Course guide
240EQ011 - 240EQ011 - Biotechnology

Last modified: 26/06/2025

Unit in charge: Barcelona East School of Engineering
Teaching unit: 713 - EQ - Department of Chemical Engineering.

Degree: **Academic year:** 2025 **ECTS Credits:** 6.0
Languages: Catalan, Spanish

LECTURER

Coordinating lecturer: Núria Saperas Plana

Others: Núria Saperas Plana
Jordi Bou Serra

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Specific:
1. Easily integrate technical team and creative interdisciplinary any chemical company or research center.
2. Designing products, processes, systems and services for the chemical industry as well as the optimization of other already developed technology based on various areas of chemical engineering, understanding of processes and transport phenomena, separation operations and engineering chemical reactions, nuclear, electrochemical and biochemical.

TEACHING METHODOLOGY

Subject in process of extinction. There is no teaching, the students that enroll it do so only with the right to an exam.

LEARNING OBJECTIVES OF THE SUBJECT

Biotechnology has a multidisciplinary nature that integrates both engineering and sciences. In this sense, our aim is to provide the future engineers with the knowledge ant tools that allows them to understand and correctly interact with the other professionals that they can find in a biotechnological industry (biochemists, microbiologists, enzymologists, etc.).

STUDY LOAD

Type	Hours	Percentage
Hours large group	27,0	18.00
Hours small group	27,0	18.00
Self study	96,0	64.00

Total learning time: 150 h

CONTENTS

1. Introduction. What is biotechnology? Main areas of application of biotechnology. Historical development of biotechnology.

Description:
Introduction. What is the biotechnology? Main areas of application of the biotechnology. Development of the biotechnology

Specific objectives:
Have a global vision of the different fields of application of the biotechnology and the role which the engineer can play

Full-or-part-time: 2h 30m
Theory classes: 1h
Self study : 1h 30m

2. Organization and chemical composition of the cell.

Description:
Types of cell organization. Procaryotic and eukaryotic cell. Procariotic and eukaryotic of interest in biotechnology. Chemical composition of the living beings

Specific objectives:
Know that the living material has an organization and a chemical composition very different to the inert matter and that the cell is its structural and funciontal unit

Full-or-part-time: 3h 30m
Theory classes: 1h 30m
Self study : 2h

3. Lipids. Carbohydrates. Examples of biotechnological interest.

Description:
Classification of lipids, structure and function. Structure and function of carbohydrates.
Monosaccharides and polysaccharides. Examples of biomedical interest and/or biotechnological

Specific objectives:
Know the structure and function of the main types of lipids and carbohydrates

Full-or-part-time: 6h
Theory classes: 2h 30m
Self study : 3h 30m

4. Amino acids, peptides and proteins. Enzymes.

Description:
Function of the proteins. Amino acids. Peptide bonds. Structural levels of the proteins. Fibrous and globular proteins. Enzymes. introduction to the enzyme kinetics. Inhibiting enzymatic. Enzyme modulators

Specific objectives:
Know the structure and function of the proteins. Know that the enzyms are byocatalists of changing nature and know its main properties and action mechanisms

Related activities:
Activities 1, 2 and 3

Full-or-part-time: 11h
Theory classes: 3h 30m
Practical classes: 1h
Self study : 6h 30m

5. Nucleic acids. Structure and function.

Description:
Structure of the nucleic acids. Replication, transcript and translation of the DNA

Specific objectives:
Know the different types of nucleic acids and its structure. understand the relation between the structure and the function of the DNA as a carrying molecule of hereditary information

Related activities:
Activity 3

Full-or-part-time: 6h 30m
Theory classes: 2h 30m
Self study : 4h

6. Genetic engineeering.

Description:
Techonology of the recombinant DNA. General stages in the introduction of a new gene and its expression. Some concrete examples and exercices to be solved

Specific objectives:
Acquire some basic knowledge about the techonology of the recombinant DNA

