Teaching Guide					
Identifying Data					2020/21
Subject (*)	Animal biotechnology			Code	610475304
Study programme	Mestrado Universitario en Biotecnoloxía Avanzada				
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	Insua Pombo, Ana Maria		E-mail	ana.insua@udc.es	
Lecturers	Insua Pombo, Ana Maria Mendez Felpeto, Josefina		E-mail	ana.insua@udc.es josefina.mendez@udc.es	
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General description	This subject intends to introduce students to the basic aspects of animal biotechnology. Main aspects involve the understanding of the fundamentals of molecular tools for the study of genomes and how molecular markers allow for species identification, population analysis and development of genetic improvement programs. Also the knowledge of tools and application of technologies for chromosomal manipulation and in vitro fertilization.				

Contingency plan	1. Modifications to the contents They are not modified 2. Methodologies *Teaching methodologies that are maintained Hybrid teaching - Guest lecture/keynote speech - Supervised projects - ICT practicals - Objective test Non-classroom teaching - Supervised projects - ICT practicals - Objective test *Teaching methodologies that are modified Hybrid teaching Laboratory practice: it will not be done; this activity is replaced by autonomous problem solving. Non-classroom teaching - Guest lecture/keynote speech: it will not be held; this activity is replaced by autonomous previous work (documentation reading/video viewing) and subsequent debate led by the teacher. - Laboratory practice: it will not be done; this activity is replaced by autonomous problem solving. 3. Mechanisms for personalized attention to students - Email. Daily. For inquiries and request virtual meeting for tutorial sessions. - Moodle/Faitic. Daily to provide materials and subject information. Teams. At the student's request (hybrid teaching). During the class timetable for debate sessions (non-classroom teaching). 4. Modifications in the evaluation Hybrid teaching - Problem solving: 15% (replaces laboratory practices 15%). Non-classroom teaching Debate: 15% (replace Guest lecture/keynote speech 15%). - Problem solving: 15% (replaces laboratory practices 15%). *Evaluation observations: The objective test will be carried out in a virtual environment. 5. Modifications to the bibliography or webgraphy Open access electronic resources will be provided.

Study programme competences / results	
Code	Study programme competences / results
A21	Coñecer os recursos microbianos, vexetais e animais de interese biotecnolóxico así como as súas aplicacións na industria alimentaria e agropecuaria.
A24	Coñecer as estratexias de produción e mellora de alimentos por métodos biotecnolóxicos.

B1	Capacidade de análise e síntese (localización de problemas e identificación das causas e a súa tipoloxía).
B2	Capacidade de organización e planificación de todos os recursos (humanos, materiais, información e infraestruturas).
B3	Capacidade de xestión da información (con apoio de tecnoloxías da información e as comunicacións).
B4	Capacidade de planificación e elaboración de estudos técnicos en biotecnoloxía microbiana, vexetal e animal.
B5	Capacidade de identificar problemas, buscar solucións e aplicalas nun contexto biotecnolóxico profesional ou de investigación.
B6	Capacidade de comunicación oral e escrita dos plans e decisións tomadas.
B7	Capacidade para formular xuízos sobre a problemática ética e social, actual e futura, que propón a Biotecnoloxía.
B8	Capacidade de comunicación eficazmente coa comunidade científica, profesional e académica, así como con outros sectores e medios de comunicación.
B9	Capacidade de Traballo en equipo multidepartamental dentro da empresa.
B10	Capacidade de Traballo nun contexto de sostibilidade, caracterizado por: sensibilidade polo medio ambiente e polos diferentes organismos que o integran así como concienciación polo desenvolvemento sostible.
B11	Racionamento crítico e respecto profundo pola ética e a integridade intelectual.
B12	Adaptación a novas situacións legais, ou novidades tecnolóxicas así como a excepcionalidades asociadas a situacións de urxencia.
B13	Aprendizaxe autónoma.
B14	Liderazgo e capacidade de coordinación.
B15	Sensibilización cara á calidade, o respecto medioambiental e o consumo responsable de recursos e a recuperación de residuos.

Learning outcomes			
Learning outcomes	Study programme competences / results		
Ability to identify the different biotechnological applications that animal resources have in the sector of food and agriculture.	AC21 AC24	BC1 BC2 BC3 BC5 BC7 BC8 BC10 BC12 BC13 BC15	
Ability to develop production strategies based on food improvement by biotechnological methods.	AC21 AC24	BC1 BC2 BC3 BC4 BC5 BC6 BC7 BC8 BC9 BC10 BC11 BC12 BC13 BC14 BC15	

Contents	
Topic	Sub-topic

Genomics and its application in the exploitation of natural animal variability.	Structural and functional genomics. Animal genomes. Paradox of C-Value. Genomic regions and their variation. Gene identification. Linkage maps.
Breeding and marker-assisted selection	Molecular makers: types, characteristics, development and analysis. Selection of quantitative traits in animals. Detection and analysis of QTLs. Use of identified genes in genetic improvement. Genome-wide association studies. Genomic selection.
Control of reproduction and assisted reproductive technologies in animals.	In vitro fertilization and embryo production Micromanipulation of gametes and embryos Sex determination.
Chromosome manipulation in fish and shellfish	Poliploidy. Gynogenesis. Androgenesis. Monosex populations. Production of clones.

