Universidad Zaragoza

Academic Year/course: 2022/23

60644 - Equipment for Chemical Processes

Syllabus Information

Academic Year: 2022/23
Subject: 60644 - Equipment for Chemical Processes
Faculty / School: 100 - Facultad de Ciencias
Degree: 540 - Master's in Industrial Chemistry
ECTS: 6.0
Year: 1
Semester: First semester
Subject Type: Compulsory
Module:

1. General information

1.1. Aims of the course

The course and its expected results respond to the following approaches and objectives:

The objective of the course is to improve the student's training to work in the Chemical Indus

For this, additional knowledge is provided to that received in the degree, so that they are ab
and in some cases carry out a basic dimensioning, of equipment used in chemical process plants
This is intended to be able to propose processes and operate them more efficiently:

These approaches and objectives are aligned with the following Sustainable Development Goals (
United Nations 2030 Agenda (https://www.un.org/sustainabledevelopment/es/), in such a way that
acquisition of the results of subject learning provides training and competence to contribute
some extent to those achievement:

- Goal 1: End of poverty.
- Goal 2: Zero hunger.
- Goal 3: Health and well-being.
- Goal 4: Quality education.
- Goal 6: Clean water and sanitation.
- Goal 7: Affordable and clean energy.
- Goal 8: Decent work and economic growth.
- Goal 9: Industry, innovation and infrastructures.
- Goal 12: Responsible production and consumption
- Goal 13: Climate Action

1.2. Context and importance of this course in the degree

The subject Equipment for Chemical Processes is compulsory and is taught in the first semester
The knowledge acquired will allow the student to have the scientific knowledge base necessary
the optional subjects of Paper Technology, Risk Analysis in the Chemical Industry, Industrial
Processes and Food Industry Processes.

1.3. Recommendations to take this course

To take the subject of **Equipment for Chemical Processes**, it is recommended to have basic know
chemical engineering. Class attendance, continued study and daily work are essential for the s
satisfactorily achieve the proposed learning. Students must take into account that for their a
have teachers in personalized and group tutorials.

2. Learning goals

3. Assessment (1st and 2nd call)

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

The student must demonstrate that he/she has achieved the expected learning results through the following evaluation activities

Written test in the call for exams corresponding to the global evaluation periods that will consist of questions and theoretical-practical questions in which the application of the theory to specific cases and examples (note 1) and delivery of the problems and practical cases that will berequested proposed and participation in class (note 2).

The final grade for the course will be the best of those obtained by the student between two alternative formulas:

Formula 1: Final grade = 0.8 * grade 1 + 0.2 * grade 2

Formula 2: Final grade = grade 1

The number of official exam sessions to which enrollment entitles (2 per enrollment) as well as the consumption of these calls will be adjusted to the Regulation of permanence in official degrees adapted to the European Higher Education Area at the University of Zaragoza and to the Regulation of Norms of Evaluation of the Learning of the University of Zaragoza. The general criteria for the design of the tests and the grading system will also be adjusted to this last regulation and, according to the same, the time, place and date on which the review will be held will be made public when the qualifications are published.

According to the Rules of Learning Assessment Regulations of the University of Zaragoza, the student will have the right to a global test in which the skills developed in the subject will be assessed. This global test will be held on the date set by the exam calendar of the Faculty of Sciences.

Teaching and evaluation activities will be carried out in person unless, due to the health situation, the provisions issued by the competent authorities and by the University of Zaragoza require them to be carried out totally or partially on-line.

4. Methodology, learning tasks, syllabus and resources

4.1. Methodological overview

This course includes 6 ECTS, 4 ECTS devoted to lectures on theory and examples, and 2 ECTS to the solution of problems given as homework.

The expected 150 hours of work by the students are distributed as follows:

- 40 hours of lectures on theory and problems.
- 20 hours for the explanation and class discussion of the examples previously proposed for homework.
- 85 hours of autonomous work.
- 5 hours of assessment, corresponding to a written final exam.

Lectures will be in the classroom, except if the sanitary situation or the rules given by the academic authorities make necessary to make them on-line.

4.2. Learning tasks

Lectures on theory and problems will be scheduled according to the timetable given by the Faculty of Sciences. Additionally, each professor will inform of their office hours.

4.3. Syllabus

The course will address the following topics:

1. Mass and energy balances: General conservation principles. Macroscopic balances in continuous contact processes with equilibrium stages. Microscopic balances in continuous differential contact. Transport coefficients
2. Chemical Reactors: Homogeneous reactors. Complex Reactions: series, parallel and series-parallel. Reactor optimization. Heterogeneous gas-solid catalytic and non-catalytic. Effectiveness factor and Thiele modulus. Fixed and fluidized bed reactors. Biochemical Reactors.
3. Separation unit operations: Material Separation Agent and Energy Separation Agent. Advantages and disadvantages. Examples. Rectification of binary mixtures. Design of rectification towers by the McCabe-Thiele method. Effectiveness factor. Liquid-Liquid extraction. Fundamentals and calculations methods.
4. Heat transfer equipment: Heat transfer in fluids with and without phase change. Empirical correlations. Shell-tubes heat exchangers. Multiple passes. Single effect and multiple effect evaporators.
5. Flow of fluids: Bernouilli equation. Fluid of non-compressible fluids in tubes. Friction factor and pressure drop. Transport of fluids: tubes, valves, pumps and compressors.
6. Auxiliary services: heating and refrigeration, water, compressed air and electricity.

4.4. Course planning and calendar

This course is given in the first semester (September-February).

The place and timetable for lectures will be established at the beginning of the course and published on the website of the Faculty of Science

http://ciencias.unizar.es/ .

4.5. Bibliography and recommended resources