Teaching Guide					
Identifying Data					2024/25
Subject (*)	Molecular Microbiology			Code	610441011s
Study programme	Máster Universitario en Bioloxía Molecular, Celular e Xenética (semipresencial)				
Descriptors					
Cycle	Period	Year		Type	Credits
Official Master's Degree	2nd four-month period	First		Optional	3
Language	Spanish				
Teaching method	Hybrid				
Prerequisites					
Department	BioloxíaDepartamento profesorado másterFisioterapia, Medicina e Ciencias Biomédicas				
Coordinador	Rioboo Blanco, Carmen		E-mail	carmen.rioboo@udc.es	
Lecturers	Poza Domínguez, Margarita Rioboo Blanco, Carmen		E-mail	margarita.poza.dominguez@correo.udc.es carmen.rioboo@udc.es	
Web					
General description	This subject is focused on the study at molecular level of microbial cooperative behaviour and the generation of resistance in bacteria, in order to explore new systems of bacteriological control in general, and of multi-resistant bacteria in particular NOTE: Semi-attendance students who choose this module will complete all the activities planned in attendance mode.				

Study programme competences / results	
Code	Study programme competences / results
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.
A5	Skills of understanding the microorganisms' role as pathogenic agents and as biotechnological tools.
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.
B5	Ability to draft, represent, analyze, interpret and present technical documentation and relevant data in the field of the branch of knowledge of the master's degree in the native language and at least in another International diffusion language.
B7	Personal progress skills : that are able to learn from freelance way, adapting to new situations, developing necessary qualities as the creativity, skills of leadership, motivation for the excellence and the quality.
B8	Critical reasoning skills and ethical commitment with the society: sensitivity in front of bioethical problems and to the ones related to the natural resource conservation
B9	Skills of preparation, show and defense of a work.
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.
C4	Acting as a respectful citizen according to democratic cultures and human rights and with a gender perspective.
C5	Understanding the importanceof entrepreneurial culture and the useful means for enterprising people.
C6	Acquiring skills for healthy lifestyles, and healthy habits and routines.
C7	Developing the ability to work in interdisciplinary or transdisciplinary teams in order to offer proposals that can contribute to a sustainable environmental, economic, political and social development.
C8	Valuing the importance of research, innovation and technological development for the socioeconomic and cultural progress of society.

Learning outcomes

Learning outcomes	Study programme competences / results		
Understand the microbial cooperative behavior and the interactions of micro-organisms with other living beings at the molecular level	AR5	BR5 BR7 BR8	CC2 CC6 CC7 CC8
Handle the techniques and understand the molecular basis of the fight against infections and resistance mechanisms	AR1 AR2 AR5	BR1	CC4 CC7 CC8
Apply the molecular knowledge to understanding and solving problems		BR1 BR2 BR3 BR4 BR7 BR8 BR9	CC3 CC4 CC5 CC6 CC7 CC8

Contents	
Topic	Sub-topic
Microbial cooperative behaviour	-Molecular basis for the cooperation -Practical implications
Microbial interactions	-Positive and negative interactions -Molecular basis of the interactions with other microorganisms, plants or animals
Mechanisms of resistance to antimicrobial agents	-Enzymes degrading antimicrobial agents -Expulsion pumps -Modification of targets -Regulation of porins
New anti-infectious therapies	-Phagotherapy against multi-resistant bacteria -Antitolerants
Bacterial tolerance and persistence	-Phenotypic studies -Molecular mechanisms
Practical study of different aspects involved in the resistance to antimicrobial agents	-PCR of involved genes -Gene clonning -Protein expression -Preparation of knock-out mutants -Studies of the regulation of the mechanisms of resistance through RNA analysis

Planning				
Methodologies / tests	Competencies / Results	Teaching hours (in-person & virtual)	Student?s personal work hours	Total hours
Short answer questions	B1 B2 B5	2	0	2
Guest lecture / keynote speech	A5 C4 C5 C8	14	32	46
Seminar	A2 B3 B7 B8 B9 C3	2	8	10
Laboratory practice	A1 B4 C2 C6 C7	7	7	14
Personalized attention		3	0	3
(*)The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.				

Methodologies	
Methodologies	Description

Short answer questions	Written test that will assess the grade of knowledge and understanding achieved by the student.
Guest lecture / keynote speech	Exposure by the teaching staff of the theoretical basis of the subject
Seminar	Preparation of a written report based on information provided by the professor. It can be individual or in group
Laboratory practice	Case study in the research laboratory of dfferent aspects involved in resistance to antimicrobial agents carried out by the students.

