Universidad Zaragoza
1542

Year : 2018/19

30027 - Industrial Chemical Processes

Syllabus Information

Academic Year:	2018/19
Subject:	30027 - Industrial Chemical Processes
Faculty / School:	110 -
Degree:	436 - Bachelor's Degree in Industrial Engineering Technology 330 - Complementos de formación Máster/Doctorado
ECTS:	6.0
Year:	330 - Complementos de formación Máster/Doctorado: XX 436 - Bachelor's Degree in Industrial Engineering Technology: 3
Semester:	Half-yearly
Subject Type:	Compulsory, ENG/Complementos de Formación
Module:	---

General information

Aims of the course

Context and importance of this course in the degree

Recommendations to take this course

Learning goals

Competences

Learning goals

Importance of learning goals

Assessment (1st and 2nd call)

Assessment tasks (description of tasks, marking system and assessment criteria)

Methodology, learning tasks, syllabus and resources

Methodological overview

Warning: The availability of this information in english does not imply that any class, course material or activity will be carried

out/available in english. The language of the course is SPANISH. The student must be able to understand and communicate adequately in spanish.

This subject has the purpose of a total analysis of the industrial chemical processes through mass and energy balances. For the student it is also important the knowledge of specific and usual components in these processes. Moreover, the students learn the key aspects of some selected processes such as air separation and sulfuric acid production, among others.

With the purpose that the students achieve this knowledge a learning process is suggested with lectures and activities in small class (around 20 students) to analyze case studies and the resolution of problems by themselves. The learning process of the student is developed from the lectures, guided by the teacher, who also solves and explains model problems. Afterwards, in small group problem classes the participation of the student is higher. The work in small groups also favours the interaction between students helping to the achievement of competences. A further step is given during the autonomous work of the student when solving a set of problems of mass and energy balances. The fulfillment of the case study of more complexity, carried out in small groups, allows the students to face a real case, promoting competences of information search about a specific process, data selection to carry out the balances, and also the consideration of environmental issues of the process. The students also learn written information with an appropriate format that will be usefull later in their TFG (Bacherlor's Degree Final Work).

Learning tasks

The course includes 6 ECTS organized according to:

- Lectures (1.6 ECTS): 40 hours.

- Small group sessions (3h/week every 2 weeks) (0.8 ECTS): 20 hours.

- Autonomous work, individually and in group for assignments (0.4 ECTS): 10 hours.

- Autonomous work, in group for case study (1.2 ECTS): 30 hours.

- Evaluation and personal study (2 ECTS): 50 hours.

In order to achieve the results, the following activities are carried out:

- Study of concepts and procedures for the transformation of raw materials and resources.

- Problem solving of mass and energy balances of chemical processes.

These activities are developed as follows:

1. Lectures, explained to the whole group, with the basic concepts of the course. The participation of the student is emphasized by questions during the class.

2. Small group activities. These activities are carried out in groups of 20 students using active learning methodologies such as problem solving and puzzles. The student faces problem solving with the aid of the lecturer.

In puzzle methodology, the class is divided in groups of three students and a different material is given to each student (three different texts). The information of the three texts must be learned by the whole group. In order to achieve this, each student studies his/her text individually. Later, an "expert" meeting is carried out, with a maximum of 4 students discussing over the same text to solve any doubt. Later, every student prepares a guide to explain the text to his/her group partners. During this part, they must pose questions to fully understand the three texts. Due to the high number of students, the evaluation is carried out by means of a short written test. The lecturer helps in the organization, timing for a correct development of the activity.

Besides, the groups (3 students maximum) must solve (out of class) a case study of higher complexity, searching the information required for describing and specifying the process suggested by the lecturer and solving the mass and energy balances.

Additionally, the work in groups helps the students to learn cooperative working, promoting communication and interpersonal skills, divergent thinking and learning styles. The use of groups can result in a higher motivation, knowledge retention and academic success.

3. Autonomous work, studying the course and applying it to exercise solving. This activity is basic in the learning process and for overcoming evaluation activities. A set of problems will be given to the student for solving them.

4. Individual and group tutorials, with a more personal work, more adaptive to the specific circumstances of the student, is the most adequate to support the autonomous work of the student. Besides, the case study carried out in group requires to follow and guide closely during its development.

Syllabus

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The course will address the following topics:

Theory sessions

1.- Introduction. Outstanding and distinguishing characteristics of the Chemical Industry.

2.- Basic knowledge on chemical reactors and unit operations.

3.- Mass and energy balances in chemical processes.

4.- Processes without reaction. Air separation by distillation (cryogenics), adsorption and membranes.

5.- Processes with reaction: sulfuric acid production.

6.- Power generation: coal combustion in fluidized bed, gasification and fuel cells (electrochemistry).

7.- Processes in the Oil Refinery.

8.- Polymerization Processes

3h sessions (Small group activities)

Session 1. Information searching. Flow diagrams.

Session 2. Mass balances.

Session 3. Energy balances.

Session 4. Mass and energy balances.

Session 5. Puzzle. Electrochemistry and fuel cells.

Session 6. Solid fuels.

Course planning and calendar

For further details concerning the timetable, classroom and further information regarding this course, please refer to the Escuela de Ingeniería y Arquitectura de la Universidad de Zaragoza, EINA, web (https://eina.unizar.es/). For the group activity (case study), at least two meetings are mandatory, first one around april 10th for orientative issues, and a final one around may 20th for results delivery. Each lecturer will inform about his/her schedule.

Bibliography and recommended resources

The literature on the course can be checked through the following link:

http://biblioteca.unizar.es/como-encontrar/bibliografia-recomendada