



## 1. General information

Course: INDUSTRIAL MICROBIOLOGY  
 Type: ELECTIVE  
 Degree: 409 - CHEMISTRY  
 Center: 1 - FACULTY OF SCIENCE AND CHEMICAL TECHNOLOGY  
 Year: 4

Main language: Spanish  
 Use of additional languages:  
 Web site:

Code: 57336  
 ECTS credits: 6  
 Academic year: 2023-24  
 Group(s): 20  
 Duration: C2  
 Second language:  
 English Friendly: Y  
 Bilingual: N

Lecturer: ANA ISABEL BRIONES PEREZ - Group(s): 20

Building/Office	Department	Phone number	Email	Office hours
Marie Curie. Planta baja	Q. ANALÍTICA Y TGIA. ALIMENTOS	3424	ana.briones@uclm.es	

Lecturer: MONICA FERNANDEZ GONZALEZ - Group(s): 20

Building/Office	Department	Phone number	Email	Office hours
San Isidro Labrador/301	Q. ANALÍTICA Y TGIA. ALIMENTOS	+34926052678	Monica.Fernandez@uclm.es	

## 2. Pre-Requisites

Not established

## 3. Justification in the curriculum, relation to other subjects and to the profession

To initiate the student in industrial Microbiology, knowing the microorganisms of industrial interest involved in Biotechnological processes. Moreover, basic knowledge of general microbiology will be taught.

## 4. Degree competences achieved in this course

## Course competences

Code	Description
CB03	Be able to gather and process relevant information (usually within their subject area) to give opinions, including reflections on relevant social, scientific or ethical issues.
CB04	Transmit information, ideas, problems and solutions for both specialist and non-specialist audiences.
E12	Understand the chemistry of the main biological processes
G05	Acquire and adapt new knowledge and techniques of any scientific-technical discipline with incidence in the chemical field
T09	Motivation for quality, job security and awareness of environmental issues, with knowledge of internationally recognized systems for the correct management of these aspects

## 5. Objectives or Learning Outcomes

## Course learning outcomes

## Description

Learn to work in a laboratory of industrial microbiology and interpret the experimental results obtained  
 Start the student in the fundamentals of Industrial Microbiology / Microbiology  
 To get the student to acquire the basic terminology of Industrial Microbiology and know how to use it.  
 Understand the versatility of industrial microorganisms and fermentation technology  
 To ensure that the student is able to search, select and interpret information in the field of biotechnology.  
 Raise their ability to criticize and discuss new issues related to the subject  
 Know the fermentation bioproducts  
 Know the concepts of metabolism and biochemistry of microorganisms for industrial use

## 6. Units / Contents

Unit 1: Introduction to Microbiology. Discovery of microorganisms

Unit 2: The microbial cell. Fundamental structures in prokaryotic and eukaryotic cells: bacteria, molds and yeasts

Unit 2.1

Unit 3: Microbial growth Specific rate of growth

Unit 3.1

Unit 3.2

Unit 4: Microbial metabolism Catabolism: breathing, fermentation. Anabolism: biosynthesis of biomolecules

Unit 5: Design and preparation of substrata for bioprocesses. Source of carbon, nitrogen, vitamins, minerals and water. Sterilization

Unit 5.1

Unit 6: Industrial microorganisms Sources. Cultivation collections. Strain improvement: fundamentals of recombination and genetic engineering

Unit 7: Fermentation systems: on batch, continuous, fed-batch. Primary and secondary metabolites

Unit 8: Industrial processes and bioproducts: enzymes and biomass

Unit 9:

## 7. Activities, Units/Modules and Methodology

Training Activity	Methodology	Related Competences (only degrees before RD 822/2021)	ECTS	Hours	As	Com	Description
Class Attendance (theory) [ON-SITE]	Lectures	CB03 CB04 E12 G05 T09	1.2	30	N		Presentation of topics by the teacher. Explanation of microbiological models
Workshops or seminars [ON-SITE]	Guided or supervised work	CB03 CB04 E12 G05 T09	0.2	5	Y	N	Presentation by the student of a novel topic related to industrial microbiology
Problem solving and/or case studies [ON-SITE]		CB03 CB04 E12 G05 T09	0.1	2.5	Y	N	Solving microbial growth problems adjusted to kinetic models
Laboratory practice or sessions [ON-SITE]	Practical or hands-on activities	CB03 CB04 E12 G05 T09	0.9	22.5	Y	Y	Experimental practices in the laboratory; microbiological tests and determinations
Progress test [ON-SITE]	Assessment tests	CB03 CB04 E12 G05 T09	0.2	5	Y	Y	Tests to check the evolution of the student and achievement of competences
Other off-site activity [OFF-SITE]	Group Work	CB03 CB04 E12 G05 T09	1.4	35	N		Autonomous work to prepare the presentation - of seminars and resolution of additional problems
Study and Exam Preparation [OFF-SITE]	Self-study	E12 G05 T09	2	50	N		- Preparation and study of topics

<b>Total:</b>	<b>6</b>	<b>150</b>
<b>Total credits of in-class work:</b>	<b>2.6</b>	<b>Total class time hours:</b>
<b>Total credits of out of class work:</b>	<b>3.4</b>	<b>Total hours of out of class work:</b>

As: Assessable training activity

Com: Training activity of compulsory overcoming (It will be essential to overcome both continuous and non-continuous assessment).

