



PERSONA CIENCIA EMPRESA  
UNIVERSITAT RAMON LLULL

## COURSE: BIOTECHNOLOGY

**SUBJECT MATTER:** Elective

**MODULE:** Professional Supplements

**PROGRAM:** Degree in Chemical Engineering

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### GENERAL CHARACTERISTICS

**Type:**  Basic formation,  Compulsory,  Elective

Final Degree Project,  Internship

**Duration:** Semestral

**Semester/s:** 8

**Number of ECTS credits:** 3

**Language/s:** English, Catalan, Spanish.

### DESCRIPTION

#### SHORT DESCRIPTION AND JUSTIFICATION

Although the use of biotechnology is very old, obtaining antibiotics, first, and the application of gene recombination techniques, have expanded their field of applications. Biotechnology consists of the application of microorganisms, cells and enzymes to obtain goods and services and constitutes a field of work in great expansion. Consequently, the subject aims to train the student in basic and fundamental knowledge that will allow the understanding, design and management of processes with microorganisms, so applications, models, identification, simulation and control of this type of processes are presented. . In addition, some bioengineering concepts are presented, such as cell culture, tissue engineering, biomaterials and medical devices.

#### COMPETENCES

- Be able to understand and apply general knowledge of Technical English, Ethics and Industrial Safety for application in the field of Chemical Engineering. (CB1, E3)
- Be able to identify, formulate and solve problems in the fields of Chemical Engineering and Chemistry. (CB2, E7)
- Be able to analyze, integrate and interpret data and information from the field of Chemical Engineering. (CB3, E8)
- To be able to assess the risks in the use of chemical and biological substances and the processes in which they are involved. (E11)
- Ability to identify hazards, assess risks and establish prevention measures in industrial environments. (CP4)

#### PREVIOUS REQUIREMENTS

According to the program planning and academic regulations.



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### CONTENTS

1. Introduction to Biotechnology.
  - a. Historical development
  - b. Applications.
2. Basic concepts in biotechnology
  - a. Microorganisms and multicellular organisms
  - b. Cell types
  - c. Metabolism
3. Bioreactors and bioprocesses
  - a. Biotechnology vs. Chemistry. Competition/alternatives/new possibilities.
  - b. Applications: use of enzymes and cells. Reactions, equipment and processes. Metabolic routes and metabolites. Anaerobic and aerobic processes. Genetic engineering.
  - c. Industrial Biotechnology. Culture media. Equipment and processes.
4. Biomedicine. Cell culture, tissue engineering, biomaterials and medical devices. Ethics and regulatory in drug development.

### METHODOLOGY

### LEARNING ACTIVITIES

Learning Activities	Hours	ECTS Credits	Competences
Lectures	22	0.8	CB1, E3, CP4
Case and Problem-Solving Sessions	6	0.2	CB2, E7, CB3, E8, E11, CP4
Seminars	2	0.1	CB1, E3, CB2, E7, CB3, E8, E11, CP4
Personal Study	49	1.8	CB1, E3, CB2, E7, CB3, E8, E11, CP4
Assessment Tasks (Exams, Continuous Assessment...)	3	0.1	CB1, E3, CB2, E7, CB3, E8, E11, CP4
<b>TOTAL</b>	<b>82</b>	<b>3</b>	

### TEACHING METHODOLOGY

The students will have in advance the content of the classes grouped by blocks. Master classes will be combined with individual and group discussions. Cases applied on topics of interest to the biotechnology sector will be worked on and discussed. Scientific articles aligned with the lectures will be discussed in class. Topics of interest in modern biotechnology will be presented by groups. There will be follow-up activities during the course to follow the progress of the student.



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### ASSESSMENT

#### ASSESSMENT METHODS

Assessment methods	Weight	Competences
Final Exam	40%	CB1, E3, CB2, E7, CB3, E8, E11, CP4
Continuous Assessment Activities	20%	CB2, E7, CB3, E8, E11, CP4
Reports and Presentations	30%	CB2, E7, CB3, E8, E11, CP4
Participation	10%	CB1, E3

#### LEARNING OUTCOMES

- The student must demonstrate the advanced knowledge of engineering and biosciences in its application to the biotechnological field (CB1, E3, CP4)
- The student must be able to use new and new techniques and tools of Chemical Engineering and Biosciences (CB2, E7, CB3, E8, E11, CP4)

#### QUALIFICATION

The evaluation of the subject will consider the qualifications of the Follow-up Activities (AS), of the Works and presentations (TP), of the Participation (P) and of the final exam (EF).

The qualification of the follow-up activities (AS, 20% of the final grade) will be calculated as a simple average of the activities carried out, consisting in the resolution of a questionnaire in the middle of the subject, which will evaluate the knowledge acquired during the lectures, and a report at the end of the subject, which will evaluate the ability of synthesis and analysis of the articles studied. The presentation of follow-up activities is mandatory in order to be able to take the final exam. Otherwise the student must contact the professor to recover the activities not delivered (which will be scored with a maximum score of 5/10).

The qualification of the Works and Presentations (TP, 30% of the final grade) will correspond to the evaluation of the articles presented and discussed in class (10%), the presentation of one of the thematic frontiers of Biotechnology proposals (10%) and the questions asked to the classmates during these presentations (10%). The presentation of all the activities is mandatory in order to be able to take the final exam. Otherwise the student must contact the professor to recover the activities not delivered (which will be scored with a maximum score of 5/10).

The qualification of the participation (P, 10% of the final grade) is awarded by the professor at the end of the course taking into account the level of participation that the student has had in the overall of the activities of the subject and especially in the discussion of exercises and cases.



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The final exam (EF, 40% of the final grade) aims to assess the synthesis of the subject.

The final grade (CF) of the subject will be calculated with the following formula:  $CF = 0.40 EF + 0.2 AS + 0.3 TP + 0.1 P$ . If the student obtains a grade lower than 4.0 (being 10 the maximum score) in the final exam, he/she cannot pass the subject, being his/her final grade only the exam.

In the second call, the final grade will be obtained by substituting the note of the final exam and of the controls for the note of the exam in the second call ( $CF = 0.6 \text{ Exam} + 0.3 TP + 0.1 P$ .)

In subsequent calls, the final grade will be that of the examination in said call.

### ASSESSMENT OF THE COMPETENCES

For the evaluation of each competence, the following indicators will be used:

- CB2/E7, CB3/E8, CP4: Global grade of the subject
- CB1/E3, E11: Practical part of the final exam (EF), papers and presentations (TP)

### BIBLIOGRAPHY

- Professor's Slides
- Scientific papers delivered by the professor.
- M.L. Shuler, F.Kargi, "Bioprocess Engineering: Basic Concepts", 2nd Ed. Prentice-Hall, 2002.
- J.E. Bailey, D.F.Ollis, "Biochemical Engineering Fundamentals" 2nd Ed., 1986, McGraw Hill.
- H. Lodish. A. Berk, Molecular Cell Biology. 7th Ed. WH Freeman, 2012

### DOCUMENT HISTORY

#### PREVIOUS REVISIONS

09/02/2016. Dr. Jordi Martorell

#### CURRENT REVISION

10/03/2019 Dr. Jordi Martorell