

**1. General information****Course:** CHEMICAL ENGINEERING**Type:** CORE COURSE**Degree:** 409 - CHEMISTRY**Center:** 1 - FACULTY OF SCIENCE AND CHEMICAL TECHNOLOGY**Year:** 4**Main language:** Spanish**Use of additional languages:** English**Web site:****Code:** 57326**ECTS credits:** 6**Academic year:** 2023-24**Group(s):** 20**Duration:** First semester**Second language:** English**English Friendly:** Y**Bilingual:** N**Lecturer:** CARMEN MARIA FERNANDEZ MARCHANTE - Group(s): 20

Building/Office	Department	Phone number	Email	Office hours
Enrique Costa Novella/Despacho 14	INGENIERÍA QUÍMICA	6351	carmenm.fmarchante@uclm.es	Monday, Wednesday and Thursday (12:30-13:30)

Lecturer: JUSTO LOBATO BAJO - Group(s): 20

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2. Pre-Requisites

Those established with general character for the degree

3. Justification in the curriculum, relation to other subjects and to the profession

Know the fundamental laws of chemical engineering to analyze unitary operations or chemical industrial processes.

Know how to apply matter and energy balances to chemical processes in stationary regime

Be able to solve problems of fluid transport, to calculate the necessary power for the flow and to select equipment and accessories of pumping

Have ability to calculate the area of heat transmission required for the heating or cooling of a given fluid, depending on the type of the exchanger and the direction of flow.

Know calculate the number of theoretical stages and the energy needs of the unit operation of rectification for the separation of an ideal binary mixture.

Know the basic principles of the design of chemical reactors.

Draw up the reports of the work done in the laboratory with clarity and order.

4. Degree competences achieved in this course**Course competences**

Code	Description
CB03	Be able to gather and process relevant information (usually within their subject area) to give opinions, including reflections on relevant social, scientific or ethical issues.
CB05	Have developed the necessary learning abilities to carry on studying autonomously
E01	Understand and use chemical terminology, nomenclature, conventions and units
E04	Understand the principles of thermodynamic and their applications in chemistry
E09	Know the kinetics of chemical change, including catalysis and reaction mechanisms
E10	Know and understand the characteristics of chemical equilibrium
E11	Know the basic operations and the unitary processes of the chemical industry
G02	Be able to gather and interpret data, information and relevant results, obtain conclusions and issue reasoned reports on scientific, technological or other problems that require the use of chemical tools
G03	Know how to apply the theoretical-practical knowledge acquired in the different professional contexts of Chemistry
T06	Ability to approach decision making
T07	Ability to work as a team and, where appropriate, exercise leadership functions, fostering the entrepreneurial character
T10	Ability to use specific software for chemistry at user level

5. Objectives or Learning Outcomes**Course learning outcomes**

Description

Know the basic design principles of chemical reactors

Use the Fundamental Laws of Chemical Engineering to analyze Unit Operations or Chemical Industrial Processes

Ability to calculate the area of ΔT heat transmission necessary for heating or cooling a given fluid, depending on the type of the exchanger and the direction of flow

Ability to solve fluid transport problems, to calculate the power needed for the flow and to select equipment and pumping accessories

Ability to select a matter transfer operation where to carry out a certain separation, calculate the number of theoretical stages and the energy needs of said unit operation.

6. Units / Contents

Unit 1: Chemical Industry and chemical engineering

Unit 2: Basic operations of chemical processes

Unit 3: Classification of basic operations

Unit 4: Macroscopic balances of matter and energy

Unit 5: Introduction to fluid flow

Unit 6: Internal flow

Unit 7: Measurement of flows

Unit 8: Introduction to heat transmission

Unit 9: Convection heat transmission

Unit 10: Introduction to the transfer of matter

Unit 11: Intermittent contact between phases

Unit 12: Chemical reactors

7. Activities, Units/Modules and Methodology

Training Activity	Methodology	Related Competences (only degrees before RD 822/2021)	ECTS	Hours	As	Com	Description
Class Attendance (theory) [ON-SITE]	Lectures	CB03 CB05 E01 E04 E09 E10 E11 G02 G03	1.1	27.5	N	-	Lecture at the classroom
Class Attendance (practical) [ON-SITE]	Practical or hands-on activities	CB03 CB05 E04 E09 E11 G02 G03 T07	0.6	15	Y	Y	Class attendance at the Laboratory
Group tutoring sessions [ON-SITE]	Guided or supervised work	CB03 CB05 G02 G03 T07	0.1	2.5	N	-	Group of tutoring for solving doubts and Seminar
Final test [ON-SITE]	Assessment tests	CB03 CB05 E01 E04 E09 E11 G02 G03	0.3	7.5	Y	Y	Assessment of a final Exam
Problem solving and/or case studies [ON-SITE]	Project/Problem Based Learning (PBL)	CB03 CB05 E01 E11 G02 G03 T06	0.2	5	N	-	Problem solving and/or case studies at classroom
Study and Exam Preparation [OFF-SITE]	Self-study	CB03 CB05 E01 E04 E09 E10 E11 G03 T06	1.4	35	N	-	Self study of the student for exam preparation and study
Other off-site activity [OFF-SITE]	Self-study	CB03 CB05 E11 G02 G03 T06 T10	2.3	57.5	N	-	Self study of the student for exam preparation and study
Total:			6	150			
Total credits of in-class work: 2.3			Total class time hours: 57.5				
Total credits of out of class work: 3.7			Total hours of out of class work: 92.5				

As: Assessable training activity

Com: Training activity of compulsory overcoming (It will be essential to overcome both continuous and non-continuous assessment).

