Basic Chemical Engineering
Code: 102492
ECTS Credits: 6

<table>
<thead>
<tr>
<th>Degree</th>
<th>Type</th>
<th>Year</th>
<th>Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>2502444 Chemistry</td>
<td>OB</td>
<td>2</td>
<td>1</td>
</tr>
</tbody>
</table>

**Contact**

Name: Julio Octavio Pérez Cañestro
Email: Julio.Perez@uab.cat

**Use of languages**

Principal working language: catalan (cat)
Some groups entirely in English: No
Some groups entirely in Catalan: Yes
Some groups entirely in Spanish: Yes

**Other comments on languages**

Key specific terms for the course will be given in Catalan, Spanish and English

**Teachers**

Adriana Artola Casacuberta

**Prerequisites**

No official requirements are defined for this course. However, we strongly recommend that the student has passed the first year courses Chemistry Fundamentals and Mathematics.

**Objectives and Contextualisation**

The general aim in this course is that the student gains skills allowing for identification, mathematical formulation and problem solving of basic problems in Chemical Engineering. Specifically, the student has to be able of:

- Building and solving mass and energy balances in systems with and without chemical reaction under diverse conditions of operation (continuous/batch, steady state/transient state)
- Conducting basic design of chemical reactors operating in continuous and batch mode, under isothermal or adiabatic conditions
- Acquiring basic notions of the unit operations in chemical engineering and their application at industrial level

**Skills**

- Apply knowledge of chemistry to problem solving of a quantitative or qualitative nature in familiar and professional fields.
- Be ethically committed.
• Communicate orally and in writing in one's own language.
• Evaluate the health risks and environmental and socioeconomic impact associated to chemical substances and the chemistry industry.
• Handle chemical products safely.
• Handle standard instruments and material in analytic and synthetic chemical laboratories.
• Have numerical calculation skills.
• "Interpret data obtained by means of experimental measures, including the use of IT tools; identify their meaning and relate the data with appropriate chemistry, physics or biology theories."
• Learn autonomously.
• Manage, analyse and synthesise information.
• Manage the organisation and planning of tasks.
• Propose creative ideas and solutions.
• Reason in a critical manner.
• Resolve problems and make decisions.
• Show an understanding of the basic concepts, principles, theories and facts of the different areas of chemistry.
• Show initiative and an enterprising spirit.
• Use IT to treat and present information.
• Use the English language properly in the field of chemistry.
• Work in a team and show concern for interpersonal relations at work.

Learning outcomes

1. Analyse equations representing experimental measurements made in the laboratory.
2. Be ethically committed.
3. Calculate matter and energy balances.
4. Communicate orally and in writing in one's own language.
5. Define the concepts and principles of the industrial chemical processes.
6. Describe the concepts and principles of transport mechanisms.
7. Describe the principles for operating chemistry reactors and the basic operations.
8. Design a distillation system.
9. Design chemical reactors.
10. Establish the principles of matter and energy balance.
11. Handle equipment and materials applied to the experimental study of matter and energy balances.
12. Have numerical calculation skills.
13. Identify and evaluate the environmental impact associated to industrial chemistry processes.
15. Learn autonomously.
16. Manage, analyse and synthesise information.
17. Manage the organisation and planning of tasks.
18. Propose creative ideas and solutions.
19. Reason in a critical manner.
20. Resolve problems and make decisions.
21. Safely handle the experimental facilities used in chemical engineering.
22. Show initiative and an enterprising spirit.
23. Use English terminology in industrial chemistry processes.
24. Use IT to treat and present information.
25. Work in a team and show concern for interpersonal relations at work.

Content

1. Chemical process and chemical industry. Introduction to Chemical Engineering.


reactors. Adiabatic conversion for steady state systems.


Methodology

Lectures: students receive a set of, on one hand, theoretical concepts, and on the other hand practical skills for solving examples or easy problems. This learning will provide the basics for understanding the course, problem solving and laboratory practicals.

