27216 - Fundamentals of Chemical Engineering

Información del Plan Docente

Academic Year	2017/18
Faculty / School	100 - Facultad de Ciencias
Degree	452 - Degree in Chemistry
ECTS	6.0
Year	3
Semester	First semester
Subject Type	Compulsory
Module	---

1.General information

1.1.Introduction

1.2.Recommendations to take this course

1.3.Context and importance of this course in the degree

1.4.Activities and key dates

2.Learning goals

2.1.Learning goals

2.2.Importance of learning goals

3.Aims of the course and competences

3.1.Aims of the course

3.2.Competences

4.Assessment (1st and 2nd call)

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

5.Methodology, learning tasks, syllabus and resources

5.1.Methodological overview

5.2.Learning tasks

5.3.Syllabus

The course is divided in two sections. The following syllabus is intended to help the student the consecution of his/her formative training throughout the following activities:

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Section 1: Introduction. Mass and energy balances in steady state.

	Hours present	Activity
1.9 ECTS	9 h	Master class (theoretical classes and exercises)
	10 h	Exercises

The 9 h of master classes will include:

- Chemical Engineering Introduction
- Nomenclature and unit systems; dimensional analysis; units conversion.
- Mass and energy balances in steady state in chemical processes.
- Mass balances in steady state with and without chemical recation.
- Simultaneous resolution of mass and energy balances in steady state.

Section 2: Transport phenomena. Unit Operations and Proceeses. Reactor Design.

	Hours present	Activity
4.1 ECTS	21 h	Master class (theoretical classes and exercises)
	8 h	Exercises
	12 h	Lab practices (2 people groups)

The 21 h of master classes will include:

- Introduction to Transport Phenomena
- Transport mechanisms. Transport equations in laminar flow regime. The boundary layer.
- Individual and global transport coefficients.
- Heat exchanger design

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- Fundamentals of separation processes. Distillation
- Design of absorption and stripping towers.
- Reactor design. Chemical reaction kinetics.
- Discontinuous reactors
- The continuous plug flow reactor model
- The continuous flow stirred-tank reactor

12 h of laboratory practices will be distributed as follows :

Each couple will carry out 3 laboratory practices, two related to Section 1 (laboratory practices 1a to 4a) and one related to section 2 (laboratory practices 5).

Each laboratory practice will last 2,5h. Each couple will carry out 2 practices from the 4 included in Section 1:

Practice 1a: Gas/liquid absorption/desorption. Determination of individual mass transport coefficients.

Practice 2a: Ion exchange. Determination of the breakthrough curve.

Practice 3a: Extraction solid/liquid. Analysis of the contact mode, temperature and number of stages.

Practice 4a: Discontinuous distillation.

Practice 5: continuous plug flow reactor model. Influence of the reaction conditions on the conversion. The continuous flow stirred-tank reactor. Reactors in series.

5.4.Course planning and calendar

The schedules can be consulted on the website of the Faculty of Sciences: http://ciencias.unizar.es/web/horarios.do

Specific dates of the different activities will be announced during the classes, bulletin boards or by ADD (Moodle2 Platform).

5.5.Bibliography and recommended resources

BB	Introducción a la ingeniería química / Editor Guillermo Calleja Pardo ; Autores Guillermo Calleja Pardo...[et al.] Madrid : Síntesis, D.L. 1999
BC	Felder, Richard M.. Principios elementales de los procesos químicos / Richard M.Felder, Ronald W. Rousseau ; [colaboradora en la traducción, María Teresa Aguilar Ortega de Sandoval ; revisión, Enrique Arriola Guevara] . - 3ª ed. México [etc.] : Limusa Wiley, cop. 2003

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BC	Himmelblau, David M.. Principios básicos y cálculos en ingeniería química / David M. Himmelblau ; traducción, Roberto Luis Escalona García ; revisión técnica, Mª del Carmen Doria Serrano . - 2ª ed. en español México [etc.] : Prentice-Hall Hispanoamericana, cop. 1997
BC	Ingeniería de reactores / Jesús Santamaría ... [et al.] Madrid : Síntesis, D.L. 1999
BC	McCabe, Warren L.. Operaciones unitarias en ingeniería química / Warren L. McCabe, Julian C. Smith, Peter Harriott ; traducción, María Aurora Lanto Arriola; revisión técnica, María Teresa Collí Serrano, Anselmo Osorio Mirón . - 6ª ed. México [etc.] : McGraw-Hill, cop. 2002
BC	Ruiz Palacín, Joaquín. Problemas resueltos de balances de materia en estado estacionario / Joaquín Ruiz Palacín Zaragoza : Prensas Universitarias de Zaragoza, 2009