SHORT DESCRIPTION AND JUSTIFICATION (of the meaning of the course in relation to the studies. Between 100 and 200 words)

Process engineering is one of the pillars of the global industrial biotechnological production. Industrially biotechnologically foods like milk, cheese or beer, hydrocarbons from renewable sources such as biomethane and pharmaceuticals such as antibiotics are produced, among other examples. This introduction to process engineering course focuses on establishing the basis for the future biotechnologist master the basics of fluid mechanics, heat transfer, mass transfer and mass balances. The biotechnologist apply this knowledge to specific cases, such as design of pumps, heat exchangers or phase separators, to name a few examples.

COMPETENCES (of the course placed in relation to the pre-assigned competences in the subject matter)

- That the students can apply their knowledge to their work or vocation in a professional manner and have competences typically demonstrated through devising and sustaining arguments and solving problems within their field of study (CB2)
- That students have developed those learning skills necessary to undertake further studies with a high degree of autonomy (CB5)
- Being able to assess the impact of their work on sustainable development of society (T3)
- Being able to understand and apply advanced knowledge of Bioscience and Engineering in the conduct of activities in the field of Biotechnology (E3)
- Be able to use tools, systems and processes to achieve the requirements of the activity performed in the field of Biotechnology (E4)
- Being able to integrate the knowledge and tools of biotechnology to apply to the different industrial sectors that use, develop or produce products or biotechnological processes (E6)

PREVIOUS REQUIREMENTS * (modules, subject matters, courses or knowledge necessary for the follow-up of the subject. State previous courses required to be completed)

Fundamentals of physics, applied mathematics and computer applications.

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CONTENTS (List the content of the course, with up to two level detail)

1. Introduction and Basic Concepts
   1.1. Why Process Engineering
   1.2. key variables: pressure, density and viscosity
   1.3. Units and Dimensional Analysis
   1.4. Typical equipment in the industry
2. Fluid Mechanics
   2.1. Fluid statics
   2.1.1. fundamental equations of fluid statics
   2.1.2. Forces on surfaces
   2.1.3. Agitation
   2.2. Fluid dynamics
   2.2.1. fundamental equations of fluid dynamics
   2.2.2. incompressible flow in pipes
   2.2.3. Design of pumps
   2.2.4. Flow around objects
3. Heat Transfer
   3.1. Driving
   3.2. Convection
   3.3. Heat Exchanger Design
4. Mass Transfer
   4.1. Molecular Diffusion models
   4.1.1. Fick laws
   4.1.2. Transfer coefficients
   4.1.3. diffusivity
   4.2. Balances of Matter
   4.2.1. unreactive systems
   4.2.2. reactive systems

METHODOLOGY

LEARNING ACTIVITIES * (Complete the table relating activities, workload in ECTS credits, and competences.)

<table>
<thead>
<tr>
<th>Learning Activities</th>
<th>ECTS Credits</th>
<th>Competences</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures</td>
<td>1,6</td>
<td>T3, E3, E4, E6</td>
</tr>
<tr>
<td>Case and Problem-Solving Sessions</td>
<td>0,5</td>
<td>B2, B5, E4</td>
</tr>
<tr>
<td>Personal Study</td>
<td>3,8</td>
<td>B2, B5, T3, E3, E4, E6</td>
</tr>
<tr>
<td>Assessment Tasks (Exams, Continuous Assessment...)</td>
<td>0,1</td>
<td>B2, E3, E4, E6</td>
</tr>
<tr>
<td>TOTAL</td>
<td>6,0</td>
<td>B2, B5, T3, E3, E4, E6</td>
</tr>
</tbody>
</table>

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**TEACHING METHODOLOGY** (justify the teaching methodology in relation to the competences and course contents. Between 100 and 200 words)

The subject is taught using dynamic exposure session of concepts and solving exercises, problems and cases in a ratio of three to one. To promote the pursuit of the subject and its continuous assessment four controls monitoring will be performed. In addition, the series will solve the problems it faces, which in some cases must show the rest of the class.

At meetings of exhibition concepts, mathematical resolution of the conceptual foundations exposed the logical explanation that supports mathematical explanation will be combined. Mathematical complexity using nearby relax examples that allow students to move away from the mathematical formula to understand the physical concept explained.

At meetings of solving exercises, the course with basic simple exercises and to progressively go complicating the issue and solving cases more complex and interesting concepts will begin. Students must submit the resolution exercise their peers, improving their presentation skills and argument in public.

A translation of the description of the LEARNING ACTIVITIES can be found in the annex file.

**ASSESSMENT**

**ASSESSMENT METHODS** * (Complete the table relating assessment methods, competences, and weight percentage in the course qualification)

<table>
<thead>
<tr>
<th>Assessment methods</th>
<th>Weight</th>
<th>Competences</th>
</tr>
</thead>
<tbody>
<tr>
<td>Final Exam</td>
<td>50%</td>
<td>B2, E3, E4, E6</td>
</tr>
<tr>
<td>Continuous Assessment Activities</td>
<td>30%</td>
<td>B2, E3, E4, E6</td>
</tr>
<tr>
<td>Reports and Presentations</td>
<td>10%</td>
<td>B2, B5, T3, E3, E4, E6</td>
</tr>
<tr>
<td>Participation</td>
<td>10%</td>
<td>B2, B5, T3</td>
</tr>
</tbody>
</table>

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LEARNING OUTCOMES (Explanation of the student's achievements that allow the assessment of competences, relating them to the competences and the assessment methods)

- The student must know how to apply their knowledge to their work in a professional manner, elaborating and defending their arguments when solving problems of the subject (B2)
- The student must develop a high degree of autonomy learning skills necessary to pursue engineering courses (B5)
- The student must learn to assess the impact of their work on sustainable development of society (T3)
- The student must be able to understand and apply advanced knowledge of Bioscience and Engineering in the conduct of activities in the field of Biotechnology (E3)
- Be able to use tools, systems and processes to achieve the requirements of the activity performed in the field of Biotechnology (E4)
- Being able to integrate the knowledge and tools of biotechnology to apply to the different industrial sectors that use, develop or produce products or biotechnological processes (E6)

QUALIFICATION (Explanation of the qualification system)

The evaluation of the subject corresponds to 40% the final exam and 60% activities, controls, and participation problems.

- The rating of the final exam has two parts:
  Theory or 30%
  Problems or 70%
  SUMA 100%
- The rating of the activities corresponds to:
  or controls 58%
  or Classroom activities 33%
  o Participation 9%
  SUMA 100%

For test scores and activities to be valid and to pass the course, a grade of at least 4/10 must be obtained in the final exam.

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ASSESSMENT OF THE COMPETENCES (Describe the grading system for each competence in relation with the assessment tasks)

- Final exam, controls and activities in class will be used as indicator of assessment of the B2, E3, E4 and E6 competences.
- Activities in class and participation will be used as indicator of assessment of the B5 and T3 competences.

BIBLIOGRAPHY (Recommended and accessible to the student.)


DOCUMENT HISTORY

PREVIOUS REVISIONS (Indicate date and author / s, first the most recent one)
28/05/2015. Dr. Jordi Martorell
09/07/2014. Dr. Jordi Martorell

CURRENT REVISION (Indicate date and author / s)
10/03/2019. Dr. Jordi Martorell

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