

Degree	Type	Year
Biotecnología Avanzada	OP	1

## Contact

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## Teachers

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## Teaching groups languages

You can view this information at the [end](#) of this document.

## Prerequisites

To attend the module it is necessary to have a basic formation in Biochemical Engineering, in fundamental aspects of Bioprocess Engineering, in Bioreactors and some basic concepts of recombinant DNA and Genetic Engineering.

## Objectives and Contextualisation

The objective of this module is to familiarize the student with the most important tools used in a bioprocess, and its application in the design and operation of bioprocesses in their future professional careers. In order to achieve this objective, different cellular factories will be explored, designed, integrated and optimized for producing industrial biotechnological products, integrating the production and purification of the bioproduct in a reproducible way (BIOPAT concept) and economically viable Bioprocess Engineering. The quality and safety regulations of bioproducts from different fields will also be explained and the principles on which the scale up of a bioprocess is based will be presented.

## Learning Outcomes

1. CA10 (Competence) Integrate and justify the use of different Biotechnology and Bioprocess Engineering tools to solve emerging problems in industrial biotechnology.

2. CA10 (Competence) Integrate and justify the use of different Biotechnology and Bioprocess Engineering tools to solve emerging problems in industrial biotechnology.
3. CA11 (Competence) Integrate knowledge and address the complexity of formulating judgments based on information that, despite being incomplete or limited, includes reflections on the social and ethical responsibilities associated to the application of such knowledge and judgments.
4. CA11 (Competence) Integrate knowledge and address the complexity of formulating judgments based on information that, despite being incomplete or limited, includes reflections on the social and ethical responsibilities associated to the application of such knowledge and judgments.
5. CA12 (Competence) Integrate and synthesize information obtained from the scientific literature using appropriate channels, contrasting alternatives and engaging in critical debate on the matter.
6. CA12 (Competence) Integrate and synthesize information obtained from the scientific literature using appropriate channels, contrasting alternatives and engaging in critical debate on the matter.
7. KA12 (Knowledge) Contrast the advantages, disadvantages and bioprocess engineering required in the prokaryotic *E. coli* cell factory, the eukaryotic *P. pastoris* cell factory and the animal cell factory.
8. SA10 (Skill) Search, compare, critically analyse, and synthesize information obtained from databases and other sources to solve complex problems in one's field.
9. SA11 (Skill) Prepare technical reports in the fields of environmental and/or biological engineering and communicate the results orally in a clear, concise and unambiguous manner.
10. SA12 (Skill) Plan different task resolution activities entrusted within a working group, while adequately managing time and resources.
11. SA13 (Skill) Assess scale-up challenges in Biotechnology.

## Content

- 1.- Introduction to the industrial production of bioproducts. Scale up in bioreactors
- 2.- Bioprocess design based on quality.
  - 2.1.- Quality by Design (QbD) / Process Analytical Technology (PAT)
  - 2.2.-Good Manufacturing Practice (GMPs). Good Laboratory Practices (BPLs),
- 3.-Cell factories: Animal cell culture
- 4.-Cell factories: *Pichia pastoris*.
- 5.-Cell factories: *Escherichia coli*.
- 6.- Case of study workshop

## Activities and Methodology

Title	Hours	ECTS	Learning Outcomes
Type: Directed			
Case study workshop	20	0.8	CA10, CA11, CA12, KA12, SA11, SA13, CA10
Lectures	33.5	1.34	CA10, CA11, KA12, SA12, SA13, CA10
seminars	4	0.16	CA10, CA11, SA12, SA13, CA10
Type: Supervised			

group work	35	1.4	CA10, CA11, CA12, KA12, SA10, SA12, CA10
Workshop report	15	0.6	CA10, CA12, SA11, CA10
Type: Autonomous			
Case study preparation	10	0.4	CA10, CA11, KA12, SA10, SA12, CA10
Search of documentation and bibliography	28	1.12	CA10, CA11, CA12, SA10, SA13, CA10
Study	50	2	CA11, KA12, SA12, CA11
writing work and oral exposure	24.5	0.98	CA10, CA12, SA10, SA12, CA10

Lectures on the topics of the syllabus.

