



IDENTIFYING DATA

Microbial Production

Subject	Microbial Production			
Code	V02G030V01908			
Study programme	Grado en Biología			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Optional	4th	1st
Teaching language	#EnglishFriendly Spanish			
Department				
Coordinator	Sieiro Vázquez, Carmen			
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Web				

General description Microbial biotechnology studies microorganisms, and the processes they carry out on a large scale, with the aim of producing products of applied and commercial interest in the health, agri-food and environmental fields. The subject covers the different knowledge, fundamental and applied, related to industrial production processes, as well as the search, selection and improvement of the microbial strains involved. The most relevant products currently being produced by micro-organisms and future prospects for new applications are examined.

The schedule of the subject can be consulted at the following link:
<http://bioloxia.uvigo.es/es/docencia/horarios>

English Friendly subject: International students may request from the teachers: a) resources and bibliographic references in English, b) tutoring sessions in English, c) exams and assessments in English.

Training and Learning Results

Code	
A1	Students should prove understanding and knowledge in this study field that starts in the Secondary Education and with a level that, even though it is supported in advanced books, also includes some aspects that involve knowledge from the vanguard of the study field.
A2	Students should know how to apply their knowledge to their work or vocation in a professional way. They also should have the competences that are usually proved through the elaboration and defence of arguments and the resolution of problems within their study field.
A3	Students should prove ability for information-gathering and interpret important data (usually within their study field) to judge relevant social, scientific or ethical topics.
A4	Students should be able to communicate information, ideas, issues and solutions to all audiences (specialist and unskilled audience).
A5	Students should develop the necessary learning skills to undertake further studies with a high degree of autonomy
B2	Ability of reading and analyzing scientific papers and having critical assessment skills to understand data collection, deducing the main idea from the least relevant ones and basing on the corresponding conclusions.
B3	Acquisition of general knowledge about the basic subjects of biology, both at theory and experimental level, without dismissing a higher specialization in subjects that are oriented to a concrete professional area.
B4	Ability in handling experimental tools, both scientific and computer technology equipment that support the search for solutions to problems related to the basic knowledge of biology and with those of a concrete labour context.
B7	Collection of information about issues of biologic interest, analysis and emission of critical opinions and reason them including the reflection about social and/or ethical aspects related to the issue.
B10	Development of analytic and abstraction skills, the intuition and the logical and rigorous thought through the study of biology and its uses.
B11	Ability to communicate in detail and clearly: knowledge, methodology, ideas, issues and solutions to all audiences (not only qualified but unskilled in Biology).

B12	Ability to identify their own educational necessities in the biology field and in concrete labour areas and to organize their learning with a high grade of autonomy in any context.
C5	Growing microorganisms, cells, tissues and organs.
C6	Assessing and interpreting metabolic activities.
C7	Manipulating and analysing genetic data and carrying out genetic counseling
C16	Growing, producing, transforming, improving biological resources as well as getting profits.
C17	Identifying and obtaining natural biological products
C18	Producing, transforming, controlling and preserving Agro-Food products.
C19	Identifying, addressing and communicating Agro-Food and environmental risks.
C20	Designing, using and supervising biotechnological processes.
C24	Designing biological process models.
C25	Gathering background information, develop experimental work and analysing data results
C29	Helping and evaluating scientific, technical, ethical, legal and socioeconomically aspects related to Biology.
C31	Knowing and handling technical and scientific apparatus.
C32	Knowing and handling basic or specific key concepts and terminology
C33	Understanding the social projection of Biology.
D1	Development of capacity of analysis and synthesis
D3	Development of oral and writing communication abilities
D6	Research and interpreting of information from different sources
D8	Development of the ability of independent learning
D10	Development of the critical thinking
D11	Adquisition of an ethical agreement with the society and the profession
D14	Adquisition of abilities in the interpersonal relationships
D16	Acceptance of a quality commitment

