Universidad Zaragoza

Academic Year/course: 2024/25

60803 - Analysis and Design of Chemical Processes

Syllabus Information

Academic year: 2024/25
Subject: 60803 - Analysis and Design of Chemical Processes
Faculty / School: 110 - Escuela de Ingeniería y Arquitectura
Degree: 532 - Master's in Industrial Engineering
ECTS: 4.5
Year:
Semester: 532-First semester o Second semester
266-Second semester
107-Second semester
332-Second semester
Subject type: Compulsory
Module:

1. General information

It is intended that students are able to analyse a chemical process and have sufficient instrumental skills to do the basic design of equipment characteristic of the chemical industry: reactors, in which matter undergoes changes in its composition, and separation operations, in which the different components are separated, calculating the associated material and energy balances.

2. Learning results

Upon completion of this subject, the student will be able to:

1.- Know the most common systems of representation for chemical processes, propose a diagram from the description of a process, and obtain information from the diagram of a process.

2.- Formulate the conservation equations (material and energy balance) of a chemical process and calculate the most relevant thermodynamic properties from the operating conditions, determine the relationship between the variables temperature, pressure, flow and composition of the process streams.

3.-Apply reaction kinetics to the design of ideal reactors.

4.- Propose, in the face of a process flow, the separation into its components through a basic operation, distinguishing between the different types of operations.

5.- Know how to size the basic parameters of a flash distillation, a rectification column or an absorption using approximate methods, calculating equilibrium compositions between phases.

3. Syllabus

1.- Introduction. Foundations of analysis and design of equipment in the chemical industry.

2.- Properties of currents. Estimation of thermodynamic properties and phase equilibrium.

3.- Selection of separation operations.

4.- Separation of binary mixtures through distillation. Differential distillation. Flash distillation. Reflux distillation.

5.- Absorption columns. Fundamentals of material transfer. Design shortcuts.

6.- Design of chemical reactors. Design equations for ideal reactors: piston flow, perfect mixing and batch reactor. Combination of reactors. Thermal effect.

These contents will be developed throughout the theory sessions, problem-solving and case sessions as well as practical simulation sessions.

4. Academic activities

Participatory master class: 25 hours

Problems and cases: 10 hours

Practices (simulation of chemical processes by computer): 10 hours

Assessment tests: 6 hours.

Personal study: 62 hours

5. Assessment system

The subject will be assessed in the form of a global evaluation through the following activities, both related to the content of the subject and the practices carried out:

Exam of the theoretical part (75% of the grade)

Exam of the practical part (25% of the grade)

A partial exam can be taken on the first part of the subject (topics 1 to 4) which will eliminate these topics in the overall test and will account for 40% of the subject's grade.

In all assessment activities, a minimum grade of 5/10 will be required to average. In the event that any of the sections have not been passed in the first call, the student will have to take an exam in the second attempt for the sections not passed. For subsequent academic years, none of the parts will be saved.

6. Sustainable Development Goals

9 - Industry, Innovation and Infrastructure
12 - Responsible Production and Consumption
13 - Climate Action