

### DETAILS OF THE SUBJECT

**Title:** INGENIERÍA BIOQUÍMICA

**Code:** 101871

**Degree/Master:** GRADO DE BIOQUÍMICA

**Year:** 4

**Name of the module to which it belongs:**

**Field:** INGENIERÍA BIOQUÍMICA

**Character:** OPTATIVA

**Duration:** FIRST TERM

**ECTS Credits:** 6

**Classroom hours:** 60

**Face-to-face classroom percentage:** 40%

**Non-contact hours:** 90

**Online platform:** Moodle

### TEACHER INFORMATION

**Name:** GARCIA GARCIA, ISIDORO (Coordinador)

**Faculty:** Facultad de Ciencias

**Department:** QUÍMICA INORGÁNICA E INGENIERÍA QUÍMICA

**Area:** INGENIERÍA QUÍMICA

**Office location:** Edificio Marie Curie, planta baja

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**Name:** SANTOS DUEÑAS, INÉS MARÍA

**Faculty:** Facultad de Ciencias

**Department:** QUÍMICA INORGÁNICA E INGENIERÍA QUÍMICA

**Area:** INGENIERÍA QUÍMICA

**Office location:** Edificio Marie Curie, planta baja

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**Phone:** 957218658

### SPECIFICS OF THE SUBJECT

#### REQUIREMENTS AND RECOMMENDATIONS

#### Prerequisites established in the study plan

None.

#### Recommendations

Prior knowledge in fundamentals of Industrial Microbiology is recommended

### SKILLS

CB2 Be able to work collaboratively in teams and share responsibility.

CB4 Be able to learn and work in an autonomous manner.

CB7	Be able to use the basic computer tools for communication, the search for information, and data processing in professional practice.
CB9	Be able to communicate scientific information clearly and effectively, including the ability to present a paper, orally and in writing, to a professional audience, and understand the language and proposals of other specialists.
CE15	Knowledge of the current problems and future challenges in the field of molecular biosciences and the ethical and social implications of the practical applications of biochemistry and biology.
CE22	Be able to work properly in a biochemical laboratory with biological and chemical material, including safety, handling, disposal of biological and chemical waste, and record keeping.
CE24	Have mathematical, statistical and computer skills to gather, analyse and interpret data, and understand simple models of biological systems and processes at the cellular level and molecular.
CE26	Be able to raise and resolve issues and problems in the field of biochemistry and molecular biology through scientific hypotheses that can be examined empirically.
CE27	Understand the basic aspects of experimental design in the field of biochemistry and molecular biology and the limitations of experimental approaches.
CE28	Ability to transmit information within the field Ability to transmit information within the field of ??biochemistry and molecular biology, including the development, writing and oral presentation of a scientific report.

## OBJECTIVES

The main aim of this course is enables the students to develop a sound understanding of the engineering principles underlying the design of Biochemical Processes.

The concepts of process development, unit operation and economic analysis are introduced. The importance of the unit operation concept for the systematic design of any biochemical process will be highlighted.

Several up and downstream operations will be studied as case studies. The analysis of the bio-reaction stage has been considered previously in a core course (Industrial Biochemistry and Microbiology)

## CONTENT

### 1. Theoretical content

Topic 1.- Introduction. Biotransformation and Biochemical Industries. Economical importance. Process development. Flow diagram and unit operations. Examples.

Topic 2.- Sterilization. Media sterilization by high pressure/temperature steam. Bacterial spore and kinetics of death. Equipments.

Topic 3.- Filtration. Types of filters. Pre-treatments. General filtration theory: Darcy law. Batch filtration. Continuous filtration. Rotary filters.

Topic 4.- Centrifugation. Settling and centrifugation. Types of centrifuges.

Topic 5.- Extraction. Liquid-liquid equilibrium. Batch extraction. Continuous extraction: staged and differential ones.

Topic 6.- Elution chromatography. Adsorbents. Yield and purity. Stage analysis. Kinetics. Scaling up.

### 2. Practical contents

\* Numerical exercises to complete and assessing the student understanding.

\* Visit to biochemical factories.

**Methodological adaptations for part-time students**

The specific rules laid down by the Faculty will be followed. Additionally, special circumstances must be weighted up in each case.

**Face-to-face activities**

Activity	Large group	Medium group	Total
<i>Assessment activities</i>	4	-	4
<i>Excursions</i>	-	6	6
<i>Group presentation</i>	8	-	8
<i>Lectures</i>	24	-	24
<i>Seminar</i>	-	18	18
<b>Total hours:</b>	<b>36</b>	<b>24</b>	<b>60</b>

**Not on-site activities**

Actividad	Total
<i>Group work</i>	10
<i>Problems</i>	30
<i>Self-study</i>	50
<b>Total hours:</b>	<b>90</b>

**WORK MATERIALS FOR STUDENTS**

Dossier  
Exercises and problems  
Online questionnaires

## EVALUATION

Skills	Tools		
	Oral presentations	Problem solving	Short answer tests
CB2	x		
CB4	x	x	x
CB7	x	x	
CB9	x		
CE15		x	x
CE22			x
CE24		x	
CE26		x	x
CE27		x	
CE28	x		x
<b>Total (100%)</b>	30%	40%	30%
<b>Minimum grade.(*)</b>	3	4	3

(\*) Minimum grade necessary to pass the subject

**¿Valora la asistencia?:** *No*

**General clarifications on instruments for evaluation:**

For the short answer and problem solving tests, the student could use freely any paper printed material.

**General clarifications on evaluation and methodological adaptation for part-time students:**

The specific rules laid down by the Faculty will be followed. Additionally, special circumstances must be weighted up in each case

**Qualifying criteria for obtaining honors:** *Se aplicará la normativa de la UCO: artículo 49 del Reglamento de Régimen Académico.*

**¿Hay exámenes/pruebas parciales?:** *No*

## BIBLIOGRAPHY

**1. Basic Bibliography:**

BIOSEPARATIONS. Downstream processing for biotechnology. P.A. Belter, E.L. Cussler & W-H Hu. Ed. John Wiley & Sons, Inc. New York. 1988.  
 BIOPROCESS ENGINEERING PRINCIPLES. P.A. Doran. Academic Press. London. 1995  
 BIOCHEMICAL ENGINEERING FUNDAMENTALS. J.E. Bailey & D.F. Ollis. McGraw-Hill, Inc. Singapore. 1986.  
 INGENIERÍA DE BIOPROCESOS. Mario Díaz. Ediciones Paraninfo. 2012.

**2. Further reading:**

None.

## COORDINATION CRITERIA

- Outputs Organization

## SCHEDULE

Period	Activity				
	Assessment activities	Excursions	Group presentation	Lectures	Seminar
1# Week	0	0	0	2	0
2# Week	0	0	0	2	0
3# Week	0	0	0	2	0
4# Week	0	0	2	0	0
5# Week	0	0	0	2	3
6# Week	0	0	0	2	3
7# Week	0	0	0	2	3
8# Week	0	0	0	2	3
9# Week	0	0	0	2	3
10# Week	0	0	0	2	3
11# Week	0	3	0	2	0
12# Week	0	3	0	2	0
13# Week	0	0	3	2	0
14# Week	0	0	3	0	0
15# Week	4	0	0	0	0
<b>Total hours:</b>	<b>4</b>	<b>6</b>	<b>8</b>	<b>24</b>	<b>18</b>