Teaching Guide					
Identifying Data					2023/24
Subject (*)	Microbiology Techniques			Code	610G02017
Study programme	Grao en Bioloxía				
Descriptors					
Cycle	Period	Year		Type	Credits
Graduate	1st four-month period	Third		Obligatory	6
Language	Spanish				
Teaching method	Face-to-face				
Prerequisites					
Department	Bioloxía				
Coordinador	Rioboo Blanco, Carmen		E-mail	carmen.rioboo@udc.es	
Lecturers	Fidalgo Paredes, Pablo Rioboo Blanco, Carmen Torres Vaamonde, Jose Enrique		E-mail	pablo.fidalgo@udc.es carmen.rioboo@udc.es enrique.torres@udc.es	
Web					
General description	Learning the basic techniques of a Microbiology Laboratory, as well as their potential applications in the field of microbiological quality control and in research.				

Study programme competences / results	
Code	Study programme competences / results
A1	Recoñecer distintos niveis de organización nos sistemas vivos.
A2	Identificar organismos.
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.
A26	Deseñar experimentos, obter información e interpretar os resultados.
A27	Dirixir, redactar e executar proxectos en Bioloxía.
A29	Impartir coñecementos de Bioloxía.
A30	Manexar adecuadamente instrumentación científica.
A31	Desenvolverse con seguridade nun laboratorio.
B1	Aprender a aprender.
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.
B10	Exercer a crítica científica.
B11	Debater en público.
B12	Adaptarse a novas situacións.
C1	Expresarse correctamente, tanto de forma oral coma escrita, nas linguas oficiais da comunidade autónoma.
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 / results		
Fluid handling of the basic techniques of microbiology laboratory and their potential applications in industry and research.	A1 A2 A9 A11 A13 A14 A15 A21 A25 A26 A27 A29 A30 A31	B2 B3 B4 B5 B6 B7 B8 B10 B11	C3 C6 C8
Ability to relate concepts and practical application thereof.		B1 B6 B8 B10 B12	C1

Contents	
Topic	Sub-topic
I. Methods for detection and quantification of microorganisms	1. Sampling 2. Processing of samples 3. Methods of enrichment, isolation and culture 4. Methods of counting
II. Classification and identification of prokaryotes	1. Phenotypic methods 2. Genotypic methods
III. Measures of biomass and microbial metabolic activity	1. Estimates of the total microbial biomass 2. Specific determination of biomass 3. Measures of microbial activity
PRACTICES	1. Methods of counting and estimating biomass and microbial activity 2. Microbiological analysis of different materials 3. Determination of indicator and pathogen microorganisms 4. Rapid bacterial identification phenotypic techniques 5. Genotypic methods for analysis of microorganisms
SEMINARS	1. Reporting of results
CASE STUDY	1. Conducting and oral presentation of case studies

Planning				
Methodologies / tests	Competencies / Results	Teaching hours (in-person & virtual)	Student?s personal work hours	Total hours

Guest lecture / keynote speech	A1 A14 A15 A21 A25 A29 B12 C6 C8	8	25	33
Laboratory practice	A2 A9 A11 A13 A26 A30 A31 B6	30	30	60
Seminar	A26 A27 B1 B2 B4 B5 B7 B10 B11 C3	5	15	20
Case study	B2 B5 B8	4	25	29
Mixed objective/subjective test	B3 B8 C1	4	0	4
Personalized attention		4	0	4
(*)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	Exposition by teachers in which the theoretical program of the subject will be developed.
Laboratory practice	Students will conduct mandatory laboratory practices, which will be in group. The student will be introduced in the use of different techniques of analysis and study of microorganisms. In addition, microbiological analysis for different practical cases will be proposed and scientific criticism should be exercised.
Seminar	Works in small groups in which the results previously obtained in the laboratory practices will be presented in a reasoned manner. Students will be evaluated by means of a specific evaluation.
Case study	Work in small groups where it will be proposed with at least one practical case in which he will reasonably indicate the actions to be taken from the point of view of a microbiologist, to meet the demand required in this case.
Mixed objective/subjective test	Test written in which the degree of knowledge and understanding achieved by the students in all aspects included in the subject will be assessed.

