

**1. General information****Course:** BIOREACTORS**Type:** CORE COURSE**Degree:** 402 - UNDERGRADUATE DEGREE PROGRAMME IN BIOTECHNOLOGY**Center:** 601 - E.T.S. AGRICULTURAL ENGINEERS AND MOUNTS AB**Year:** 3**Main language:** Spanish**Use of additional languages:****Web site:****Code:** 60626**ECTS credits:** 6**Academic year:** 2022-23**Group(s):** 10**Duration:** C2**Second language:** English**English Friendly:** Y**Bilingual:** N

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2. Pre-Requisites

Not established

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

Not established

4. Degree competences achieved in this course**Course competences**

Code	Description
CB01	Prove that they have acquired and understood knowledge in a subject area that derives from general secondary education and is appropriate to a level based on advanced course books, and includes updated and cutting-edge aspects of their field of knowledge.
CB02	Apply their knowledge to their job or vocation in a professional manner and show that they have the competences to construct and justify arguments and solve problems within their subject area.
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.
CB05	Have developed the necessary learning abilities to carry on studying autonomously
CE10	Apply mass and energy balances to calculate systems, and obtain results from heat and mass transfer processes and separation processes.
CE17	Apply bioreactor design and management techniques.
CE18	Apply "omics" tools (genomics, proteomics, metabolomics).
CG01	Organizational and planning skills.
CG02	Capacity for analysis and synthesis.
CG03	Ability to work in multidisciplinary teams collaboratively and with shared responsibility.
CG04	Sensitivity towards environmental issues.
CT01	Know a second foreign language.
CT02	Know and apply the Information and Communication Technologies.
CT03	Use correct oral and written communication.
CT04	Know the ethical commitment and professional deontology.

5. Objectives or Learning Outcomes**Course learning outcomes****Description**

To Recognize the devices used for the application of the main biotechnological processes.

To Know the calculation methods and the design systems needed for the application of the main processes in the agri-food industry.

To know the relevance of different parameters involved in the design of a bioreactor.

To know enzymatic catalysis and its regulation.

To know about the fundamentals of biotechnological processes at laboratory scale to understand their design at industrial scale.

To Acquire a critical attitude and aptitude towards the technologies applicable to the processes carried out in the agri-food industries

To know the characteristics and applications of immobilized bio-catalyzers.

6. Units / Contents**Unit 1:****Unit 2:**

Unit 3:
Unit 4:
Unit 5:
Unit 6:
Unit 7:

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	CB01 CB03 CB04 CE10 CE17 CG02 CG04	1	25	N	-	
Class Attendance (practical) [ON-SITE]	Practical or hands-on activities	CB03 CE17 CG03 CT02 CT03	0.7	17.5	Y	Y	
Other on-site activities [ON-SITE]	Individual presentation of projects and reports	CB01 CB02 CB04 CT02 CT03	0.1	2.5	Y	N	
Problem solving and/or case studies [ON-SITE]	Problem solving and exercises	CB02 CE17 CG02 CT02 CT03	0.2	5	Y	N	
Group tutoring sessions [ON-SITE]	Group tutoring sessions	CB04 CG01 CG02 CG03 CT03	0.2	5	Y	N	
Study and Exam Preparation [OFF-SITE]	Self-study	CB05 CG01	3.6	90	Y	N	
Progress test [ON-SITE]	Assessment tests	CB01 CB02 CB03 CB04 CB05 CE10 CE17 CG01 CG03 CG04 CT03	0.2	5	Y	N	
Total:			6	150			
Total credits of in-class work: 2.4			Total class time hours: 60				
Total credits of out of class work: 3.6			Total hours of out of class work: 90				

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
Progress Tests	65.00%	65.00%	
Laboratory sessions	20.00%	20.00%	
Projects	10.00%	10.00%	
Assessment of problem solving and/or case studies	5.00%	5.00%	
Total:	100.00%	100.00%	

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
Class Attendance (practical) [PRESENCIAL][Practical or hands-on activities]	17.5
Unit 1 (de 7):	
Activities	Hours
Class Attendance (theory) [PRESENCIAL][Lectures]	4.5
Study and Exam Preparation [AUTÓNOMA][Self-study]	12.5
Unit 2 (de 7):	
Activities	Hours
Class Attendance (theory) [PRESENCIAL][Lectures]	3.5
Problem solving and/or case studies [PRESENCIAL][Problem solving and exercises]	1
Study and Exam Preparation [AUTÓNOMA][Self-study]	12.5
Unit 3 (de 7):	
Activities	Hours
Class Attendance (theory) [PRESENCIAL][Lectures]	4.5
Problem solving and/or case studies [PRESENCIAL][Problem solving and exercises]	1.5
Group tutoring sessions [PRESENCIAL][Group tutoring sessions]	2.5
Study and Exam Preparation [AUTÓNOMA][Self-study]	15
Progress test [PRESENCIAL][Assessment tests]	2.5
Unit 4 (de 7):	
Activities	Hours
Class Attendance (theory) [PRESENCIAL][Lectures]	3
Problem solving and/or case studies [PRESENCIAL][Problem solving and exercises]	.5
Study and Exam Preparation [AUTÓNOMA][Self-study]	10

Unit 5 (de 7):	
Activities	Hours
Class Attendance (theory) [PRESENCIAL][Lectures]	3
Problem solving and/or case studies [PRESENCIAL][Problem solving and exercises]	2
Study and Exam Preparation [AUTÓNOMA][Self-study]	15
Unit 6 (de 7):	
Activities	Hours
Class Attendance (theory) [PRESENCIAL][Lectures]	3
Study and Exam Preparation [AUTÓNOMA][Self-study]	10
Unit 7 (de 7):	
Activities	Hours
Class Attendance (theory) [PRESENCIAL][Lectures]	3.5
Other on-site activities [PRESENCIAL][Individual presentation of projects and reports]	2.5
Group tutoring sessions [PRESENCIAL][Group tutoring sessions]	2.5
Study and Exam Preparation [AUTÓNOMA][Self-study]	15
Progress test [PRESENCIAL][Assessment tests]	2.5
Global activity	
Activities	hours
Other on-site activities [PRESENCIAL][Individual presentation of projects and reports]	2.5
Progress test [PRESENCIAL][Assessment tests]	5
Group tutoring sessions [PRESENCIAL][Group tutoring sessions]	5
Problem solving and/or case studies [PRESENCIAL][Problem solving and exercises]	5
Class Attendance (theory) [PRESENCIAL][Lectures]	25
Class Attendance (practical) [PRESENCIAL][Practical or hands-on activities]	17.5
Study and Exam Preparation [AUTÓNOMA][Self-study]	90
Total horas: 150	

10. Bibliography and Sources						
Author(s)	Title/Link	Publishing house	Citv	ISBN	Year	Description
Doran, P.M.	Principios de la ingeniería de los bioprocesos	Acribia		978-84-200-0853-0	1998	
Gòdia Casablanques, Francesc; López Santín, Josep; Casas Alvero, Carlos	Ingeniería Bioquímica	Síntesis		84-7738-611-0	2005	
Mandenius, Carl-Fredrik	Bioreactors: Design, Operation and Novel Applications	Wiley-VCH		978-3-527-33768-2	2016	
José Mario Díaz Fernández	Ingeniería de bioprocesos	Ediciones Paraninfo, S.A; 3ª Edición		9788413660233	2021	https://www.paraninfo.es/catalogo/9788413660233/ingenieria-de-bioprocesos-3%c2%aa-edicion
Van't Riet, Klaas; Tramper, Johannes	Basic Bioreactor Design	CRC Press		0824784464	1991	