Expected results from this subject

Expected results from this subject	Training and Learning Results			
	A1	B3	C6	D1
Know the selection and improvement of the industrial microorganisms as well as the appearances related with the microbial biotechnology	A2	B12	C7	D3
	A3		C16	D6
	A4			D8
Know the systems of processed and purification of the products of microbial origin	A1	B3	C16	D1
	A2	B12	C18	D3
	A3		C20	D6
	A4			D8
Know the legislation and relative rules to the microbial production	A1	B3	C19	D3
	A2	B11	C20	D6
	A3	B12	C24	D8
	A4		C29	
Isolate, identify, handle and analyse microorganisms and/or his cellular and molecular constituents of interest in microbial production	A2	B3	C5	D10
	A5	B4	C6	D16
			C17	
			C31	
Manipulate and analyse the genetic material in the processes of improvement of the industrial microorganisms	A2	B3	C7	D10
	A5	B4	C16	D11
			C31	
Apply knowledges and relative technology to the microbial production in appearances related with the production, exploitation, analysis and diagnostic of processes and biological resources	A1	B4	C5	D10
	A2	B10	C6	D11
	A5		C16	D16
			C18	
		C20		
		C24		
Obtain information, develop experiments and interpret results	A1	B2	C25	D1
	A2	B3		D6
	A3	B7		
	A4	B10		
	A5	B12		
Comprise the social projection of the microbial production and his repercussion in the professional exercise	A3	B7	C29	D11
	A5	B11	C33	
Apply knowledges of microbial production to advise, supervise and *peritar on scientific appearances-technical, ethical, legal and partner-economic related with the living beings and environment	A2	B4	C19	D3
	A3	B7	C29	D10
	A4	B10		D11
		B11		D14

Know and handle the concepts, terminology and scientific instrumentation-technical relative to the microbial production	A1	B2	C31	D3
	A2	B3	C32	
	A3			
	A4			
	A5			

Contents

Topic

1-Introduction to Microbial Biotechnology: Historical Development, Socioeconomic Importance and Legislation

2-Microbial Metabolism and Production: Regulation and Metabolic Strategies for Hyperproduction

3-Production Technology (I): Culture media and industrial sterilization, industrial fermentation and product recovery and processing

4-Production Technology (II): Development of industrial strains (search, selection and improvement of strains)

5-Microbial food production: alcoholic beverages, dairy products and novel foods obtained by fermentation

6-Microbial production of drugs: antimicrobials, vaccines, hormones and other products of therapeutic interest

7-Microbial production of enzymes, amino acids, pigments and vitamins

8-Production of organic acids, solvents and biofuels

9-Microbial Polymers Production: Polysaccharides, Bioplastics and Biosurfactants

10-Microbial Biomass Production as an Industrial Product: SCP, Probiotics, Bioinsecticides and Biofertilizers

PRACTICES

The practices will consist of laboratory sessions and/or case studies related to:

The isolation, characterization, selection, typification and improvement of microorganisms of industrial interest

Planning

	Class hours	Hours outside the classroom	Total hours
Laboratory practical	13.5	3	16.5
Seminars	10	32	42
Lecturing	23	39	62
Objective questions exam	0.5	5	5.5
Objective questions exam	0.25	3	3.25
Objective questions exam	0.25	10	10.25
Objective questions exam	0.25	5	5.25
Objective questions exam	0.25	5	5.25

*The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.

Methodologies

	Description
Laboratory practical	The students will get experience in the characterisation, selection and improvement of microorganisms of industrial interest, as well as in the study of the processes in which they are involved.

Seminars	<p>I. The students, guided by the teacher, will document (search, evaluate, classify and select information) on a topic related to the program of the subject (or on a part of such topic) and, with the selected material, will prepare a summary.</p> <p>II. Students will work on the topic for which they have researched by completing a worksheet and preparing a presentation, which they will present to their classmates and the teacher. They will have a discussion with the teacher and their classmates about the topic and will resolve any questions that arise in relation to it.</p>
Lecturing	Exhibition, by the professor, of the contents on the matter object of study, theoretical bases and/or guidelines of a work, exercise or project to develop by the student

Personalized assistance

Methodologies	Description
Lecturing	Personalized attention will be given during tutorial hours.
Laboratory practical	Personalized attention will be given during tutorial hours.
Seminars	Personalized attention will be given during tutorial hours.

