Teaching Guide				
Identifying Data				2021/22
Subject (*)	Applied Microbiology and Microbiological Control		Code	610G02016
Study programme	Grao en Bioloxía			
Descriptors				
Cycle	Period	Year	Type	Credits
Graduate	2nd four-month period	Second	Obligatory	6
Language	Spanish			
Teaching method	Face-to-face			
Prerequisites				
Department	Bioloxía			
Coordinador	Torres Vaamonde, Jose Enrique		E-mail	enrique.torres@udc.es
Lecturers	Fidalgo Paredes, Pablo Herrero Lopez, Maria Concepcion Poza Domínguez, Margarita Torres Vaamonde, Jose Enrique		E-mail	pablo.fidalgo@udc.es concepcion.herrero@udc.es margarita.poza.dominguez@correo.udc.es enrique.torres@udc.es
Web				
General description	Subject in which the concepts, procedures and methods of microbiological control, normal and pathogenic interaction of microorganisms with animals, the basic knowledge of environmental microbiology and the application of microorganisms in industrial scale processes are treated.			
Contingency plan	1. In case there are capacity problems in the spaces designated for the realization of face-to-face activities, additional spaces will be reserved in which students can follow the activities through the TEAMS platform. In the case of practical activities, the groups will be divided according to the capacity of the laboratory. 2. In case of non-attendance due to a new outbreak of the pandemic, the following modifications will be considered: 2.1. Modifications to the contents An attempt will be made to maintain the content. 2.2. Methodologies *Teaching methodologies that are maintained *Teaching methodologies that are modified Master Session: it will be done electronically through Teams. Solving problems: they will be carried out via Teams and through solutions through Moodle. Laboratory practices: in case the practices cannot be done in person, they will be replaced by telematic alternatives related to the corresponding temary. Mixed test and short exams: they will be done electronically via Moodle. 2.3. Mechanisms for personalized attention to students Sessions will be held via Teams, Moodle, and email. 2.4. Modifications in the evaluation The evaluation will not be modified, and the tests will be via Moodle. *Evaluation observations: 2.5. Modifications to the bibliography or webgraphy			

Study programme competences	
Code	Study programme competences
A1	Recoñecer distintos niveis de organización nos sistemas vivos.
A2	Identificar organismos.
A4	Obter, manexar, conservar e observar especímenes.
A9	Identificar e utilizar bioindicadores.
A11	Identificar e analizar material de orixe biolóxica e as súas anomalías.

A13	Realizar o illamento e cultivo de microorganismos e virus.
A14	Desenvolver e aplicar produtos e procesos de microorganismos.
A15	Deseñar e aplicar procesos biotecnológicos.
A21	Deseñar modelos de procesos biolóxicos.
A25	Desenvolver e aplicar técnicas de biocontrol.
A27	Dirixir, redactar e executar proxectos en Bioloxía.
A30	Manexar adecuadamente instrumentación científica.
A31	Desenvolverse con seguridade nun laboratorio.
B2	Resolver problemas de forma efectiva.
B3	Aplicar un pensamento crítico, lóxico e creativo.
B4	Traballar de forma autónoma con iniciativa.
B5	Traballar en colaboración.
B6	Organizar e planificar o traballo.
B7	Comunicarse de maneira efectiva nunha contorna de traballo.
B8	Sintetizar a información.
B9	Formarse unha opinión propia.
B10	Exercer a crítica científica.
B11	Debater en público.
B12	Adaptarse a novas situacións.
C3	Utilizar as ferramentas básicas das tecnoloxías da información e as comunicacións (TIC) necesarias para o exercicio da súa profesión e para a aprendizaxe ao longo da súa vida.
C6	Valorar criticamente o coñecemento, a tecnoloxía e a información dispoñible para resolver os problemas cos que deben enfrontarse.
C8	Valorar a importancia que ten a investigación, a innovación e o desenvolvemento tecnolóxico no avance socioeconómico e cultural da sociedade.

Learning outcomes			
Learning outcomes	Study programme competences		
Function and application of microorganisms in clinical, environmental and industrial sectors.	A1 A4 A11 A14 A15 A21 A30 A31	B2 B3 B4 B5 B6 B7 B8 B9 B10 B11 B12	C3 C6 C8
Know and use methods and techniques used in microbiological control.	A1 A2 A4 A9 A13 A14 A15 A25 A27 A30 A31	B2 B3 B4 B5 B6 B7 B8 B9 B10 B11 B12	C3 C6 C8

