Universidad Zaragoza

Academic Year/course: 2024/25

30810 - Basic principles of chemical engineering

Syllabus Information

Academic year: 2024/25
Subject: 30810 - Basic principles of chemical engineering
Faculty / School: 105 - Facultad de Veterinaria
Degree: 568 - Degree in Food Science and Technology
ECTS: 6.0
Year: 2
Semester: First semester
Subject type: Basic Education
Module:

1. General information

The general objective of this introductory subject is that students acquire the tools and basic knowledge of chemical engineering, to be able to face with a broad criterion the various problems that will arise in the field of food processing. To this end, the study of the fundamentals that govern the basic operations will be addressed for their subsequent application in the food industry: Magnitudes and units, Balances of matter, Enthalpy balances, Fluid flow, Heat transfer, Matter transfer.

These approaches and objectives are aligned with some of the Sustainable Development Goals (SDGs) of the 2030 Agenda (https://www.un.org/sustainabledevelopment/es/), at specifically, the learning activities planned in this subject contribute to a certain extent to the achievement of Objectives 7.2 and 7.3 of Goal 7, and Objective 9.4 of Goal 9.

2. Learning results

The student, in order to pass this subject, must demonstrate that:

1. Knows and handles the basic calculations necessary in Chemical Engineering: unit systems and calculation methods.
2. It is able to perform matter and energy balances, which entails drawing and marking in its entirety the flow diagram, choosing a calculation base with criterion and proposing and solving the equations necessary to solve the balance. In addition, the student should know how to obtain the equations of matter and energy balance for some systems in non-stationary state and to obtain the analytical solutions for the case of first order differential equations.
3. Is able to apply the fundamentals of transport phenomena (amount of motion, energy and matter) and the laws that govern them to concrete cases of food processing.
4. Is capable of solving fluid flow problems and heat transfer problems, in both steady and non-steady state and problems of matter transfer between phases and through porous solids.

3. Syllabus

BLOCK I. INTRODUCTION

- Topic1. Introduction to Chemical Engineering. Unit systems and calculation methods

BLOCK II. MACROSCOPIC MATERIAL AND ENERGY BALANCES

- Topic 2. Balances of matter without steady-state chemical reaction
- Topic 3. Energy balances without steady-state chemical reaction
- Topic 4. Non-steady state energy and matter balances

BLOCK III. INTRODUCTION TO FLUID DYNAMICS, HEAT TRANSFER AND TRANSFER OF MATTER

- Topic 5. Fluidodynamics
- Topic 6. Heat transfer
- Topic 7. Matter transfer

4. Academic activities

Master classes: 21 h to deal with theoretical contents.

Types of questions and problems: 27 h for the resolution of the exercises.

Seminars: 4 hours distributed in two sessions of 2 hours each for the resolution and sharing of cases.

Laboratory practices: 8 hours distributed in 4 sessions of 2 h each.

Supervised practical work: 15 h of autonomous work in which the student will carry out the personal work problems posed by the teacher and will be tutored by the them.

Study: 72 hours of autonomous work not supervised by the teacher.

Examinations: 4 h for the completion of the evaluation tests.

Individual/group tutoring: face-to-face or virtual sessions to resolve doubts.

5. Assessment system

The evaluation of this subject will be carried out with a GLOBAL TEST that will consist of the following activities:

- **Written assessment test** (80% of the grade, minimum 4 out of 10).

1. Theoretical-practical questions (40% of the mark)
2. Problems (40% of the grade)

- **Laboratory practices** (20% of the grade, minimum 4 out of 10).

They will be evaluated by means of a group work in which the students will have to elaborate a practice script and give a reasoned answer to a series of questions and/or exercises set out for each practice. The necessary calculations will be performed using a spreadsheet. Students who do not pass or waive the grade obtained in the group work, must individually take a written test of questions related to the laboratory practices.

The grade obtained will be valid during the present academic year and the following one, as long as a grade equal to or higher than 5 out of 10 is obtained.

Assessment criteria:

- In order to pass the subject, the student must obtain a weighted average of the two tests equal to or higher than 5.
- **Theoretical or theoretical-practical questions**: correct use of Spanish, ability to synthesize, clarity of explanation, coherence in reasoning, adequacy of the answer to the questions and degree of knowledge of the subject matter.
- **Problem solving**: handling of units and dimensions and change of units, search for physical and chemical properties in tables, diagrams, abacuses and figures, problem posing, solving the equations posed and accuracy in the calculation.
- **Laboratory practical work**: validity of the results obtained and of the conclusions reached, order and clarity in the presentation of the results.

6. Sustainable Development Goals

7 - Affordable and Clean Energy
9 - Industry, Innovation and Infrastructure
13 - Climate Action