Planning				
Methodologies / tests	Competencies / Results	Teaching hours (in-person & virtual)	Student?s personal work hours	Total hours
Guest lecture / keynote speech	A21 A24 B11 B12 B15	14	21	35
Laboratory practice	A21 A24 B9	4	2	6
ICT practicals	A24 A21 B2 B3	3	6	9
Supervised projects	A21 A24 B1 B2 B6 B7 B8 B10 B13 B14	0	12	12
Objective test	A21 A24 B1 B3 B4 B5 B6	2	10	12
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	Lectures will be given by the course teachers in order to convey a general knowledge of the subject. Lectures will be held by videoconference and dialogue between students and teachers will be encouraged.
Laboratory practice	Visit a labotatory where biotechnology tools are used for animal reproduction
ICT practicals	Knowledge application activity based on the use of computer resources. It will be carried out under the guidance of a teacher.
Supervised projects	Students, in groups or individually, will write an essay about some aspect of the subject
Objective test	This test will be used to assess the knowledge acquired in this subject. It may consists of the following types of questions: multiple choice, true/false, short answer and/or association.

Personalized attention	
Methodologies	Description
Supervised projects	Custom and group tutorial sessions are possible, either in person or via videoconference, for advice on jobs and to review any subject-related issue.

Assessment			
Methodologies	Competencies / Results	Description	**Qualification**
ICT practicals	A24 A21 B2 B3	The degree of understanding of analyzes carried out and the skill with bioinformatics tools used will be evaluated.	10

Supervised projects	A21 A24 B1 B2 B6 B7 B8 B10 B13 B14	Originality, degree of understanding of the topic, ability to synthesize and review and consulted literature sources will be evaluated.	20
Guest lecture / keynote speech	A21 A24 B11 B12 B15	Attitude attendance and participation in the dialogues promoted by teachers will be evaluated.	15
Laboratory practice	A21 A24 B9	Attendance at practices will be assessed. Students will respond to a questionnaire on visit they make.	15
Objective test	A21 A24 B1 B3 B4 B5 B6	The objective test will allow the student to demonstrate mastery of the knowledge acquired on basic issues of the subject.	40

Assessment comments
To be assessed it is necesary to take the objective test. Preferably, first class honors will be awarded in June among students with a score of 9 or higher. The grade of Non Attendance (NP) will be applied to students that do not complete any of the proposed activities. In the case of justified exceptional circumstances, additional measures may be taken, so that the student can pass the subject.

Sources of information	
Basic	- Lynch, M (2007). The Origins of Genome Architecture. Sinauer Assoc., Sunderland - Lewin B. (2008). Genes IX. McGraw Hill - Allis, D., Jenuwein, T., Reinberg, D. & M.T. Caparros (2007). Epigenetics. Cold Spring Harbor Laboratory Press - Ruvinsky, A., Marshall-Graves, J.A. (2005). Mammalian Genomics. CABI Publishing - Piferrer, F., Felip, A., Cal, R.M. (2007). Inducción de la triploidía y la ginogénesis para la obtención de peces estériles y poblaciones monosexo en acuicultura . En Genética y genómica en acuicultura. Observatorio Español de Acuicultura, Madrid. - Piferrer, F., Beaumont, A., Falguière, J.C., Flajshans, Haffray, P., Colombo, L (2009). Polyploid fish and shellfish: production, biology, applications to aquaculture for performance improvement and genetic containement. Aquaculture 293: 125-156 - Cortés Rubio, E.& Morcillo Ortega G. (2002). Ingenieria Genética. Manipulación de genes y genomas. Universidad Nacional de Educación a Distancia - Thieman W.J. & Palladino M.A. (2009). Introduction to Biotechnology Second Edition. Pearson International Edition - Smith J.E. (2004). Biotecnología . Acribia S.A.
Complementary	

Recommendations
Subjects that it is recommended to have taken before
Genetic Engineering and Transgenetics /610475101 Cellular and Tissue Engineering/610475102 Genomics and Proteomics/610475103
Subjects that are recommended to be taken simultaneously
Organisation and management of a laboratory/610475201 Legal and ethical aspects in Biotechnology/610475203 Analysis of foodstuff. food security and traceability /610475302
Subjects that continue the syllabus
Assisted reproduction technology/610475502
Other comments

Recommendations:Students are recommended to have the necessary English level to understand scientific information sources for the proper learning of the skills of the subject.Folow the development of the course regularly.Check Moodle/Faitic and email to obtain materials and know the schedule of activities.Attend tutorials to resolve any questions or dfficulties that may arise.Consult the recommended bibliography.