Seminars on aspects of the industrial world of Biotechnology by experts invited from the sector.

Elaboration of group works. Group activity. Students will prepare a report on a topic related to the contents, at the teacher's proposal. These works will be exposed and defended in public.

Case study workshop. Students will carry out workshops on the different cell factories, consisting of familiarization with a recombinant protein production process, cell cultures and bioprocess monitoring. In addition, a visit will be made to a biotechnology company related to the course theme.

Annotation: Within the schedule set by the centre or degree programme, 15 minutes of one class will be reserved for students to evaluate their lecturers and their courses or modules through questionnaires.

## Assessment

### Continuous Assessment Activities

Title	Weighting	Hours	ECTS	Learning Outcomes
Assessment of workshop	25	1	0.04	CA12, KA12, SA11, SA12, SA13
Assessment of oral presentation	22,5%	1	0.04	CA10, CA11, CA12, KA12, SA10
4 Writing exams	13,1% each	3	0.12	CA10, CA11, CA12, KA12, SA13

### Evaluation of the theoretical part of the module:

#### Continuous assessment

Individual written evaluation: It is 70% of the final grade. Four partial tests corresponding to different subjects of the course are carried out with a weight of 25% each of them. If in the individual written evaluation the student obtained a grade lower than 3/10, he will not pass the module.

Evaluation of the defense and oral presentation of a research paper (30%)

#### Final evaluation:

Students who do not pass the continuous assessment will have a global test of written individual final recovery. Whenever this test is exceeded with a grade higher than 3/10, it will be done with the grade of the oral presentation.

## Global evaluation of the module

Evaluation of workshop (25%). Minimum note of this part to approve the module 3.5/10

Evaluation of the theoretical part of the module (75%). Minimum note of this part to approve the module 3.5/10

The calendar of exams and the different activities to be carried out in the module will be announced at the beginning of the course. Once scheduled, in no case will exams be held with different dates and times.

For the review of the results of the evaluations, the time and manner will be fixed within 10 working days after the communication of the results through the virtual platform. If the student does not show up for this review, this activity will not be subsequently reviewed.

Matriculation of Honor (MH). Awarding the grade of MH is the decision of the faculty responsible for the subject. UAB regulations state that MHs can only be awarded to students who obtain a final grade equal to or higher than 9.00. Up to 5% of the total number of students may be awarded MHs.

A student is considered as not evaluable (NA) if he/she has not shown up for any of the evaluation activities.

Regardless of other disciplinary measures that may be considered appropriate, irregularities committed by students that may result in a modification of the grade of an evaluation activity will be graded with a zero. Therefore, copying, plagiarism, cheating, allowing copying, etc... in any of the evaluation activities will imply a zero grade.

## **Bibliography**

López Santín, Josep et al. Ingeniería bioquímica / Eds: Francesc Gòdia Casablanques, Josep López Santín. Madrid: Síntesis, 2010.

Bailey, James E. (James Edwin), and David F Ollis. Biochemical Engineering Fundamentals / James E. Bailey, David F. Ollis. 2nd ed. New York [etc: McGraw-Hill, 1986.

Doran, Pauline M. Bioprocess Engineering Principles. 2nd ed. San Diego: Elsevier Science & Technology, 2012.

Villadsen, John, ed. Fundamental Bioengineering / Ed. John Villadsen. 1st ed. Weinheim, Germany: Wiley-VCH, 2016.

Additional bibliography, mainly scientific articles, necessary for following the module can be consulted through the virtual platform. In parallel, the student will have to carry out specific bibliographic searches and consultations for the preparation of their group work.

## **Software**

It is not planned to use any specific software for the subject.

## **Groups and Languages**

Please note that this information is provisional until 30 November 2025. You can check it through this [link](#). To consult the language you will need to enter the CODE of the subject.

Name	Group	Language	Semester	Turn
(PLABm) Practical laboratories (master)	1	Spanish	first semester	morning-mixed
(SEMm) Seminars (master)	1	Spanish	first semester	afternoon
(SEMm) Seminars (master)	2	Spanish	first semester	afternoon
(TEm) Theory (master)	1	Spanish	first semester	afternoon