



IDENTIFYING DATA

Biotechnology applied to microbiological production

Subject	Biotechnology applied to microbiological production			
Code	V02G031V01412			
Study programme	Grado en Biología			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Optional	4th	1st
Teaching language	#EnglishFriendly Spanish			
Department				
Coordinator	Sieiro Vázquez, Carmen			
Lecturers	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	
A5	Students should develop the necessary learning skills to undertake further studies with a high degree of autonomy.
B1	Developing autonomous learning by identifying their own training need and organizing and planning tasks and time.
B2	Manage scientific-technical information using diverse and reliable sources. Analyze data and documents and interpret them critically and rigorously, including considerations on their social relevance and in the professional field of Biology.
B4	Draft and write reports, documents and projects related to Biology. Proceed to their presentation and debate in the teaching and specialized areas, highlighting the competences of the degree.
C4	Isolate, identify and grow microorganisms, cells, tissues and organs, making easier their study and the assessment of their metabolic activity.
C5	Manipulate and analyse genetic material and determine its alterations and pathological implications. Knowing the applications of genetic engineering.
C9	Identify resources of biological origin and assess their efficient and sustainable use in order to obtain products of interest. Propose and implement improvements in production systems.
C10	Identify biological and biotechnological processes and their potential applications, in particular in health, agri-food and environmental fields.
C19	The ability to manage animal, plant and microbial production processes, implement biological tools that improve production efficiency and identify new areas of application and professional opportunities.
C20	Understanding the social projection of biology applied to production at its different levels of application (analytical, production and management) and its repercussions on professional practice.
D4	Collaborate and work in teams or multidisciplinary groups, promote negotiation skills and the ability to reach agreements.

Expected results from this subject

Expected results from this subject	Training and Learning Results	
To identify microbial products of applied importance and demonstrate scientific criteria to find the most appropriate microorganisms for their production, according to their metabolic diversity.	A5	C4 C9
To apply the knowledge acquired to deal with the selection and improvement of microorganisms of biotechnological interest.	A5	C4 C5 C9
To differentiate the different types of industrial fermentations, identify the most important technological aspects for their implementation and recognize the role of environmental factors in the development of fermentation.	A5	C9 C10 C19
To apply in an integrated manner the knowledge acquired to design, optimize and control of profitable and sustainable fermentation processes, as well as the design of product purification processes.	A5	C10 C19 C20
Knowing the legislation and regulations related to microbial production.	B2	
To compile and handle information and/or data related to the different aspects of microbial production and interpret them critically. Make reasoned judgements or assessments, apply them to innovation or transmit them in an academic or business context.	B1 B2 B4	D4

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 (searching, 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 practical lessons will consist of laboratory sessions and/or case studies related to:

The isolation, characterization, selection, typing 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	
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	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. 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.
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	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%). 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 %). OBJECTIVE TEST on the contents of the seminars (10%)	25	A5	B1 B2 B4	C20	D4
Objective questions exam	Exam with objective questions about PRACTICAL SESSIONS	15	A5	B1 B2	C4 C20	D4
Objective questions exam	Exam with objective questions on the theoretical concepts of the INTRODUCTION AND GENERAL ASPECTS OF THE SUBJECT	10	A5	B2	C4 C5 C9 C10 C19 C20	
Objective questions exam	Exam with objective questions on the theoretical aspects of PRODUCTION TECHNOLOGY	20	A5	B2	C4 C5 C9 C10 C19 C20	
Objective questions exam	Exam with objective questions on the theoretical aspects of MICROBIAL PRODUCTION (I)	15	A5	B2	C4 C5 C9 C10 C19 C20	

Objective questions exam	Exam with objective questions on the theoretical aspects of MICROBIAL PRODUCTION (II)	15	A5 B2 C4 C5 C9 C10 C19 C20
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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**, 978-036-77816-75, 2nd ed., CRC Press, 2021

Wilson D.B., Sahm H., Stahmann K-P and Koffas M., **Industrial Microbiology**, 978-527-34035-4, 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**, 978012821487, 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