## 8. Evaluation criteria and Grading System

Evaluation System	Continuous assessment	Non-continuous evaluation*	Description
Laboratory sessions	20.00%	20.00%	
Assessment of problem solving and/or case studies	10.00%	5.00%	
Oral presentations assessment	10.00%	0.00%	
Progress Tests	60.00%	0.00%	
Final test	0.00%	75.00%	
<b>Total:</b>	<b>100.00%</b>	<b>100.00%</b>	

According to art. 4 of the UCLM Student Evaluation Regulations, it must be provided to students who cannot regularly attend face-to-face training activities the passing of the subject, having the right (art. 12.2) to be globally graded, in 2 annual calls per subject, an ordinary and an extraordinary one (evaluating 100% of the competences).

## 9. Assignments, course calendar and important dates

### Not related to the syllabus/contents

Hours	hours
Workshops or seminars [PRESENCIAL][Guided or supervised work]	5
Problem solving and/or case studies [PRESENCIAL][ ]	2.5
Laboratory practice or sessions [PRESENCIAL][Practical or hands-on activities]	22.5
Progress test [PRESENCIAL][Assessment tests]	5
Other off-site activity [AUTÓNOMA][Group Work]	35
Study and Exam Preparation [AUTÓNOMA][Self-study]	50

### Unit 1 (de 9): Introduction to Microbiology. Discovery of microorganisms

Activities	Hours
Class Attendance (theory) [PRESENCIAL][Lectures]	1

### Unit 2 (de 9): The microbial cell. Fundamental structures in prokaryotic and eukaryotic cells: bacteria, molds and yeasts

Activities	Hours
Class Attendance (theory) [PRESENCIAL][Lectures]	4

### Unit 3 (de 9): Microbial growth Specific rate of growth

Activities	Hours
Class Attendance (theory) [PRESENCIAL][Lectures]	5

### Unit 4 (de 9): Microbial metabolism Catabolism: breathing, fermentation. Anabolism: biosynthesis of biomolecules

Activities	Hours
Class Attendance (theory) [PRESENCIAL][Lectures]	3

### Unit 5 (de 9): Design and preparation of substrata for bioprocesses. Source of carbon, nitrogen, vitamins, minerals and water. Sterilization

Activities	Hours
Class Attendance (theory) [PRESENCIAL][Lectures]	4

### Unit 6 (de 9): Industrial microorganisms Sources. Cultivation collections. Strain improvement: fundamentals of recombination and genetic engineering

Activities	Hours
Class Attendance (theory) [PRESENCIAL][Lectures]	4

### Unit 7 (de 9): Fermentation systems: on batch, continuous, fed-batch. Primary and secondary metabolites

Activities	Hours
Class Attendance (theory) [PRESENCIAL][Lectures]	3

### Unit 8 (de 9): Industrial processes and bioproducts: enzymes and biomass

Activities	Hours
Class Attendance (theory) [PRESENCIAL][Lectures]	2

### Global activity

Activities	hours
Laboratory practice or sessions [PRESENCIAL][Practical or hands-on activities]	22.5
Class Attendance (theory) [PRESENCIAL][Lectures]	26
Workshops or seminars [PRESENCIAL][Guided or supervised work]	5
Problem solving and/or case studies [PRESENCIAL][ ]	2.5
Progress test [PRESENCIAL][Assessment tests]	5
Other off-site activity [AUTÓNOMA][Group Work]	35
Study and Exam Preparation [AUTÓNOMA][Self-study]	50
<b>Total horas:</b>	<b>146</b>

## 10. Bibliography and Sources

Author(s)	Title/Link	Publishing house	City	ISBN	Year	Description
Glazer, Alexander N.	Microbial biotechnology : fundamentals of applied microbiolo	W.H. Freeman and Company		0-7167-2608-4	1999	
Ingraham, John L.	Introducción a la microbiología			84-291-1869-1	2004	
Tortora, Gerard J.	Microbiology : an introduction	Benjamin Cummings		0-321-58420-1	2010	
Wistreich, George A.	Microbiology laboratory : fundamentals and applications	Prentice-Hall		0-13-010074-9	2003	
	Industrial microbiology : an introduction	Blackwell Science		0-632-05307-0	2001	
	Practical fermentation technology	Wiley		978-0-470-01434-9	2008	
Brock, Thomas D.	Brock, biología de los microorganismos	Prentice Hall		84-89660-36-0	2001	