Universidad Zaragoza

Academic Year/course: 2021/22

27115 - Chemical Engineering

Syllabus Information

Academic Year: 2021/22
Subject: 27115 - Ingeniería química
Faculty / School: 100 - Facultad de Ciencias
Degree: 446 - Degree in Biotechnology
ECTS: 9.0
Year: 3
Semester: Annual
Subject Type: Compulsory
Module:

1. General information

1.1. Aims of the course

- To use basic terms of Chemical Engineering
- To develop and solve macroscopic mass and energy balances in bioprocesses
- To know the mass and energy transport mechanisms and the mathematical equations describing them
. To know and apply properly transport equations between phases for the for the design of mass transfer equipment
- To apply simple mathematical methods in the simulation and design of equipment for mass and energy transfer, for fluid transport and chemical reactors

1.2. Context and importance of this course in the degree

The industrial development of processes based on biomolecules requires knowledge by the biotechnologist of the basic operations used in the industry and of the reactors for biochemical processes. In this subject, the necessary tools are provided to carry out the mass and energy balances of biochemical processes, as well as the basic design of equipment for mass and heat transfer and for fluid flow. The bases for the design of chemical reactors are provided, although the detailed study of biochemical reactors will take place in a specific subject.

1.3. Recommendations to take this course

Basic courses on Mathematics and Physical-Chemistry are necessary.

2. Learning goals

2.1. Competences

The student will be able to:

- Analyze material and energy balances in chemical and biochemical processes.

- Analyze the transport mechanisms of matter and heat.

- Apply simple calculation methods for the analysis and sizing of equipment for heat and mass for fluid transport and for chemical reactors.

- Express the result of their work orally using appropriate scientific language

2.2. Learning goals

The student will:
- Explain in a reasoned way, using basic terminology, the phenomena of matter transfer and hea

that take place in physical and chemical processes.

- Identify the main operations of a chemical plant, and specifically those of greatest interes process plants, and their principle of operation.

- Analyze flow diagrams (new or existing) of chemical processes from the point of view of mass balances.

- Dimension and simulate basic equipment for heat and mass transfer, for fluid transport and c by means of simple graphical or analytical calculation methods.

2.3. Importance of learning goals

The learning outcomes described above are necessary to conceive, design, and operate industria using biochemical molecules.

3. Assessment (1st and 2nd call)

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

Participation during lectures will represent 20% of the final grade and will be the sum of the contributions that the student makes in class throughout the course. This will include participation during lectures, the delivery of problems or the presentation of exercises in class.
A final written exam, including a theory part and a problem part, will account for 80% of the final grade. In the problems, both the correct application of the procedures and the obtaining of a correct result will be assessed. The weighting of the problems in the exam grade will be double that of theory.
In addition to the evaluation modality indicated in the previous paragraphs, the student will have the possibility of being evaluated in a global test, which will judge the achievement of the learning results indicated above. The final grade for the course will be the best among those obtained in the continuous assessment mode and the one based on the global test.
Fraud or total or partial plagiarism in any of the evaluation tests will lead to the suspension of the subject with the minimum grade, in addition to the disciplinary sanctions that the guarantee commission adopts for these cases.
The syllabus that students must use to prepare the different tests can be found in the "Activities and resources" section of this same teaching guide.

4. Methodology, learning tasks, syllabus and resources

4.1. Methodological overview

The methodology followed in this course is oriented towards the achievement of the learning objectives. A wide range of teaching and learning tasks are implemented, such as lectures, practice sessions, autonomous work and study, tutorials and assessment tasks.

Students are expected to participate actively in class throughout the semester.

Further information regarding the course will be provided on the first day of class.

4.2. Learning tasks

The course includes the following learning tasks:

- Lectures. Mainly participative lectures in which the basic concepts of the matter and examples will be explained.
- Practice sessions. In which the participation of the students will be the principal issue.
- Autonomous work and study.
- Assessment tasks.
- Tutorials.

The teaching and evaluation activities will be carried out in face-to-face mode, 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 telematically

4.3. Syllabus

The course will address the following topics:

- Topic 1- Mass and energy balances. Mass balances and atomic balances. Steady and unsteady state. Recirculation and purge.

- Topic 2. Introduction to transport phenomena. Transport equations. Transport inside a fluid. Transport between phases. Application to mass transfer in fermentation reactors.
- Topic 3. Heat transfer. Mechanisms for heat transfer. Heat transfer in solids. Design of equipments for heat transfer.
- Topic 4. Transport of fluids. Bernouilli equation. Pressure drop in pipes. Pumps.
- Topic 5. Introduction to Separation Units. Types of contact. Design of equipment for contact by stages.
- Topic 6. Liquid-liquid extraction. Principles. Types of equipments. Design of equipment by stages.
- Topic 7. Other separation units: lixiviation, filtration and separation with membranes.
- Topic 8. Introduction to Chemical Reaction Engineering. Classification of ideal reactors. Design of ideal reactors for simple and homogeneous reactions.

4.4. Course planning and calendar

Schedules of lectures and problems will coincide with the officially established and will be available at: https://ciencias.unizar.es/grado-en-biotecnologia.

The places, calendar and groups for training and practical sessions will be established in coordination with the rest of the subjects at the beginning of course. The Coordinator will produce the groups of students for these activities at beginning of course to avoid overlaps with other subjects.

For students enrolled in the subject, places, times and dates of lectures and practical sessions will be public via Bulletin Board advertisements of the grade on the platform Moodle at the University of Zaragoza, https://moodle2.unizar.es/add/, and in the moodle page for the course. These routes will be also used to communicate enrolled students their distribution by groups of practical sessions, which will be organized by the coordination of degree. Provisional dates will be available on the website of the Faculty of Sciences in the corresponding section of the Degree in Biotechnology: https://ciencias.unizar.es/grado-en-biotecnologia.

In this web there will be also available the dates of exams.

4.5. Bibliography and recommended resources

http://psfunizar10.unizar.es/br13/egAsignaturas.php?codigo=27115