

Degree programme	Type	Course
Biological and Environmental Engineering	OB	1

Contact lecturer

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Group languages

You can consult this information at the [end](#) of the 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

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

- CA06 (Integrate and justify the use of different biotechnology and bioprocess engineering instruments to solve emerging problems in fields of industrial biotechnology.) Integrate and justify the use of different biotechnology and bioprocess engineering instruments to solve emerging problems in fields of industrial biotechnology.
- CA07 (Integrate knowledge and deal with the complexity of formulating judgments based on information that, due to being incomplete or limited, requires consideration of the social and ethical responsibilities

associated to the application of one's knowledge and judgements.) Integrate knowledge and deal with the complexity of formulating judgments based on information that, due to being incomplete or limited, requires consideration of the social and ethical responsibilities associated to the application of one's knowledge and judgements.

- CA08 (Integrate and abridge the information obtained from the scientific literature using the appropriate channels, contrasting and critically debating different alternatives.) Integrate and abridge the information obtained from the scientific literature using the appropriate channels, contrasting and critically debating different alternatives.
- KA05 (Contrast the advantages, disadvantages and the bioprocess engineering required for prokaryotic E.coli cell factories, eukaryotic P.pastoris cell factories and animal cell factories.) Contrast the advantages, disadvantages and the bioprocess engineering required for prokaryotic E.coli cell factories, eukaryotic P.pastoris cell factories and animal cell factories.
- SA01 (Search, compare, critically analyse and summarise information obtained from databases and other sources to solve complex problems in one's specialist area.) Search, compare, critically analyse and summarise information obtained from databases and other sources to solve complex problems in one's specialist area.
- SA02 (Prepare technical reports in the field of environmental engineering and/or biological engineering and present the results orally in a clear, concise and unambiguous manner.) Prepare technical reports in the field of environmental engineering and/or biological engineering and present the results orally in a clear, concise and unambiguous manner.
- SA03 (Plan the different activities related to the resolution of tasks assigned as part of a work group, while appropriately managing time and resources.) Plan the different activities related to the resolution of tasks assigned as part of a work group, while appropriately managing time and resources.
- SA05 (Assess problems with scale-up and scale-down in Biotechnology.) Assess problems with scale-up and scale-down in Biotechnology.

Contents

- 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

Learning activities and methodology

Title	Hours	ECTS	Learning outcomes
Study	50	2	
Search of documentation and bibliography	28	1.12	
Group work	35	1.4	
Workshop report	15	0.6	

Seminars	4	0.16
Case study workshop	20	0.8
Lectures	33.5	1.34
Case study preparation	10	0.4
Preparation of writing work and oral exposure	24.5	0.98

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.

The use of AI is permitted to improve the drafting and style of the reports. However, generating original content with AI is strictly prohibited. If AI tools are used, their use must be explicitly declared, and it must be clearly identified within the report what they were used for.

The UAB virtual campus will be the virtual platform used for communication with students.

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	Weight	Hours	ECTS	Learning outcomes
Assessment of oral presentation	22,5%	1	0.04	CA06, CA07, CA08, KA05, SA01, SA03
Assesment of workshop	25%	1	0.04	CA08, KA05, SA02, SA03, SA05
4 Writing exams	13,1% each one	3	0.12	CA06, CA07, CA08, KA05, SA05

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%). Nota mínima de esta parte para aprobar el módulo 3/10

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

Single assessment: There is no single assessment in this subject.

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

Ms. Office.

Course groups and languages

The information provided is provisional until November 30. After this date, you will be able to consult the language of each group through this [link](#). To access the information, you will need to enter the course CODE