Teaching Guide				
Identifying Data				2020/21
Subject (*)	Recombinant proteins and protein Engineering		Code	610441012
Study programme	Mestrado Universitario en Bioloxía Molecular , Celular e Xenética			
Descriptors				
Cycle	Period	Year	Type	Credits
Official Master's Degree	2nd four-month period	First	Optional	3
Language	Spanish			
Teaching method	Face-to-face			
Prerequisites				
Department	Bioloxía			
Coordinador	Gonzalez Siso, Maria Isabel	E-mail	isabel.gsiso@udc.es	
Lecturers	Becerra Fernandez, Manuel Gonzalez Siso, Maria Isabel Vizoso Vázquez, Ángel José	E-mail	manuel.becerra@udc.es isabel.gsiso@udc.es a.vizoso@udc.es	
Web				
General description	The current importance of enzymatic processes applied to the food and drug industry allows the production of compounds that could not obtain by any other way. Industrial production of enzymes is a business that at the beginning of the 21st century moves around 1600 million of dollars a year. The use of enzymes in industrial processes is often limited by factors inherent to the nature of enzymes as for example a lack of stability in extreme conditions of temperature or pH, denaturation in presence of organic solvents or poor activity against certain substrates. Currently, there are a wide range of techniques of expression and engineering of proteins that allow the generation of modified proteins in order to overcome these limitations. There are a wide range of products developed by these pathways that are used in various fields. This course will describe current methods for expression and modification of proteins, both in basic research and biotechnological applications.			
Contingency plan	1. Modifications to the contents No changes will be made 2. Methodologies *Teaching methodologies that are maintained Guest lecture/keynote speech, Laboratory Practices, Directed Discussion, Mixed objective/subjective Test *Teaching methodologies that are modified The Guest lecture/keynote speech and the Directed Discussion will be carried out through Teams. Students will be required to submit completed response bulletins via Moodle. Laboratory Practices will be replaced by a "Case Method" type work. The Mixed objective/subjective Test will be done through Moodle. 3. Mechanisms for personalized attention to students Tutorials will be served via email, Teams and Moodle forums. 4. Modifications in the evaluation Mixed objective/subjective Test 40%, Laboratory Practices 30%, Directed Discussion 30% *Evaluation observations: Attendance will only be calculated for the sessions that took place face-to-face until such time as face-to-face activity has been suspended. 5. Modifications to the bibliography or webgraphy No changes will be made. Work materials are available digitally in Moodle.			

Study programme competences / results	
Code	Study programme competences / results
A10	Skills of modifying genes, proteins and chromosomes with biotechnological applications
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

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.
C3	Using ICT in working contexts and lifelong learning.
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		
Ability to learn and use biochemical concepts, techniques and resources available in databases related to the subject	AR10	BR7	CC3 CC8
Ability to solve practical cases through the acquisition of skills that allow to carry out a simulated project of expression of recombinant proteins and directed evolution of proteins.	AR10	BR3 BR7	CC3 CC8

Contents	
Topic	Sub-topic
Systems for expresión of native and recombinant proteins: bacterias	Systems of expression of Heterologous proteins in bacteria and purification.
Systems for expresión of native and recombinant proteins: yeasts	Systems of expression of Heterologous proteins in yeast and down-stream processing.
Systems for expresión of native and recombinant proteins: animal cells	Genetic manipulation of animal cells. Systems of expression and production of proteins in mammalian cells.
Protein engineering I	Introduction. Site-directed mutagenesis techniques.
Protein engineering II	Techniques of artificial evolution of proteins.
Protein engineering III	Techniques of stabilization and immobilization of enzymes.
Industrial applications of protein engineering	Applications in Enzymology, pharmaceutical, food industry and other applications.

Planning				
Methodologies / tests	Competencies / Results	Teaching hours (in-person & virtual)	Student?s personal work hours	Total hours
Guest lecture / keynote speech	A10 B7	7	7	14
Laboratory practice	A10 B3 C3	7	14	21
Mixed objective/subjective test	B3	2	16	18
Directed discussion	B3 C3 C8	7	14	21
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	Oral presentation complemented with the use of audiovisual media in order to pass on knowledge and facilitate learning.
Laboratory practice	A methodology that allows students to learn effectively through practical activities.
Mixed objective/subjective test	Exam comprising questions type of testing trial, questions objective type testing and resolution of cases and problems.
Directed discussion	Technique of group dynamics in which the members of a group discussed free, informal and spontaneous way on a subject, coordinated by a moderator.

Personalized attention	
Methodologies	Description

Directed discussion	The directed discussion is conceived as moments of face-to-face student work with the teacher by involving compulsory student participation.

Assessment			
Methodologies	**Competencies / Results**	**Description**	**Qualification**
Mixed objective/subjective test	B3	Test to evaluate the knowledge acquired during the master classes, practical classes of laboratory as well as directed discussion	60
Laboratory practice	A10 B3 C3	Regular attendance and active participation to laboratory practices as well as the report made by students will be evaluated	20
Directed discussion	B3 C3 C8	Regular attendance and active participation will be evaluated	20

Assessment comments
To get honours preference will be given to the best notes of the call of June

Sources of information	
Basic	-Cerdán Villanueva, M. E. Curso Avanzado de Proteínas y Ácidos Nucleicos. A Coruña. Universidade da Coruña. 2005. Libro. -Cerdán Villanueva, M. E., Freire Picos, M. A., González Siso, M. I. y Rodríguez Torres, A. M., Biología Molecular. Avances y Técnicas generales , A Coruña. Universidade da Coruña, 1997, Libro. -Gerd Gellisen Ed., Production of recombinant proteins: novel microbial and eukaryotic expression systems, Weinheim: Wiley-VCH, 2005, Libro,BM-720 -Glick, B. R., Molecular Biotechnology: Principles and Application of Recombinant DNA, Washington: American Society Microbiology, 2003, Libro,BM-668 -Gómez-Moreno, C. y Sancho, J. Estructura de proteínas. Ariel Ciencia. 2003. Libro -González Siso, M. I., La Biotecnología en el tratamiento de residuos industriales , A Coruña. Universidade da Coruña. Servicio de Publicacións, 1999, Libro, - Lutz, S., Bornscheuer. Protein Engineering Handbook. Wiley-Vch. Volumen 1 y 2. 2009. Libro. BM-785 -Ninfa, A. J., Fundamental laboratory approaches for biochemistry and biotechnology, Hoboken: John Wiley and Sons, 2010, Libro,BM-801 -Perera, J., Tormo, A., García, J. L., Ingeniería Genética. Vol I. Preparación, análisis, manipulación y clonaje del DNA. , Madrid. Síntesis , 2002, Libro, -Perera, J., Tormo, A., García, J. L., Ingeniería Genética. Vol II. Expresión de DNA en sistemas heterólogos., Madrid. Síntesis , 2002, Libro, -Thiel, T., Bissen, S. T., Lyons, E. M., Biotechnology: DNA to Protein. A Laboratory Project in Molecular Biology. , , 2001, Libro, -Wink, M., An introduction to molecular Biotechnology: from molecular biological fundamentals to methods and applications in modern biotechnology, Verlag Chemie, GmbH, 2006, Libro,BM-762
Complementary	

Recommendations
Subjects that it is recommended to have taken before
Molecular Techniques/610441002
Subjects that are recommended to be taken simultaneously
Protein Structure and Dynamics/610441011 Bioinformatics and Biomolecular models /610441020
Subjects that continue the syllabus
Project/610441022
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.