Teaching Guide				
Identifying Data				2021/22
Subject (*)	Molecular Techniques		Code	610441002s
Study programme	Máster Universitario en Bioloxía Molecular, Celular e Xenética (semipresencial)			
Descriptors				
Cycle	Period	Year	Type	Credits
Official Master's Degree	1st four-month period	First	Obligatory	6
Language	SpanishGalicianEnglish			
Teaching method	Hybrid			
Prerequisites				
Department	BioloxíaDepartamento profesorado máster			
Coordinador	Lamas Maceiras, Mónica	E-mail	monica.lamas@udc.es	
Lecturers	Diaz Varela, Jose Lamas Maceiras, Mónica Martinez Martinez, M. Luisa Pomar Barbeito, Federico Rego Perez, Jose Ignacio Vizoso Vázquez, Ángel José	E-mail	jose.diaz.varela@udc.es monica.lamas@udc.es m.l.martinez@udc.es federico.pomar@udc.es a.vizoso@udc.es	
Web	ciencias.udc.es/masters-bcm/master-en-biología-molecular-y-celula			
General description	Molecular Techniques used in Molecular and Cell Biology, and other related subjects.			
Contingency plan	Model in the case of confinament 1. Modifications to the contents No modifications in contents 2. Methodologies *Teaching methodologies that are maintained The practical classes (laboratory) will consist of video- visualizations related to the practical course, resolution of practical exercises and work with databases. 3. Mechanisms for personalized students attention: By e-mail, Moodle or Teams platforms. 4. Modifications in the evaluation No modifications in the evaluation *Evaluation observations: The exams will be on-line by Moodle and/or Teams 5. Modifications to the bibliography or webgraphy No changes			

Study programme competences	
Code	Study programme competences
A1	Skills of working in a sure way in the laboratories knowing operation handbooks and actions to avoid incidents of risk.
A2	Skills of using usual techniques and instruments in the cellular, biological and molecular research: that are able to use techniques and instruments as well as understanding potentials of their uses and applications.
A3	Skills of understanding the functioning of cells through the structural organization, biochemistry, gene expression and genetic variability.

A4	Skills to apply molecular techniques to the study of the plant cell physiology, its response to external triggers and their biotechnological applications.
A5	Skills of understanding the microorganisms' role as pathogenic agents and as biotechnological tools.
A8	Skills of having an integrated view of the previously acquired knowledge about Molecular and Cellular Biology and Genetics, with an interdisciplinary approach and experimental work.
A9	Skills of understanding the structure and dynamics of proteins to individual and proteomic level, as well as the techniques that are necessary to analyze them and to study their interactions with other biomolecules.
A10	Skills of modifying genes, proteins and chromosomes with biotechnological applications
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.
B3	Skills of management of the information: that are able to gather and to understand relevant information and results, obtaining conclusions and to prepare reasoned reports on scientific and biotechnological questions
B4	Organization and work planning skills: that are able to manage the use of the time as well as available resources and to organize the work in the laboratory.
C1	Ability to express oneself correctly, both orally and in writing, in the official languages of the autonomous community
C3	Using ICT in working contexts and lifelong learning.
C6	Acquiring skills for healthy lifestyles, and healthy habits and routines.
C8	Valuing the importance of research, innovation and technological development for the socioeconomic and cultural progress of society.
C9	Ability to manage times and resources: developing plans, prioritizing activities, identifying critical points, establishing goals and accomplishing them.

Learning outcomes			
Learning outcomes	Study programme competences		
Handle the necessary equipment for cellular and molecular techniques.	AR1 AR2 AR3 AR4		
Know the protocols used for the different techniques.	AR1 AR2 AR4 AR5		
Know the applications for the different techniques.	AR2 AR4 AR5 AR10 AR12 AR13	BR2	CC6
Consider the ways to resolve the methodological problems associated with the performance of the techniques.	AR8	BR1 BR2 BR3	
Establish the relationships between the different techniques used and its possible combination to resolve the problems.	AR8 AR9 AR10	BR1 BR2 BR3	
Interpret data from observations and measurements in the laboratory.		BR2 BR3	CC3

Plan, design and conduct experiments related with the techniques learned.	AR9 AR10 AR12 AR13	BR2 BR4	CC3 CC8 CC9
Maintain a critical attitude for a perfect experimental work.			CC1 CC3 CC6 CC8 CC9
Relate the chemical and structural properties of biomolecules with laboratory techniques that are most suitable for isolation, purification and characterization.	AR2 AR9	BR1 BR2	
Know in depth the possibilities and characteristics of PCR and real-time PCR.	AR1 AR10	BR3 BR4	
Understand and handle the techniques of recombinant DNA that can be used for analysis and manipulation of biomolecules.	AR1 AR2 AR8 AR10	BR2	
Use methods and techniques to detect and analyze genetic variation.	AR2 AR3 AR12	BR3	

