Course guide
220210 - 220210 - Analysis and Design of Chemical Processes

Unit in charge: Terrassa School of Industrial, Aerospace and Audiovisual Engineering
Teaching unit: 717 - DEGD - Department of Engineering Graphics and Design.
Degree: MASTER'S DEGREE IN INDUSTRIAL ENGINEERING (Syllabus 2013). (Compulsory subject).
Academic year: 2022 ECTS Credits: 5.0 Languages: Catalan, Spanish

LECTURER

Coordinating lecturer: Cusola Aumedes, Oriol
Roncero Vivero, Maria Blanca
Valls Vidal, Cristina

Others:

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Specific:
1. Capacity for analysis and design of chemical processes.
2. Knowledge and skills to perform verification and control facilities, processes and products.

TEACHING METHODOLOGY

- Lectures presenting the subject content.
- Sessions of applied work.
- Independent learning and exercises solving by the students.

In lectures teachers introduce fundamentals of the subject, concepts and methods, illustrated with suitable examples to facilitate their understanding.

The practical sessions involve the following activities: experimental practices in laboratory and the use of a process simulator.

LEARNING OBJECTIVES OF THE SUBJECT

The purpose of this course is to provide an introduction to the analysis and design of chemical processes applied to industrial engineering. The fundamentals of the unit operations involved in the industrial sector are provided, allowing students to perform basic engineering and design of industrial processes.

The main goal is to provide students with:
- Knowledge and skills to analyze, plan and design chemical processes.
- Knowledge and skills to perform verification and control facilities of chemical processes.

STUDY LOAD

<table>
<thead>
<tr>
<th>Type</th>
<th>Hours</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Self study</td>
<td>80,0</td>
<td>64.00</td>
</tr>
<tr>
<td>Hours large group</td>
<td>30,0</td>
<td>24.00</td>
</tr>
<tr>
<td>Hours small group</td>
<td>15,0</td>
<td>12.00</td>
</tr>
</tbody>
</table>

Total learning time: 125 h
CONTENTS

1. Introduction to processes and unit operations

Description:
Introduction. Fundamentals and classification of unit operations. Physical unit operations controlled by momentum transfer. Physical unit operations controlled by energy transfer. Physical unit operations controlled by mass transfer.

Full-or-part-time: 8h
Theory classes: 4h
Self study: 4h

2. Coagulation and flocculation

Description:

Related activities:
Laboratory work about coagulation wastewater: Destabilization by adsorption and charge neutralization. Zeta potential determination of colloidal particles. Destabilization by precipitation with metal coagulants; destabilization by adsorption and bridge formation between particles with different types of flocculants.

Full-or-part-time: 20h
Theory classes: 4h
Laboratory classes: 2h
Self study: 14h

3. Sedimentation

Description:

Full-or-part-time: 12h
Theory classes: 4h
Self study: 8h

4. Flotation

Description:

Related activities:
Laboratory work about selective flotation I: Application to deinking of printed paper by using a laboratory flotation cell.

Laboratory work about selective flotation II: Deinking process evaluation by optical spectrophotometric technique.

Full-or-part-time: 19h
Theory classes: 4h
Laboratory classes: 4h
Self study: 11h
<table>
<thead>
<tr>
<th>5. Filtration and Membrane separation processes</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Full-or-part-time:</strong> 15h</td>
</tr>
<tr>
<td>Theory classes: 4h</td>
</tr>
<tr>
<td>Self study : 11h</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>6. Simultaneous transmission of energy and matter</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Full-or-part-time:</strong> 12h</td>
</tr>
<tr>
<td>Theory classes: 4h</td>
</tr>
<tr>
<td>Self study : 8h</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>7. Chemical Reactors</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Related activities:</strong> Laboratory work about chemical reaction: Application to the delignification of cellulosic material. Application in a CADSIM process simulator: Learning to use the simulator and case studies.</td>
</tr>
<tr>
<td><strong>Full-or-part-time:</strong> 39h</td>
</tr>
<tr>
<td>Theory classes: 6h</td>
</tr>
<tr>
<td>Laboratory classes: 9h</td>
</tr>
<tr>
<td>Self study : 24h</td>
</tr>
</tbody>
</table>
GRADING SYSTEM

The final grade depends on the following evaluative acts:
- Activity 1 (Delivery of solved exercises and questionnaires): 5%
- Activity 2 (attendance to the practical sessions, delivery of the experimental practical reports, and one evaluative session of the knowledge acquired with the process simulator): 15%
- Activity 3 (midterm exam): 40%
- Activity 4 (final exam): 40%

Only the students assigned to a specific session will be able to attend that session. Students from other groups will not be able to attend. Students will be allowed to change group if they agree and exchange with a student from another group. In this case, the change must be notified via e-mail to the teachers before the practical session. Group exchanges will not be allowed on the same day of the laboratory session. The practical sessions will be held exclusively on the days established by the School without any possibility to do recover in another day.

The unsatisfactory result in the midterm exam (Activity 3) may be redirected by a written test on the day set for the final exam (Activity 4). Students who didn’t assist at the midterm exam (Activity 3) or with a grade lower than 5.0 in the midterm exam (Activity 3) can access this test. The grade obtained in the redirected test will replace the initial grade as long as it is higher, until a maximum of 5.0.

BIBLIOGRAPHY

Basic:
- Professors de l'assignatura. Presentacions de classe a ATENEA.

Complementary: