

29922 - Applied Kinetic Chemistry

Información del Plan Docente

Academic Year	2017/18
Faculty / School	110 - Escuela de Ingeniería y Arquitectura
Degree	330 - Complementos de formación Máster/Doctorado 435 - Bachelor's Degree in Chemical Engineering
ECTS	6.0
Year	XX
Semester	Half-yearly
Subject Type	Compulsory, ENG/Complementos de Formación
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

For the design of the learning process, it was considered that this is a theoretical-practical subject. This implies continued study of theoretical aspects and their subsequent application to the resolution of issues and problems of particular interest to allow the students to assimilate the contents of the subject.

The teaching method includes explanatory slides containing the most important theoretical and practical aspects of the

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discipline. Numerous schemes and examples that allow easy assimilation and application of the most important concepts are provided. It also offers a collection of exercises and questions whose resolution will offer the student a tool for self-evaluation. This material is accompanied by a set of references for consultation and deepening.

5.2. Learning tasks

The subject "Applied chemical kinetics" requires a dedication by students of about 150 h, equivalent to 6 ECTS. The learning process is based on the following schedule of teaching and learning activities

- Participative theoretical lectures (40 h)
- Questions and exercises sessions (20 h)
- Programmed works in small student groups, supervised by the teacher (20 h)
- Personal study (64 h)
- Assessment tests (6 h)
- Individual tutorials throughout the course

The Reprography Service of EINA makes available to students the photocopies of slides, questions and exercises that include all the lessons of the course. In addition, all this is accessible on the platform ADDUnizar.

5.3. Syllabus

Block 1. Introduction.

Lesson 1. Basics of Applied Chemical Kinetics.

Block 2. Kinetics of homogeneous reactions.

Lesson 2. Homogeneous reactions: Kinetic equation. Elementary and non-elementary reactions. Reaction mechanisms. Dependence of the reaction rate on concentration and temperature. Activation energy. Arrhenius approach. The reaction rate from kinetic theories.

Lesson 3. Interpretation of kinetic data obtained in laboratory reactors: Batch and continuous reactors.

Lesson 4. Method differential of kinetic data analysis.

Lesson 5. Integral method of kinetic data analysis.

Lesson 6. Homogeneous catalysis.

Block 3. Kinetics of heterogeneous reactions.

Lesson 7. Introduction to kinetic study of heterogeneous reactions.

Lesson 8. Heterogeneous catalytic reactions. Solid catalysts. General concepts of catalysis and adsorption. Obtaining experimental of kinetic data on gas / solid catalytic reactions.

Lesson 9. Kinetics and mechanism of reactions on solid catalysts.

Lesson 10. Kinetics of deactivation of catalysts.

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Block 4. Kinetics of the enzymatic reactions.

Lesson 11. Enzymatic reactions: Enzymes. Homogeneous enzyme kinetics. Michaelis-Menten kinetics. Determination of kinetic constants. Enzymatic inhibition.

5.4.Course planning and calendar

	Theoretical lectures and model exercises	Questions and exercises sessions	Programmed works
Block 1. Introduction			
Lesson 1	2	0	
Block 2. Kinetics of homogeneous reactions			
Lesson 2	4	2	Work 1
Lesson 3	2		
Lesson 4	2	2	
Lesson 5	8	4	Work 2
Lesson 6	2	1	
First partial exam (3 h)			
Block 3. Kinetics of heterogeneous reactions			
Lesson 7	2	1	Work 3
Lesson 8	8	4	
Lesson 9	3	2	
Lesson 10	4	2	

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Block 4. Kinetics of the enzymatic reactions			
Lesson 11	3	2	Work 4
Total student hours	40	20	20
Second partial exam (3 h)			

Theoretical and exercise lectures are given following the schedule established by EINA before the beginning of the current academy course. Every teacher will inform the students about individual tutorial schedule. Other activities will be planned as a function of the number of students early enough.

5.5. Bibliography and recommended resources

- BB** Cinética química aplicada / Juan Ramón González Velasco...[et al.] Madrid : Síntesis, D.L. 1999
- BB** H. Scott Fogler. 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
- BB** Levenspiel, Octave. Ingeniería de las reacciones químicas / Octave Levenspiel ; [versión española por Juan A. Conesa] . - 3ª ed. México D. F. : Limusa Wiley, 2004
- BB** Pérez Báez, Sebastián O.. Problemas y cuestiones en ingeniería de las reacciones químicas / Sebastián O. Pérez Báez, Antonio Gómez Gotor . - 1a ed. Madrid : Bellisco, 1998
- BB** Smith, Joe Mauk. Chemical engineering kinetics / J.M. Smith . - 3rd. ed. Auckland [etc.] : McGraw-Hill, 1981
- BC** Cinética de las reacciones químicas / José Felipe Izquierdo ... [et al.] Barcelona : Universitat de Barcelona, D.L. 2004
- BC** Froment, Gilbert F. Chemical reactor analysis and design / Gilbert F. Froment, Kenneth B. Bischoff . - 2nd. ed. New York [etc.] : John Wiley, cop. 1990
- BC** Levenspiel, Octave. El omnilibro de los reactores químicos / O. Levenspiel ; [versión española por J. Costa López y L. Puigjaner Corbella] . - [1ª ed.], 1ª reimp. Barcelona [etc.] : Reverté, 2002
- BC** Problemas resueltos de cinética de las reacciones químicas / José Felipe

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Izquierdo ... [et al.] Barcelona : Universitat
de Barcelona, D.L. 2004