Related activities:
Activity 3

Full-or-part-time: 3h 30m
Theory classes: 1h 30m
Self study : 2h

7. Metabolism. General view and regulation.

Description:
Concept and and types of metabolism. Catabolism and anabolism. Aerobic and anaerobic respiration. Main types of fermentations of industrial interest. Metabolic regulation

Specific objectives:
Know the main concepts related to the matabolism, which on the bioquemical side is about fermentation and which are the main fermentations of industrial interest. understand the need to regulate the metabolism and that its knowledge can sometimes be used to increase productivity in a certain process

Full-or-part-time: 3h 30m
Theory classes: 1h 30m
Self study : 2h

8. Industrial culture of microorganisms.

Description:
Objectives of the fermentation industry. Types of culture of microorganisms. General structure of the fermentation process. Bioreactors

Specific objectives:
Know the main types of industrial culture of microorganisms and its possible objectives. Know the general structure of a fermentation process and which are its main elements. Know the main control elements of a bioreactor. Know some of the main types of bioreactors.

Related activities:
Activities 3 and 4

Full-or-part-time: 9h
Theory classes: 3h 30m
Self study : 5h 30m

9. Enzymatic technology

Description:
Production of enzymes. Main application of the industrial enzymes. Obtaining sources of enzymes. Immobilization of biocatalysts.

Specific objectives:
Know the main fields of application of the industrial production of enzymes. Know the advantages offered by the microorganisms as enzym sources against the sources of animal or plant origin. Know the different techniques of immobilization of enzyms and its advantages.

Full-or-part-time: 3h 30m
Theory classes: 1h 30m
Self study : 2h

10. Recovery of products

Description:
Inline process issue: separation of insoluble, cell disruption, concentration and product purification, stabilization. Examples

Specific objectives:
Have a global vision of the following steps to make in the recovery and purification of a biotechnological product as well as the most common unit operations

Full-or-part-time: 3h 30m
Theory classes: 1h 30m
Self study : 2h

11. Specific applications

Description:
Application of the biotechnology in different areas: food industry, power production from biomass, biotechnology and environment

Specific objectives:
Know the application fields of the biotechnology in the food industry, specially in the case of the fermented beverages. know the different ways of energy use of the biomass (bioethanol, biogas,...) Know the role of the biotechnology both in the protection (biologic treatments of the waste) as in the restoration (bioremediation) of the environment

Full-or-part-time: 22h 30m
Theory classes: 9h
Self study : 13h 30m

ACTIVITIES

1. WORKSHOP

Description:
Workshop about the experimental techniques. resolution of exercices and cases.

Specific objectives:
Know the basics of the experimental techniques which will be used along the lab sessions. Apply that knowledge to solve numerical problems or practical cases

Material:
Guideline

Full-or-part-time: 7h 30m
Laboratory classes: 3h
Self study: 4h 30m

2. PRACTICE 1

Description:
Purification of a protein of commercial interest from an animal tissue

Specific objectives:
Familizarize the students with a big number of experimental techniques (extraction of proteins, centrifugation, precipitation, chromatography, electrophoresis of proteins,...)yet not isolated practices, disjointed, but following a logic sequence, integrated towards a final objective

Material:
Guideline

Full-or-part-time: 27h
Laboratory classes: 9h
Self study: 18h

3. PRACTICE 2

Description:
Purification of a protein of animal origin from a genetically modified bacteria by the students

Specific objectives:
the same way as the previous case, the aim is to get the students to familiarize eith a good number of experimentla techniques related to the current practice (genetic engineering, culture of microorganisms, cell disruption, electropheresis of nucleic acids) yet in an integrated way and as a mean to achieve a final objective

Material:
Guideline

Delivery:
Written report

Full-or-part-time: 15h
Theory classes: 6h
Self study: 9h

4. VISITS

Description:
Visit to three companies/biotechnology facilities

Specific objectives:
Approach the real practice to those theory aspects studying in class

Material:
Guideline

Full-or-part-time: 21h
Laboratory classes: 12h
Self study: 9h

GRADING SYSTEM

Subject in process of extinction. There is only one final test that corresponds to 100% of the final grade of the subject.

BIBLIOGRAPHY

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