Personalized attention	
Methodologies	**Description**
Seminar Guest lecture / keynote speech Laboratory practice Case study	During the development of the subject, requirements and queries of the students regarding the subject will be addressed by providing the necessary guidance and support, both in person as non-presential. Within the personalized attention you can include mentoring requested by the student for the preparation of examinations, as well as the subsequent revision of the same, and the preparation of seminars and case studies.

Assessment			
Methodologies	**Competencies / Results**	**Description**	**Qualification**
Seminar	A26 A27 B1 B2 B4 B5 B7 B10 B11 C3	Evaluation of the tasks carried out during the seminars. It will be required by the students the results that have been obtained in the performing of laboratory practices.	15
Guest lecture / keynote speech	A1 A14 A15 A21 A25 A29 B12 C6 C8	Assessed through the mixed test.	0
Laboratory practice	A2 A9 A11 A13 A26 A30 A31 B6	Mandatory attendance and evaluation of student work during the development of practices. In mixed test, questions directly related to practical issues will be also proposed.	15
Mixed objective/subjective test	B3 B8 C1	Test written about the knowledge acquired in the keynote sessions, the laboratory practices and in the seminars.	50
Case study	B2 B5 B8	The student must resolve and present in group a practical case that will be proposed. Work will be assessed by means of a rubric.	20

Assessment comments
To pass the course, in any of the diets to which the student may go, the student must have obtained a 2,5 points out of 5 in the "mixed test", performing all tasks that are considered mandatory, and obtain a minimum score of 2.5 points on a maximum 5. To account for the final grade in the value obtained in sections of seminars, practical and case study, the student must have passed the mixed test, corresponding to the theory of the subject. In order to be evaluated, students must attend to practical sessions. In the case of not passing the subject in a first option, in the second option, the student must pass only the mixed test. For a student to be considered "NOT PRESENT", he must have the following requirements: not site the examination (the mixed-test) or not attend the practice sessions. If the number of "with Honours" that may be granted is exhausted in the first option, none will be granted in the second option, even though the maximum note is obtained.Exceptionally, the teacher should take appropriate actions in order to not prejudice her/his evaluation in case a student is not able to take all the continuous evaluation examinations, for justified reasons (part-time students or specific learning and diversity support circumstances). 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 microorganismos. 14º ed.. Pearson Education - WILEY, SHERWOOD & WOOLVERTON (2009). Microbiología de Prescott, Harley y Klein. 7ª ed.. McGraw Hill
Complementary	- COLLINS, LYNE & GRANGE (1995). Collins and Lyne's Microbiological Methods. 7th ed.. Butterworth-Heinemann Ltd. - GAMAZO, LÓPEZ-GOÑI & DÍAZ (2005). Manual Práctico de Microbiología. 3ª ed.. Editorial Masson - HUDSON & SHERWOOD (1997). Explorations in Microbiology. Prentice Hall - SINGER (2001). Experiments in Applied Microbiology. Academic Press - APHA, AWWA, WPCF (1992). Métodos normalizados para el análisis de aguas potables y residuales. Ediciones Díaz de Santos, S.A. - PASCUAL ANDERSON & CALDERON PASCUAL (2000). Microbiología alimentaria. Metodología Analítica para alimentos y bebidas. Ediciones Díaz de Santos S.A.

Recommendations
Subjects that it is recommended to have taken before
Microbiology/610G02015 Applied Microbiology and Microbiological Control/610G02016
Subjects that are recommended to be taken simultaneously
Subjects that continue the syllabus
Microbiology and Environmental Biotechnology/610G02018
Other comments

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.

- Drafts should be avoided.

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