Personalized attention	
Methodologies	**Description**
Seminar Laboratory practice Guest lecture / keynote speech	During the development of the subject will be addressed in the needs of the student and consultations relating to the subject matter, providing you the necessary support, both in person or through email.

Assessment			
Methodologies	**Competencies / Results**	**Description**	**Qualification**
Seminar	A2 B3 B7 B8 B9 C3	The critical and synthesis capacity of the presented report will be valued.	10
Short answer questions	B1 B2 B5	Written test on the knowledge acquired during the course, both in its theoretical and practical aspects	70
Laboratory practice	A1 B4 C2 C6 C7	Continuous assessment of practices	20
Guest lecture / keynote speech	A5 C4 C5 C8	This item is evaluated by means of the short answer test	0

Assessment comments
Attendance is mandatory laboratory practices to be evaluated. To account for the final grade in the value obtained in sections of seminars, practical and oral presentation, the student must have passed the short answer questions, corresponding to the theory of the subject. The students that not pass the course at the first choice, must overcome the unapproved part at the second chance. In the case of very exceptional circumstances and properly justified, the Professor could exempt total or partially to the student in that concur of any process of evaluation. This Student would have to subjected it a particular examination that will not leave doubts envelope his level of knowledge, competitions, skills and habilities. "NO PRESENTADO" mark is obtained only when the student has not been submitted to the mixed test. If the number of "Matrículas de Honor" (Distinction Award) that can be granted in the first option, you will not be granted in the second chance even when the maximum score is reached. In case of fraudulent and proven performance of the tests or evaluation activities, regulations at the UDC will be applied.

Sources of information	
Basic	- Madigan, Martinko, Bender, Buckley y Stahl (2015). Brock. Biología de los microorganismos. 14ª edición. Pearson Educación, S.A. - Gerischer (Ed) (2008). Acinetobacter Molecular Biology. Caister Academic Press - Lederberg & Schaeter (Eds) (2009). Encyclopedia of Microbiology. 3rd edition. Academic Press

Complementary	- Gootz (2010). The global problem of antibiotic resistance. Crit Rev Inmunol 30(1): 79-93 - Otero, Muñoz, Bernárdez & Fábregas (2005). "Quorum sensing": El lenguaje de las bacterias. Zaragoza. Acribia - Maragakis & Perl (2008). Acinetobacter baumannii: epidemiology, antimicrobial resistance, and treatment options. Clin Infect Dis 46(8): 1254-63 - Vila, Martí & Sánchez-Céspedes (2007). Porins, efflux pumps and multidrug resistance in Acinetobacter baumannii. J Antimicrob Chemother 59(6): 1210-5 - Pachón & Vila (2009). Treatment of multiresistant Acinetobacter baumannii infections. Curr Opin Invest Drugs 10(2): 150-6 Señálanse varias revisions relacionadas directamente co contido da materia. Además, durante o desenvolvemento da materia proporcionarase ao estudante outra bibliografía que dependerá dos seminarios programados e de calquera novidade que xurdise.

Recommendations
Subjects that it is recommended to have taken before
Regulation of gene expression/610441006 Molecular Plant-Pathogen Interaction Mechanisms/610441019
Subjects that are recommended to be taken simultaneously
Subjects that continue the syllabus
Cellular Techniques/610441001 Molecular Techniques/610441002 Advanced Cellular Biology/610441003 Cell Signaling/610441004 Genetic Variation Mechanisms/610441005 Regulation of gene expression/610441006
Other comments
Professor: María del Mar Tomás Carmona (ma.del.mar.tomas.carmona@sergas.es).Of all the subjects that it recommends to have studied previously, compulsory all of them of the master's degree, the technical subjects are considered to be fundamental. The student has access to teacher presentations via Moodle, being these presentations only a guide for the study but never will be the total content of the matter.Green Campus Science Faculty ProgrammeIn order to help achieve a sustainable environment and comply with point 6 of the "Declaración Ambiental da Facultade de Ciencias (2020)", the work carried out in this subject area will be documented:a. They will be mainly requested in virtual format and computer support.b. To be done on paper:- Plastics shall not be used.- Double-sided printing must be used.- Recycled paper must be used.- Drafts should be avoided.As stated in the different application regulations for university teaching, the gender perspective is incorporated in this subject.