



IDENTIFYING DATA

Microbial Production

Subject	Microbial Production			
Code	V02G030V01908			
Study programme	(*)Grao en Bioloxía			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Optional	4th	1st
Teaching language	Spanish			
Department	Functional Biology and Health Sciences			
Coordinator	Sieiro Vázquez, Carmen			
Lecturers	Sieiro Vázquez, Carmen			
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Web				

General description The subject deals with the study of the products of microbial synthesis with applied interest, including the development of strains used to produce them as well as the production processes.

The timetable of the course can be consulted through the following link:

<http://bioloxia.uvigo.es/en/teaching/schedules>

Competencies

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

Learning outcomes

Expected results from this subject

Training and Learning Results

New	A1	B3	C6	D1
	A2	B12	C7	D3
	A3		C16	D6
	A4			D8
New	A1	B3	C16	D1
	A2	B12	C18	D3
	A3		C20	D6
	A4			D8
New	A1	B3	C19	D3
	A2	B11	C20	D6
	A3	B12	C24	D8
	A4		C29	
New	A2	B3	C5	D10
	A5	B4	C6	D16
			C17	
			C31	
New	A2	B3	C7	D10
	A5	B4	C16	D11
			C31	
New	A1	B4	C5	D10
	A2	B10	C6	D11
	A5		C16	D16
			C18	
			C20	
New	A1	B2	C25	D1
	A2	B3		D6
	A3	B7		
	A4	B10		
	A5	B12		
New	A3	B7	C29	D11
	A5	B11	C33	
New	A2	B4	C19	D3
	A3	B7	C29	D10
	A4	B10		D11
		B11		D14
New	A1	B2	C31	D3
	A2	B3	C32	
	A3			
	A4			
	A5			

Contents

Topic

1. Introduction to microbial production: historical development, socio-economic importance and legislation.

2. Microbial metabolism.

3. Production technology: Culture media; Industrial sterilization; Industrial fermentation and Products recovery and processing.

4. Production technology: Development and improvement of industrial strains.

5. Food production by microorganisms: Biomass, alcoholic beverages, dairy products.

6. Microbial products of therapeutic interest: Antibiotics, vaccines and hormones.

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

8. Production of organic acids, solvents and biofuels.

9. Other products of microbial synthesis.

PRACTICES

Fermented microbial products: alcoholic beverages and dairy foods. Characterization, selection (selection criteria), and typing of strains. Organoleptic characteristics of the products.

Production of secondary metabolites: antibiotics and industrial enzymes. Strains search, effect of the medium composition on the production, process monitoring.

Improvement of industrial strains: obtaining yeasts diploid strains. Marker characterization in haploid strains (design of specific culture media) and diploid selection (design of selective media).

Production of microbial biomass, obtaining strains of interest, encapsulation of cells, applications of encapsulated cells for the recovery of contaminated water.

Planning			
	Class hours	Hours outside the classroom	Total hours
Laboratory practices	14	9.8	23.8
Seminars	10	10	20
Group tutoring	2	0	2
Supervised work	1	20	21
Lecturing	22	49.06	71.06
Objective questions exam	1.5	2.7	4.2
Other	2	6	8

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

Methodologies	
Laboratory practices	Description The students will acquire experience in the characterization, selection and improvement of microorganisms of industrial interest as well as in the study of the processes in which they are involved.
Seminars	The students will present to the teacher and their colleagues the supervised work they have done and they will have a debate about it.
Group tutoring	The students will have interviews with the teachers to receive advice on the different activities they have to develop and solve doubts. The teaching staff, for their part, will supervise the evolution of the students.
Supervised work	Students will prepare a paper related to one of the program topics. They will give, according to the instructions, a summary to the teacher.
Lecturing	Presentation, by the teacher, of the contents on the matter under study, theoretical bases and/or guidelines for exercises or projects to be developed by the students.

Personalized attention

Methodologies	Description
Lecturing	Personalized attention will be given during tutorial hours.
Laboratory practices	Personalized attention will be given during tutorial hours.
Group tutoring	A minimum of two sessions will be held during the course in order to supervise and evaluate the evolution of the students, as well as to direct the supervised work.
Supervised work	The direction and supervision of the works done by the students will be carried out in the group tutorial sessions.

Assessment						
	Description	Qualification	Training and Learning Results			
Seminars	Presentation of the supervised work (capacity to synthesize, explain and transmit, as well as the design and selection of the support material for the presentation). The students will have a rubric that will detail the aspects that will be evaluated.	10	A2 A3 A4	B2 B4 B7 B10 B11 B12	C25 C32 C33	D1 D3 D6 D8 D10 D14 D16
Supervised work	Submitted summary (ability to search and manage information, structure, synthesize, criticize and interrelate). The students will have a rubric that will detail the aspects that will be evaluated.	10	A1 A3 A4 A5	B2 B4 B7 B10 B11 B12	C6 C17 C18 C24 C25 C29 C32 C33	D1 D3 D6 D8 D10 D14 D16
Objective questions exam	-Continuous evaluation questionnaires about the Master sessions (10%) -Practices evaluation questionnaire (20%)	30	A1 A2	B2 B3	C5 C6 C7 C16 C17 C18 C19 C20 C25 C29 C31 C32 C33	D1 D3 D8 D10 D11 D14 D16
Other	Exam about the Master sessions including objective and short questions	50	A1 A5	B2	C5 C6 C7 C17 C18 C20 C32 C33	D3 D8

Other comments on the Evaluation

A grade of 5/10 is required to pass the course.

It is essential to obtain a minimum grade of 4/10 in each of the activities in order to pass the course.

The grade of the activities graded with a minimum of 4 may be kept, if desired by the student, for the second and/or subsequent calls, in which he or she must only present the exam for the not passed activities.

EXAMS DATES

They can be consulted at the following link:

<http://bioloxia.uvigo.es/en/teaching/exams>

Sources of information

Basic Bibliography

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

Waites M.J., Morgan N.L., Rockey J.S., Highton G. and Malden M.A., **Industrial Microbiology**, First ed., Blackwell Science, 2001.

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

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

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

Complementary Bibliography

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

Agri-food analysis and diagnostic/V02G030V01901

Quality management and control/V02G030V01911

Animal production/V02G030V01907

Vegetable production/V02G030V01909

Subjects that it is recommended to have taken before

Biology: Basic laboratory techniques/V02G030V01203

Biochemistry I/V02G030V01301

Biochemistry II/V02G030V01401

Genetics I/V02G030V01404

Microbiology I/V02G030V01304

Genetics II/V02G030V01505

Microbiology II/V02G030V01605

Advanced techniques in biology/V02G030V01504
