295551 - 295EQ011 - Biotech Processes and Polymer Industry

Coordinating unit: 295 - EEBE - Barcelona East School of Engineering
Teaching unit: 713 - EQ - Department of Chemical Engineering
Academic year: 2019
Degree: MASTER'S DEGREE IN CHEMICAL ENGINEERING (Syllabus 2019). (Teaching unit Compulsory)
ECTS credits: 6
Teaching languages: English

Teaching staff
Coordinator: NURIA SAPERAS PLANA
Others: Primer quadrimestre:
       NURIA BORRÀS CRISTÒFOL - T11, T12
       NURIA SAPERAS PLANA - T11, T12
       DAVID ZANUY GOMARA - T11, T12

Opening hours
Timetable: By appointment

Requirements
A lab coat is required for the laboratory sessions (see activity 1). Attendance to these sessions is mandatory.

Degree competences to which the subject contributes

Specific:
CEMUEQ-01. To apply knowledge of mathematics, physics, chemistry, biology and other natural sciences, obtained through study, experience and practice, with critical reasoning, to establish economically viable solutions to technical problems
CEMUEQ-02. To design products, processes, systems and services of the chemical industry, as well as the optimization of others already developed, taking as a technological base the various areas of chemical engineering, including processes and transport phenomena, separation operations and engineering of chemical, nuclear, electrochemical and biochemical reactions

Generic:
CGMUEQ-02. To conceive, project, calculate and design processes, equipment, industrial facilities and services, in the field of chemical engineering and related industrial sectors, in terms of quality, safety, economy, rational and efficient use of natural resources and environment conservation

Transversal:
05 TEQ. TEAMWORK. Being able to work as a team player, either as a member or as a leader. Contributing to projects pragmatically and responsibly, by reaching commitments in accordance to the resources that are available.
03 TLG. THIRD LANGUAGE. Learning a third language, preferably English, to a degree of oral and written fluency that fits in with the future needs of the graduates of each course.
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Teaching methodology

- Lectures using both audiovisual media and the blackboard, and encouraging students’ participation.
- Problems and cases to solve individually or in small groups.
- Laboratory classes. The experimental techniques will not be presented separately but integrated as part of a project that the student will develop throughout the sessions.

Learning objectives of the subject

To provide future engineers with the basic knowledge and tools that will allow them to understand, interact and easily integrate in any biotechnological industry and polymer industry.

Study load

<table>
<thead>
<tr>
<th>Total learning time: 150h</th>
<th>Hours large group:</th>
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<tbody>
<tr>
<td></td>
<td>12h</td>
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<td></td>
<td>8.00%</td>
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<tr>
<td>Hours medium group:</td>
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<td>Hours small group:</td>
<td>42h</td>
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<tr>
<td>Guided activities:</td>
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<td></td>
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<tr>
<td>Self study:</td>
<td>96h</td>
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<td>64.00%</td>
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# 1. Introduction to biotechnology and biomolecules

**Learning time:** 35h  
Theory classes: 14h  
Self study: 21h

**Description:**  

**Related activities:**  
Activity 1.

**Specific objectives:**  
- To get an overview of the different fields of application of biotechnology and the role an engineer can play.  
- To understand the basic organization of living beings, especially those of biotechnological interest.  
- To know the structure and function of the main types of biomolecules and learn that they can be used for technological purposes.

# 2. Upstream and downstream bioprocessing. Examples of different biotechnology industries/applications

**Learning time:** 35h  
Theory classes: 14h  
Self study: 21h

**Description:**  

**Related activities:**  
Activity 1.

**Specific objectives:**  
- To understand the metabolic diversity of the organisms used in biotechnology and how this knowledge can be used sometimes to increase their productivity.  
- To learn the different types of industrial culture of microorganisms and its main goals.  
- To know some of the main types of bioreactors and their differences compared to chemical reactors.  
- To know the main steps required for the recovery of bioproducts and understand the main differences between bioseparation and chemical separation processes.  
- To get acquainted with the main areas of application and industries involved with biotechnology.
### 3. Introduction to the polymer industry and polymer chemistry

**Learning time:** 25h  
Theory classes: 10h  
Self study: 15h

**Description:**  

**Related activities:**  
Activity 1.

**Specific objectives:**  
- To know and understand the chemical structure of polymers, how to determine it and how it is related to the polymer behavior.
- To get a basic knowledge of the procedures used for the synthesis of polymers.

### 4. Common use and technological polymers

**Learning time:** 25h  
Theory classes: 10h  
Self study: 15h

**Description:**  

**Related activities:**  
Activity 1.

**Specific objectives:**  
- To know the properties and applications of the synthetic polymers most frequently used.
- To know the degradation processes that affect polymers in their use and recycling.
Qualification system

There will be an exam after the biotechnology block (E1) and another after the polymer industry block (E2). Continuous assessment exercises will also be carried out during the two blocks (CAE1, CAE2). For the evaluation of the practical sessions (PS) a written report will be required at the end of the project.

\[ FM = 0.6\times(\frac{ME1+ME2}{2}) + 0.3\times(\frac{MCAE1+MCAE2}{2}) + 0.1\times MPS \]

FM: Final mark
ME1, ME2: marks of exams E1 and E2
MCAE1, MCAE2: marks of continuous assessment exercises CAE1 and CAE2.
MPS: Mark of the practical sessions.

In case of reassessment:
The mark of the reassessment exam will represent 90% of the final mark. The practical sessions mark is not amenable to reassessment and accounts for 10% of the final mark.

Please, check the EEBE regulations regarding the requirements to qualify for the reassessment exam (see section 1.1.3 at https://eebe.upc.edu/ca/estudis/normatives-academiques/documents/eebe-normativa-avaluacio-i-permanencia-18-19-aprovat-je-2018-06-13.pdf)

Bibliography

Basic:


Complementary:
