

Process and Product Engineering

Code: 102435
ECTS Credits: 6

| Degree | Type | Year | Semester |
|------------------------------|------|------|----------|
| 2500897 Chemical Engineering | OB | 3 | 2 |

Contact

Name: Adriana Artola Casacuberta
Email: Adriana.Artola@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: No

Prerequisites

To have passed the subject of the first year (second term): Balances in chemical engineering.

Recommended to have attended to the following subjects:

- Chemical kinetics (2nd year, 2nd term)
- Applied Thermodynamics (2nd year, 2nd term)
- Separation Operations (3rd year, 1st term)
- Reactors (3rd year, 1st term)
- Heat transfer (3rd year, 1st term)

Objectives and Contextualisation

The main objective of the subject is to analyse and evaluate the production processes of the main inorganic and organic products of the different sectors of chemical industry.

Competences

- Analyse, evaluate, design and operate the systems or processes, equipment and installations used in chemical engineering in accordance with certain requirements, standards and specifications following the principles of sustainable development.
- Apply quality principles and methods.
- Apply the techniques for analysing and synthesising systems to process and product the engineering.
- Objectively compare and select different technical options for chemical processes.
- Observe ethics and professionalism.
- Show an understanding of the role of chemical engineering in the prevention and resolution of environmental and energy problems, in accordance with the principles of sustainable development.

Learning Outcomes

1. Analyse, design and implement systems, processes, equipment and installations in the production processes of the main inorganic and organic products in the different sectors of industrial chemistry.
2. Apply chemical engineering to the prevention of environmental and energy problems in accordance with the principles of sustainable development and applied to the different production processes of the main inorganic and organic products in the different sectors of industrial chemistry.
3. Apply chemical engineering to the resolution of energy problems.
4. Apply knowledge to the preparation of related documentation, organised by work processes and procedures.
5. Contribute to society's welfare and to sustainable development.
6. Describe the different work methodologies in relation to quality management systems.
7. Properly interpret process production diagrams of the main inorganic and organic products in the different sectors of industrial chemistry.
8. Show understanding of the integration of quality management in improved production.
9. Show understanding of the structure of a quality management system and its implantation in process engineering.
10. Specify the different technical alternatives in the production processes of the main inorganic and organic products in the different sectors of industrial chemistry.

Content

PART 1: Chemical industry. Generalities

- Introduction to the chemical industry: origin, development, classification of products.
- Graphical representation of processes. Block diagram. Process diagram.
- Energy and material resources, waste and emissions. Sustainable development. Best available techniques (BAT).
- Quality. Quality management systems. Total quality

PART 2: Overview of some industrial sectors. Processes, operations, equipment and products.

The petrochemical industry. The industry of polymers. The industry of sulphur, nitrogen, phosphorus and chlorine. The agrochemical industry (fertilizers and pesticides). Fine chemistry: the pharmaceutical industry. The biotechnology industry, etc.

Methodology

- Theoretical lessons:

They include an introduction to the chemical industry, focusing on raw materials, energy, sustainable processes, quality, graphic representation of productive processes, as well as the explanation of processes, equipment and operations in different sectors of the chemical industry. During these lessons, different industrial processes will be analysed from a practical point of view, through exercises, information research, comparison among processes and products, etc.

- Completion of a work (voluntary):

The work will consist of the search of information related to some industrial processes or some aspects of these processes by the students as well as sharing this information through an oral presentation and the preparation of written reports.

- Visits to industrial installations (mandatory assistance):

Visiting industrial installations of different companies in order to learn on the real implementation of some industrial processes.

Activities

| Title | Hours | ECTS | Learning Outcomes |
|--|-------|------|-------------------------------|
| Type: Directed | | | |
| Theoretical lessons | 40 | 1.6 | 1, 4, 2, 3, 5, 9, 8, 6, 7, 10 |
| Visits to industrial installations | 10 | 0.4 | 1 |
| Type: Autonomous | | | |
| Development of a work (individually or in group) (voluntary) | 26 | 1.04 | 1, 4, 2, 3, 5, 9, 8, 6, 7, 10 |
| Own study | 55 | 2.2 | 1, 4, 2, 3, 5, 9, 8, 6, 7, 10 |

Assessment

a) Evaluation activities

The evaluation of the subject will be based on the following activities:

- 2 exams.
- Assistance to visits to companies (2 minimum) plus completion of the corresponding questionnaires.
- A work (voluntary).

Visits to companies are mandatory. You must have attended 2 of the visits that will be scheduled, at least, to pass the subject. In addition, a questionnaire on each visit will be raised at a later date immediately after each visit, which will be announced in advance through Aula Moodle. The mark obtained from the questionnaires contributes to the global mark of the subject in a 10%. The repeating students who attended the visits in some previous year will not have to attend again, nor answer the related questions. The mark for this activity will be the one obtained in the previous academic year.

The work is voluntary

- In the case of carrying out the work:

The work will contribute to the mark of the subject in 20%. It will be a collaborative work that may require attendance at some class sessions. The content of the work and related dates will be announced in a timely manner.

Each of the 2 exams will contribute 35% to the final grade of the subject. A minimum mark of 3.5 out of 10 of each exam is required to be able to make a weighted average with the rest of evaluation items (work and visits' questionnaires).

- In the case of not carrying out the work:

Each of the 2 exams will contribute 45% to the final grade of the subject. A minimum mark of 3.5 out of 10 of each test is required to be able to make a weighted average with the rest of evaluation items (questions visits).

To pass the subject, at least, a score of 3.5 out of 10 must be obtained in each of the two exams. Also, students must have attended, at least, 2 of the visits that will be scheduled and must have reached a weighted note of all evaluation items of 5 out of 10.

b) Evaluation activities scheduling

The scheduling of the exams, dates of the visits to the industrial sites and dates related to the work (voluntary) will be published in Aula Moodle. Dates of the exams will also be announced on the Escola d'Enginyeria website.

c) Resit exam

The resit exam will have two parts, each corresponding to one of the two regular exams. The date of the resit exam will be set in the exam calendar of the degree (Escola d'Enginyeria web page). The students should attend the resit exam if, having attended a minimum of 2 visits to industrial sites:

- They got a mark below 3.5 out of 10 on some or all of the regular exams. They should attend to the part of the resit exam corresponding to that exam (or both, if applicable).
- Although having a mark higher than 3.5 out of 10 in the regular exams do not reach 5 out of 10 of the weighted mark of all the evaluation activities. In this case, students should attend to the part of the resit exam corresponding to the regular exam with a mark below 5 out of 10.

A specific resit exam for the questionnaires on industrial sites visits is also planned. Students with an average mark of the questionnaires below 4/10 can attend to this exam as long as they have obtained a minimum average mark of 2/10 of the rest of the evaluation activities.

d) Procedure for evaluation activities' revision

For each assessment activity, a place, date and time of revision will be indicated in which the student will be able to review the activity with the teacher.

e) Qualifications

UAB evaluation norm indicate that the Honor Matricules (MH) can only be awarded to students who have obtained a final grade of 9/10 or more. It can be granted up to 5% of MH of the total number of students enrolled. In this sense, in order to be able to opt for this qualification, in addition to the criteria established by the UAB, a mark equal to or greater than 8.5/10 in each of the assessment activities is required. Students performing the reseat exam will not be granted with this qualification.

The qualification of Non-Evaluable (NA) will be obtained by those students who do not attend any of the regular exams or the resit exam.

Students not achieving the minimum mark in the regular exams and not attending the resit exam, will be qualified with Fail (Suspens) with the numerical mark corresponding to the average of the regular exams.

f) Irregularities by the student, copy and plagiarism

Without prejudice to other disciplinary measures that are deemed appropriate, and in accordance with the current academic regulations, the irregularities committed by the student that can lead to a variation of the mark in an evaluation activity, will be qualified by a 0 out of 10. Therefore, copying, plagiarizing, cheating, letting copy, etc., in any of the assessment activities, will involve a mark of 0 in that activity. Assessment activities qualified in this way and by this procedure will not be recoverable. If it is necessary to pass any of these assessment activities to pass the subject, the student will fail the subject directly without any opportunity of resitting exam. In this case, the mark will be Suspens (Fail) with a maximum numeric score of 3/10.

All the important dates related to the different activities related to the subject will be published in the Aula Moodle and may be subject to changes in scheduling due to different reasons. Information in Aula Moodle will be continuously updated. Students are encouraged to check this platform with assiduity.

Assessment Activities

| Title | Weighting | Hours | ECTS | Learning Outcomes |
|-------|-----------|-------|------|-------------------|
|-------|-----------|-------|------|-------------------|

| | | | | |
|---|--------|---|------|-------------------------------|
| Exam 1 | 35-45% | 5 | 0.2 | 1, 2, 3, 5, 7, 10 |
| Exam 2 | 35-45% | 5 | 0.2 | 1, 4, 2, 3, 5, 9, 8, 6, 7, 10 |
| Questionnaires on the visits to industrial sites | 10% | 1 | 0.04 | 1 |
| Work on industrial production processes (voluntary) | 20% | 8 | 0.32 | 1, 2, 7, 10 |

Bibliography

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- R.H. Perry, D. Green, Perry's Chemical Engineers' Handbook, 8a edició, McGraw-Hill, New York, 2008.
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- A. Vian, Introducción a la Química Industrial, 2a edició, Reverté, 1994.
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- University of York, The Essential Chemical Industry on line: <http://www.essentialchemicalindustry.org>