Workshops: In these sessions the students will practice the concepts and skills acquired during the lectures. Small groups will easy the participation of the students in the problem solving process.

Laboratory practicals: familiarization with the experimental methods used in Chemical Engineering to learn how to operate equipment of industrial application.

Activities

<table>
<thead>
<tr>
<th>Title</th>
<th>Hours</th>
<th>ECTS</th>
<th>Learning outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type: Directed</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lectures</td>
<td>27</td>
<td>1.08</td>
<td>5, 6, 7, 9, 8, 23, 10, 13, 19</td>
</tr>
<tr>
<td>Problems whorkshop</td>
<td>10</td>
<td>0.4</td>
<td>15, 9, 8, 23, 3, 16, 18, 19, 20, 12, 24</td>
</tr>
<tr>
<td>Type: Supervised</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Laboratory practicals</td>
<td>20</td>
<td>0.8</td>
<td>1, 23, 14, 21, 18, 20, 25</td>
</tr>
<tr>
<td>Practicals report writing</td>
<td>20</td>
<td>0.8</td>
<td>15, 4, 7, 3, 10, 16, 14, 19, 20, 12, 25, 24</td>
</tr>
<tr>
<td>Type: Autonomous</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Problem solving</td>
<td>50</td>
<td>2</td>
<td>15, 16, 17, 19, 20, 12, 24</td>
</tr>
<tr>
<td>Team working</td>
<td>15</td>
<td>0.6</td>
<td>15, 4, 9, 23, 3, 16, 17, 19, 20, 12, 25, 24</td>
</tr>
</tbody>
</table>

Evaluation

1. Individual grade: in this part the acquired skills will be evaluated for both theoretical concepts and problem solving. The student can choose between obtaining the final grade from the marks of the partial exams or from the final test.

1.1. Two partial exams: each partial exam will contain problem solving and theoretical questions.

1.2. Final test: it consists of problem solving and theoretical questions covering the whole course.

2. Grading assigned problems: Problem solving for some specific problems will be graded as 10 % of the final course mark.

3. Practical grading: The laboratory practicals are of mandatory attendance. They will be grade with a written report derived from the laboratory experiments and it will consist of a multiplicative factor applied to the final course score. This coefficient ranges from 0.9 to 1.1.

Student passing the course: Students will pass the course with a final score of 5/10.
The qualification **Not gradable** will be given to students who did not pass the course with the partial exams and not attending to the final test.

**Evaluation activities**

<table>
<thead>
<tr>
<th>Title</th>
<th>Weighting</th>
<th>Hours</th>
<th>ECTS</th>
<th>Learning outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Final Test</td>
<td>0.9</td>
<td>2</td>
<td>0.08</td>
<td>1, 4, 5, 6, 7, 9, 23, 3, 10, 19, 20, 12</td>
</tr>
<tr>
<td>Partial Exam II</td>
<td>0.5*0.9</td>
<td>3</td>
<td>0.12</td>
<td>4, 5, 6, 7, 23, 10, 19</td>
</tr>
<tr>
<td>Partial Test I</td>
<td>0.5*0.9</td>
<td>3</td>
<td>0.12</td>
<td>9, 8, 3, 10, 16, 19, 20, 12</td>
</tr>
<tr>
<td>Practicals report</td>
<td>Multiplicative factor [0.9-1.1]</td>
<td>0</td>
<td>0</td>
<td>1, 15, 4, 23, 13, 14, 11, 21, 18, 19, 12, 25, 24</td>
</tr>
<tr>
<td>Team working</td>
<td>0.1</td>
<td>0</td>
<td>0</td>
<td>15, 22, 9, 3, 16, 17, 2, 19, 20, 12, 25, 24</td>
</tr>
</tbody>
</table>

**Bibliography**

**AUTHOR** Aucejo A., Benaiges D., Berna, A., Sanchotello M., Solà C.

**TITLE** Introducció a l'Enginyeria Química


**AUTHOR** Himmelblau D.M.

**TITLE** Balances de materia y energia