66211 - Advanced Reactor Design

Información del Plan Docente

Academic Year	2017/18
Faculty / School	110 - Escuela de Ingeniería y Arquitectura
Degree	531 - Master's in Chemical Engineering
ECTS	6.0
Year	1
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

The objective of this course is to impart the rigorous study of reactor engineering. In this course, particular emphasis will be given to heterogeneous reacting systems, design of fluid-fluid and fluid-solid reactors, process intensification, scale-up and stability of chemical reactors.

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

The methodology followed in this course is oriented towards achievement of the learning objectives. A wide range of teaching and learning tasks are implemented, such as

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- Lectures. Explanation of the theoretical principles of the course and solving of some model problems.
- Practice sessions. The sessions of problems and case studies, laboratory practice sessions and special sessions are the support of lectures, because these enable the learning of the course contents and also help to develop a more applied knowledge in the students. Besides, these increase student participation.
- Assignment will complement the work done in lectures and practice sessions.

5.2.Learning tasks

The course includes the following learning tasks:

- Lectures (30 hours).
- Practice sessions (25 hours). Problems and case studies.
- Laboratory sessions (3 hours).
- Special session (2 hours). Visit to a chemical company, seminar, etc.
- Guided tasks (14 hours). The student will give a talk summarizing the main aspects of his/her work in a public defense.
- Autonomous work and study (70 hours).
- Assessment (6 hours).

5.3.Syllabus

The course will address the following topics:

SECTION 1. INTRODUCTION

- Topic 1. General considerations in the design of heterogeneous reactors. Confidence levels in the design.
- Topic 2. Fixed-bed catalytic solid-fluid reactors.

SECTION 2. TWO-PHASE HETEROGENEOUS REACTORS

- Topic 3. Catalytic solid-fluid reactions. Fluidized bed reactors. Models of design. Reactors with deactivation of the catalyst.
- Topic 4. Fluid-fluid reactions. Gas-liquid and liquid-liquid reactors. Ideal models and rigorous models.

SECTION 3. MULTIPHASE HETEROGENEOUS REACTORS

- Topic 5. Packed Bed catalytic reactors.
- Topic 6. Reactors with suspended solid catalyst: Trickle bed reactor and Slurry reactor.

SECTION 4. REACTOR TYPES

- Topic 7. Reactors used in polymerization, electrothermal, electrochemical, biochemical, photochemical and radiochemical processes. New advances in reactor engineering.
- Topic 8. Process intensification in chemical reactor engineering.

SECTION 5. ADVANCED REACTOR DESIGN

- Topic 9. Reactor safety and control. Basis for the design and scale-up.

5.4.Course planning and calendar

Further information concerning the timetable, classroom, office hours, assessment dates and other details regarding this course, will be provided on the first day of class or please refer to the EINA website, the Master's http://titulaciones.unizar.es/mas_inge_quim/ and the course's https://moodle.unizar.es/

5.5.Bibliography and recommended resources

Universidad Zaragoza

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BB	Nauman, E. Bruce. Chemical reactor design, optimization, and scaleup / E. Bruce Nauman . - 2nd ed. Hoboken (New Jersey) : John Wiley & Sons, cop. 2008
BB	Novel concepts in catalysis and chemical reactors : improving the efficiency for the future / edited by Andrzej Cybulski, Jacob A. Moulijn, and Andrzej Stankiewicz Weinheim (Germany) : Wiley-VCH, cop. 2010
BB	Smith, Joe Mauk. Ingeniería de la cinética química / J.M. Smith . - 1a ed, 10a reimp. México D.F. : CECSA, 1997
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BC	Fogler, H. Scott. Elementos de ingeniería de las reacciones químicas / H. Scott Fogler ; traducción, María Teresa Aguilar Ortega ; revisión técnica, Román Ramírez López ... [et al.] . 4ª ed. Naucalpan de Juarez, México : Pearson Educación, 2008
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BC	Theodore, Louis. Chemical reactor analysis and applications for the practicing engineer / Louis Theodore . Hoboken, N.J. : Wiley, 2012
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