Contents	
Topic	Sub-topic
UNIT 1. - CONCEPTS AND MICROBIAL CONTROL PROCEDURES	ITEM 1. CONTROL BY PHYSICAL AGENTS ITEM 2. CONTROL BY CHEMICAL AGENTS ITEM 3. ANTIMICROBIAL CHEMOTHERAPEUTICS
UNIT 2. - METHODS FOR THE MICROBIOLOGICAL CONTROL OF QUALITY	ITEM 4. IMPORTANCE OF THE MICROBIOLOGICAL QUALITY CONTROL: MICROBIOLOGICAL CRITERIA ITEM 5. SAMPLING: MICROBIOLOGICAL SAMPLING PROGRAMMES ITEM 6. PROCEDURES OF MICROBIOLOGICAL ANALYSIS OF COMMERCIAL PRODUCTS ITEM 7. MICROBIOLOGICAL INDICATORS OF QUALITY AND SAFETY
UNIT 3. - MICROORGANISMS AND DISEASE	ITEM 8. NORMAL MICROBIOTA. MICROBIAL PATHOGENICITY ITEM 9. MICROBIAL INTERACTION WITH THE HOST DEFENSES ITEM 10. IMMUNOPATHOLOGY AND IMMUNOLOGICAL THERAPEUTICS ITEM 11. IMMUNOLOGICAL TECHNIQUES FOR THE DETECTION AND IDENTIFICATION OF MICROORGANISMS
UNIT 4. - ENVIRONMENTAL MICROBIOLOGY	ITEM 12. MICROORGANISMS AS COMPONENTS OF ECOSYSTEMS. BIOGEOCHEMICAL CYCLES ITEM 13. MICROBIAL INTERACTIONS ITEM 14. MICROORGANISMS IN NATURAL ENVIRONMENTS
UNIT 5. - USE AND INDUSTRIAL MICROORGANISMS APPLICATIONS	ITEM 15. INDUSTRIAL MICROORGANISMS AND FORMATION OF PRODUCTS ITEM 16. INDUSTRIAL PROCESSES: TYPES OF BIOREACTORS ITEM 17. GROWTH OF MICROORGANISMS IN INDUSTRIAL SYSTEMS
UNIT 6. - INDUSTRIAL PRODUCTS USING MICROORGANISMS	ITEM 18. ALCOHOLIC FERMENTATION ITEM 19. LACTIC FERMENTATION ITEM 20. PRODUCTION OF ORGANIC ACIDS, ANTIBIOTICS, VITAMINS AND ENZYMES

LABORATORY PRACTICES	Practice 1. Alcoholic fermentation Practice 2. Lactic acid fermentation Practice 3. Obtaining of microbial metabolites of interest. Practice 4. Determination of antibiotic susceptibility of bacteria Practice 5. Control of microorganisms by physical agents Practice 6. Experimental determination of decimal reduction time: the value of D

Planning				
Methodologies / tests	Competencies	Ordinary class hours	Student?s personal work hours	Total hours
Guest lecture / keynote speech	A15 A21 A25 B3 B6 B7 B8 B9 B10 B11 B12 C3 C6 C8	30	67.5	97.5
Laboratory practice	A1 A2 A4 A9 A11 A13 A14 A25 A30 A31	15	15	30
Problem solving	B2 B4 B5	5	10	15
Mixed objective/subjective test	A14 A15 A21 A27 B2	2.5	0	2.5
Personalized attention		5	0	5
(*)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	The exposition of the theoretical content of the subject will be carried out by teachers. In the exposition, different resources based on information technologies and on the use of web-based resources will be used.
Laboratory practice	Practices are of compulsory attendance. In the practice sessions, practical examples of most of the processes that have been shown in the lectures and keynote sessions will be carried out.
Problem solving	The resolution of problems related to different aspects of the content of the subject will take place in seminars. The knowledge acquired in solving the problems will be assessed in the mixed test.
Mixed objective/subjective test	The contents explained in lectures and keynote sessions and in the resolution of problems seminars will be assessed through a written test.

Personalized attention	
Methodologies	Description
Problem solving Laboratory practice Guest lecture / keynote speech Mixed objective/subjective test	Tutorials are included within the personalized attention for both theoretical sessions (lectures and keynotes sessions) as for seminars and laboratory practices. Also, theory and practical test preparation sessions can be included. Specific times of personalized attention for the review of the tests of theory, practices and other aspects that are evaluated in the mixed event will be reserved.

Assessment			
Methodologies	Competencies	Description	**Qualification**

Problem solving	B2 B4 B5	There will be a continuous evaluation of the problem solving and questionnaires, which will be assessed and will account 10% of the final mark. In addition, the knowledge acquired in solving problems will be assessed in the mixed test.	10
Laboratory practice	A1 A2 A4 A9 A11 A13 A14 A25 A30 A31	Mandatory attendance. Continuous evaluation throughout the development of the lab work (5%). Exam (15%).	20
Mixed objective/subjective test	A14 A15 A21 A27 B2	Written proof of the knowledge acquired in the magisterial sessions (50%) and in the seminars (20%). During the development of the subject several short exams will be carried out in person. For students who do not take these exams, a global exam will be held on the date set for the final exam.	70

Assessment comments

Attendance to laboratory practices and problem solving sessions is compulsory to pass the subject.

