

Academic Year/course: 2021/22

60644 - Equipment for Chemical Processes

Syllabus Information

Academic Year: 2021/22

Subject: 60644 - Equipos para procesos químicos

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

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 be requested 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 = $0.8 * \text{grade 1} + 0.2 * \text{grade 2}$

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: Bernoulli 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

http://biblos.unizar.es/br/br_citas.php?codigo=60644&year=2019