética, tanto en el aspecto de sus bases moleculares como en el de su impacto sobre los genomas.			

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.
C2	Ability to know and use appropriately the technical terminology of the field of knowledge of the master, in the native language and in English, as a language of international diffusion in this field
C3	Using ICT in working contexts and lifelong learning.

Learning outcomes	
Learning outcomes	Study programme competences / results

Comprehensive reading of scientific texts related to the subjects of the module	AR3	BR1	CC2
Ability to expose the current state of knowledge within this field	AR6	BR2	CC3
Critical ability to assess hypotheses and interpret results	AR11		
Understanding of cell structure and functioning from an interdisciplinary perspective in which Cell Biology, Classical Cytology, Genetics and Molecular Biology converge	AR12 AR13		
Understanding of the biochemical and physiological processes that allow signaling between cells and with structural elements, as well as the aspects that cause pathologies related to alterations in cell signaling and the tools used for its study			
Know the experimental techniques to access the study of the molecular mechanisms of regulation of the gene expression as well as the molecular machinery involved and its regulation systems			
Know the characteristics of proteins and complexes involved in the regulation of gene expression, their interaction with genetic material and the enzymatic reactions that modulate their activity			
Know the mechanisms that cause genetic variability			

Contents	
Topic	**Sub-topic**
Topic 1. Nature of mutations.	Estimates of mutation rate and frequency. Types of lesions caused by mutations. Physical and chemical mutagens. Reversion and deletion. Paramutation.
Topic 2. DNA repair mechanisms.	Preventive methods. Direct repair. Excision repair. Post-replication repair.
Topic 3. Genetic diseases related to mutagenic agents.	Cancer. Diseases due to failures in repair systems.
Topic 4. Mobile DNA:	abundance in genomes. Classifications of transposable elements. Proliferation. Modular evolution. Impact on genomes. Domestication.
Topic 5. Recombination processes.	Recombination rates. Gene conversion. Sexual dimorphism of the rate of recombination, crossing over and gene conversion. Biased gene conversion.
Topic 6. Evolution of scientific thinking about the origin of genetic variability. The contribution of Woese.	Introduction: Cell evolution: the "bumpy" path to "who knows where" History of evolutionary thought: Lamarck History of evolutionary thought: Darwin History of evolutionary thought: Modern Synthesis of Evolutionary Biology State of Microbiology (and Virology) for most of the 20th century Carl Woese LUCA Generation of genetic variability in the beginning of life
Unit 7. Microbial evolution in the era of genomics	Introduction The turbulent dynamics of microbial evolution HGT Damned concepts of classical genetics: genetic elements with Lamarckian flavor? Damned concepts of classical genetics: Evolution of evolution?

Unit 8. The mysterious world of viruses	Introduction figures and definitions Are the viruses alive? Early ideas about the evolution of viruses Structural biology allows a deep look into the past The origin of viral replicons When did viruses originate? Gene flow between viruses and hosts New discoveries about the evolution of viruses Viral population dynamics models conclusions

Planning				
Methodologies / tests	Competencies / Results	Teaching hours (in-person & virtual)	Student?s personal work hours	Total hours
Guest lecture / keynote speech	A3 A6 A11 A12 A13 B1 B2 C2 C3	12	24	36
Workbook	A6 A11 A12 A13 B1 B2 C2 C3	0	14	14
Long answer / essay questions	C2 C3	2	8	10
Multiple-choice questions	C2 C3	8	0	8
ICT practicals	A3 B1 B2 C2 C3	6	0	6
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 each class, content will be presented on different aspects of the agenda
Workbook	Students will read scientific documents to deepen the content worked on the subject.
Long answer / essay questions	
Multiple-choice questions	
ICT practicals	Work with computer tools for the analysis of genetic variation

Personalized attention	
Methodologies	Description
Workbook	Los estudiantes podrán acudir a las tutorías de los profesores en aquellos horarios previamente establecidos.

Assessment			
Methodologies	Competencies / Results	Description	**Qualification**
Guest lecture / keynote speech	A3 A6 A11 A12 A13 B1 B2 C2 C3	Se valorará, mediante una prueba objetiva, los conocimientos adquiridos	60
ICT practicals	A3 B1 B2 C2 C3	Se valorará asistencia y ejecución de los ejercicios mediante la elaboración de un cuaderno de prácticas (en inglés)	25
Workbook	A6 A11 A12 A13 B1 B2 C2 C3	Se realizará un journal club con presentación en power point mediante la lectura de varios artículos de investigación.	15

Assessment comments

Sources of information	
Basic	
Complementary	

Recommendations
Subjects that it is recommended to have taken before
Subjects that are recommended to be taken simultaneously
Subjects that continue the syllabus
Other comments
Attendance at lectures makes it possible to deal with any doubts or questions that may arise in the course of the explanations, facilitating the understanding of the subjects. Study should include regular reading of at least the recommended bibliography. Group study and work favours understanding and develops a critical spirit. The doubts and difficulties that arise in any aspect of the subject will be resolved as soon as possible, raising them in the classroom or attending individual tutorials. Given that part of the recommended bibliography for this subject is in English, it is recommended to have a good command of this language, at least at the level of comprehension of written texts.Gender PerspectiveIn this subject, the gender perspective will be taken into account, sexist attitudes will not be tolerated and the values of respect and equality will be promoted.Program Green Campus Empower of SciencesTo help to achieve some sustainable immediate surroundings and fulfil with the point 6 of the Environmental Statement of the faculty of Sciences (2020), the documentary works that realise in this matter:a. They will request mostly in virtual format and computer supportb. To realise in paper:-they will not employ plastic-will realise impressions to double expensive-will employ paper recycled-will avoid the realisation of draftsTo Environmental Statement is available in:https://ciencias.udc.es/images/Facultade/Green_Campus/Regulamento_Comit%C3%A9_Green_Campus_FCiencias.pdf

(*)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.