If the student does not attend the lab practices, he/she will not pass the subject; therefore they cannot do the mixed test.

To pass the subject, each of the evaluated parts must be passed; theory, practices and problem solving.

To pass the practices, besides the attendance, the student must pass a specific test.

For continuous evaluation, regarding to the resolution of problems, each student must have the corresponding problems solved prior to attend session and as indicated by the teacher. Finally, it should go to the corresponding session.

Mixed test: It will consist of two parts, theoretical (50%) and problem solving (20%).
"NO PRESENTADO" mark is obtained when the student do not do the written exam (mixed test).

If the student does not pass the subject at the first opportunity, he/she must overcome the unpassed part at the second chance. If it is the theory, repeating the corresponding part of the mixed test; the same in the case of problems solving. If they are the practices, repeating the test.

The highest grade "Matricula de Honor" will be mainly given to students that pass the subject in the"First Opportunity". And it will only be given in the so-called "second Opportunity" if there are still any available.

As a part of the continuous evaluation, the progression of the student throughout the semester will be taken into consideration with a maximum of 1 point.
In the case of very special and exceptional circumstances, adequately justified, the teacher can totally or partially exempts the student from part of the evaluation process. This student will then have to go through an examination process where he/she will need to clearly proof his/her level of knowledge, competence, capabilities and skills. Students with recognition of part-time dedication and academic exemption from the attendance exemption both in the end of semester opportunity and in the second opportunity will be taken into account, for the calculation of the general grade, the grade obtained in the mixed test and the practical part.

The fraudulent performance of tests or evaluation activities, once verified, will directly imply a failure grade "0" in the subject at the corresponding opportunity.

Sources of information

Basic	DURIEUX, A y SIMON, JP (eds.) 2001. Applied Microbiology. Kluwer Academic Publishers FORSYTHE, SJ y HAYES, PR, 2002. Higiene de los alimentos, microbiología y HACCP. Editorial Acribia. Zaragoza. España. ICMSF (2000). Microorganismos de los alimentos 1. Su significado y métodos de enumeración. Editorial Acribia, s.a. Zaragoza. España. ICMSF (2000). Microorganismos de los alimentos 2. Métodos de muestreo para análisis microbiológicos: principios y aplicaciones específicas. Editorial Acribia, s.a. Zaragoza. España. MADIGAN, MT, MARTINKO JM, DUNLAP, PV y CLARCK, DP, 2009. Brock, Biología de Los Microorganismos 12ª Edición. Pearson Education. Madrid. MOSIER, NS y LADISCH, MR, 2009. Modern biotechnology. John Wiley & Sons, Inc. RATLEDGE, C y KRISTIANSEN B. (Eds) 2001 Basic Biotechnology ? Second Edition Publisher: Cambridge University Press. SMITH, JE. 2006. Biotecnología. Editorial Acribia. Zaragoza. THIEMAN, WJ y PALLADINO, MA, 2010. Introducción a la biotecnología. Prentice Hall. WILLEY, JM, SHERWOOD, LM y WOOLVERTON, CJ 2009 Microbiología de Prescott, Harley y Klein. 7ª Edición. McGraw-Hill-Interamericana de España. Madrid.
Complementary	Recursos web: Inclúese neste apartado algúns URL que recompilan recursos, imaxes, repositorios de técnicas, bases de datos,etc. relacionados coa Microbioloxía Aplicada, Biotecnoloxía e Control microbiolóxico: http://www.microbialcellfactories.com/start.asp http://www.microbialcellfactories.com/start.asp http://www.eng.rpi.edu/chme/ http://www.eng.rpi.edu/chme/ http://wiki.yeastgenome.org/ http://wiki.yeastgenome.org/ http://www.phys.ksu.edu/gene/ http://www.phys.ksu.edu/gene/ http://www.asm.org/ http://www.asm.org/ http://www.bio.davidson.edu/courses/genomics/genomics.html http://www.bio.davidson.edu/courses/genomics/genomics.html http://www.nsta.org/ http://www.nsta.org/ http://fangman-brewer.genetics.washington.edu/index.html http://fangman-brewer.genetics.washington.edu/index.html http://vadlo.com/ http://vadlo.com/ http://www.lgcstandards-atcc.org/ http://www.lgcstandards-atcc.org/ Outros materiais de apoio: Os alumnos dispoñerán de material de apoio na Plataforma MOODLE de apoio á formación da UDC. Ao longo do curso iranse incorporando materiais, actividades, probas de control, etc., tanto elaborados polo profesor como polos alumnos, que irán cambiando ao longo do curso.

Recommendations
Subjects that it is recommended to have taken before
Microbiology/610G02015
Subjects that are recommended to be taken simultaneously
Subjects that continue the syllabus
Microbiology Techniques/610G02017 Microbiology and Environmental Biotechnology/610G02018
Other comments
Power point presentations uploaded in Moodle constitute a guide for the study of the themes, but in no case they include the overall contents of these themes