Assessment

	Description	Qualification	Training and Learning Results
Seminars	<p>BIBLIOGRAPHIC DOCUMENTATION: Abstract delivered considering the ability to seek to value, classify and select information, as well as the ability to structure, synthesize, criticize and interrelate the contents. Students will have a rubric that will detail the aspects that will be evaluated (5%).</p> <p>WORK/PRESENTATION AND EXPOSITION: The worksheet elaborated by the students on the topic will be considered, as well as the exposition (capacity to synthesize, explain and transmit the information) that they carry out and the presentation (design and selection of the support material) that they use in the exposition. The ability to resolve questions and issues related to the topic will also be taken into account. Students will have a rubric that will detail the aspects that will be evaluated (10 %).</p> <p>OBJECTIVE TEST on the contents of the seminars (10%)</p>	25	A1 B2 C17 D1 A2 B7 C24 D3 A3 B10 C25 D6 A4 B11 C29 D8 A5 B12 C32 D10 C33 D14 D16
Objective questions exam	Exam with objective questions about PRACTICAL SESSIONS	15	
Objective questions exam	Exam with objective questions on the theoretical concepts of the INTRODUCTION AND GENERAL ASPECTS OF THE SUBJECT	10	
Objective questions exam	Exam with objective questions on the theoretical aspects of PRODUCTION TECHNOLOGY	20	
Objective questions exam	Exam with objective questions on the theoretical aspects of MICROBIAL PRODUCTION (I)	15	
Objective questions exam	Exam with objective questions on the theoretical aspects of MICROBIAL PRODUCTION (II)	15	

Other comments on the Evaluation

1.- The evaluation will be preferably continuous according to the qualification of the activities/test above mentioned. It is essential to achieve a grade of 5/10 to pass the subject. It will be necessary to achieve a minimum grade of 4/10 in each of the activities/tests to pass the subject. In case of not achieving the minimum grade required in any of the activities/tests, the grade that will appear in the report card will be the highest failing grade achieved by the student.

Attendance to practicals and seminars is compulsory for all students, being allowed to miss only one session if the absence is duly justified. The non-attendance to the practicals sessions and/or seminars, as well as the non-submission of group work, is not recoverable in the second or successive calls, preventing also to pass the global evaluation (in the case of students who have opted for this mode of evaluation).

The grade obtained in the different continuous evaluation tests (practicals, seminars, lectures), as long as it reaches the minimum of 4/10, will be kept for the July exam, so in this exam the student will only take the tests that he/she has not passed in the first exam.

2.- Alternatively, the student may opt for a single global evaluation test. The grades obtained in the practicals and seminars

will be transferred to the final grade of this evaluation. The student must declare on the date established by the Center his or her intention to opt for the global evaluation, which will prevent him or her from taking the continuous evaluation.

DATES OF EXAMINATIONS

They can be consulted in the following link:

<http://bioloxia.uvigo.es/es/docencia/examenes>

Sources of information

Basic Bibliography

Okator N. and Okeke B., **Modern Industrial Microbiology and Biotechnology**, 2nd ed., CRC Press, 2021

Wilson D.B., Sahm H., Stahmann K-P and Koffas M., **Industrial Microbiology**, First ed., Wiley, 2020

Glazer A.N. and Nikaido H., **Microbial Biotechnology. Fundamentals of Applied Microbiology**, 2nd ed., Cambridge University Press, 2008.

Byong H. Lee, **Fundamentals of Food Biotechnology**, 2nd ed., Wiley-Blackwell, 2015.

Hutkins R.W., **Microbiology and Technology of Fermented Foods**, First ed., IFT Press. Blackwell Publishing, 2008.

Singh V, **Microbial Cell Factories Engineering for Production of Biomolecules**, First ed., Elsevier, 2021

Complementary Bibliography

Primrose S.B. and Twyman R.M., **Principles of gene manipulation and genomics**, 7th ed., Blackwell Science, 2014.

Bora S.K., Sarma K. and Das S., **An Approach to Microbial Biotechnology. A Laboratory Handbook**, First ed., LAP Lambert Academic Publishing, 2013.

Recommendations

Subjects that are recommended to be taken simultaneously

Quality management and control/V02G030V01911

Subjects that it is recommended to have taken before

Genetics II/V02G030V01505

Microbiology II/V02G030V01605

Advanced techniques in biology/V02G030V01504

Microbiology I/V02G031V01204