Contents	
Topic	**Sub-topic**
Purification of Biomolecules	Principle of centrifugation technique and instrumentation. Preparative and Analytical Centrifugation. Chromatographic Techniques: principle and selection criteria. Electrophoresis: principle and types. Isoelectric focusing technique. Capillary electrophoresis.
PCR	Advanced concepts in PCR Differences between PCR and Real-time PCR Detection methods of amplicons Trial design and results analysis
Tecnology of molecular markers	Molecular markers: definition and main characterisics Basic principles, development and genotyping of RFLPs, AFLPs, microsatellites and SNPs
Recombinant DNA	Enzymes and protocols used in recombinant DNA techniques Genomics GeneBank Expression GeneBank GeneBank analysis Transfer and Blotting techniques Sequencing techniques Site-direct mutagenesis techniques Silencing techniques Transgenic organisms: uses and applications

Planning				
Methodologies / tests	**Competencies**	**Ordinary class hours**	**Student?s personal work hours**	**Total hours**
Laboratory practice	A1 A2 A3 A12 B4 C8 C9	24	48	72

Supervised projects	A2 A3 A8 A9 B1 B2 B3	0	42	42
Document analysis	A4 A5 A8 A10 A13 C3 C1	0	28	28
Mixed objective/subjective test	A2 A3 A9 A12 B1 B2 C6	2	4	6
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	Practical classes in the laboratory; Problem solving and practical cases
Supervised projects	Research Project related with the techniques performed in the laboratory. It will be developed individually under the Professor?s supervisión. Tutorials can be done via Teams
Document analysis	To study the theoretical part of the subject, students will have various material available: powerpoint presentations, videos, websites ...
Mixed objective/subjective test	Exam about theoretical and practical subjects.

Personalized attention	
Methodologies	**Description**
Laboratory practice Supervised projects	Tutorials will be done on line via Teams or e-mail. Personalized tutoring focused on guidance to help the students: resolving doubts and clarifications. The tutoring schedule will be indicated the first class by each Professor.

Assessment			
Methodologies	**Competencies**	**Description**	**Qualification**
Laboratory practice	A1 A2 A3 A12 B4 C8 C9	Along the practical classes, the students will answer questions and problems, which will be part of the continuous evaluation of the course.	20
Supervised projects	A2 A3 A8 A9 B1 B2 B3	Elaboration and writing of a supervised work.	30
Mixed objective/subjective test	A2 A3 A9 A12 B1 B2 C6	Exam with questions in which the student must apply the knowledge and skills acquired along the course.	50
Document analysis	A4 A5 A8 A10 A13 C3 C1		0

Assessment comments

-The attendance to Practical clases is a necessary condition to be evaluated.
-The qualifications obtained with the Supervised Project and Practical Exercises will be maintained for the 2nd Option (July) if the student do not pass the Final Exam in the 1st Option (January), and in the Final Qualification Records (QRs) will appear the qualification of 4.
-According to the rule of qualifications and records in Grades and Masters, the Quality Committee of the Faculty of Sciences, agreed to the recommendation to concede the ?Honors Qualification? to those students who obtained the highest marks in the 1st Option_June.
-The students that do not show up in any of the two official examination dates will obtain a NOT
PRESENTED in the Final Grades (ACTAS).
- The fraudulent performance of tests or evaluation activities will directly imply a failure grade in the subject in the corresponding call, thus also invalidating any grade obtained in all evaluation activities for the extraordinary evaluation.

Sources of information	
Basic	- Brown TA (2008). Genomes (3º ed). . Médica Panamericana, Buenos Aires. - Avise CJ (2004). Molecular markers, natural history, and evolution (2ª ed.). . Sinauer Associates, Sunderland, MA. - Weiner MP, Gabriel SB, Stephens JC, (2007). Genetic variation: a laboratory manual. Cold Spring harbor Laboratory Press, New York. - Nuez F, Carrillo JM, (2000). Los marcadores genéticos en la mejora vegetal.. Universidad Politécnica de Valencia. - Westermeier, Reiner. (2005). Electrophoresis in practice : a guide to methods and applications of DNA and protein separations. Weinheim : Wiley-VCH - Morteza G. Khaledi (1998). High-performance capillary electrophoresis theory, techniques, and applications . New York : John Wiley & Sons, - M. L. Marina, A. Ríos, M. Valcárcel (2005). Analysis and detection by capillary electrophoresis . Amsterdam : Elsevier - Dorak, T. (2007). Real-Time PCR. Routledge Taylor and Francis. - Edwards, K., Logan J. & Saunders, N. (2004). Real-time PCR: an essential guide.. Horizon bioscience. - Mackay, I. M. (2007). Real-time PCR in microbiology : from diagnosis to characterisation. Norfolk: Caister Academic Press. - Keith Wilson and John Walker (1995). Principles and Techniques of Practical Biochemistry. Cambridge, University Press - Logan J, Edawards K, Saunders N. (2009). Real-Time PCR: Current Technology and applications.. Caister Academic Press
Complementary	Además se proporcionarán artículos científicos de revisión sobre los temas tratados en la asignatura en la plataforma virtual Moodle

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
Green Campus Faculty of Science ProgramTo help achieve an immediate sustainable environment and with point 6 of the "Environmental Declaration of the Faculty of Sciences (2020)", the work carried out in this area:a. They will be make in virtual format and computer support.b. If they will be made on paper:- Plastics will not be used.- Double-sided prints will be made.- Recycled paper will be used.- Drafts will be avoided.

(*)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.