8. Evaluation criteria and Grading System

Evaluation System	Continuous assessment	Non-continuous evaluation*	Description
Mid-term tests	80.00%	0.00%	Written test of theory and problems.
Laboratory sessions	20.00%	20.00%	The qualification of this section comprises both the elaboration of the workbook of practices and of a specific examination of the practices.
Final test	0.00%	80.00%	
Total:	100.00%	100.00%	

According to art. 4 of the UCLM Student Evaluation Regulations, it must be provided to students who cannot regularly attend face-to-face training activities the passing of the subject, having the right (art. 12.2) to be globally graded, in 2 annual calls per subject, an ordinary and an extraordinary one (evaluating 100% of the competences).

Evaluation criteria for the final exam:

Continuous assessment:

The final test will consist of two different parts in the same exam. Different competences will be assessed, a theory exam and another part of resolution of practical cases. The minimum grade in each of the parts will be 40% of the grade of each of them and minimum mark for each part is 4.0/10.0 to apply the average.

The minimum note to pass the subject is a 5.

Non-continuous evaluation:

The final test will consist of two different parts in the same exam. Different competences will be assessed, a theory exam and another part of resolution of practical cases. The minimum grade in each of the parts will be 40% of the grade of each of them and minimum mark for each part is 4.0/10.0 to apply the average.

The minimum note to pass the subject is a 5.

Specifications for the resit/retake exam:

The final test will consist of two different parts in the same exam. Different competences will be assessed, a theory exam and another part of resolution of practical cases. The minimum grade in each of the parts will be 40% of the grade of each of them and minimum mark for each part is 4.0/10.0 to apply the

average.

The minimum note to pass the subject is a 5.

Specifications for the second resit / retake exam:

The final test will consist of two different parts in the same exam. Different competences will be assessed, a theory exam and another part of resolution of practical cases. The minimum grade in each of the parts will be 40% of the grade of each of them and minimum mark for each part is 4.0/10.0 to apply the average.

It will be necessary to have passed the practical part in previous courses, with a minimum of 4.0 out of 10.

The minimum note to pass the subject is a 5.

9. Assignments, course calendar and important dates	
Not related to the syllabus/contents	
Hours	hours
Class Attendance (theory) [PRESENCIAL][Lectures]	27.5
Class Attendance (practical) [PRESENCIAL][Practical or hands-on activities]	15
Group tutoring sessions [PRESENCIAL][Guided or supervised work]	2.5
Final test [PRESENCIAL][Assessment tests]	7.5
Problem solving and/or case studies [PRESENCIAL][Project/Problem Based Learning (PBL)]	5
Study and Exam Preparation [AUTÓNOMA][Self-study]	35
Other off-site activity [AUTÓNOMA][Self-study]	57.5
Global activity	
Activities	hours
Final test [PRESENCIAL][Assessment tests]	7.5
Class Attendance (theory) [PRESENCIAL][Lectures]	27.5
Problem solving and/or case studies [PRESENCIAL][Project/Problem Based Learning (PBL)]	5
Study and Exam Preparation [AUTÓNOMA][Self-study]	35
Other off-site activity [AUTÓNOMA][Self-study]	57.5
Class Attendance (practical) [PRESENCIAL][Practical or hands-on activities]	15
Group tutoring sessions [PRESENCIAL][Guided or supervised work]	2.5
Total horas: 150	

10. Bibliography and Sources					
Author(s)	Title/Link	Publishing house	City	ISBN	Year Description
Darby R.	Chemical Engineering fluids mechanics	Marcel Dekker		0-8247-9628-4	1996
Felder R.; Rousseau R.W.	Elementary principles of Chemical processess	John Wiley and sons	New York	0-471-53478-1	1999
Henley E.J.	Cálculo de balances de materia y energía: (métodos manuales)	Reverté		84-291-7228-9	1993
Henley E.J.	Operaciones de separación por etapas de equilibrio en Ingeniería Química	Reverté		84-291-7908-9	2003
Himmerblau D.M.	Principios básicos y cálculos en Ingeniería Química	Prentice-Hall Hispanoamérica		968-880-802-4	1997
Calleja G; García F.; Iglesias J; de Lucas A.; Rodríguez J.M.,	Nueva Introducción a la Ingeniería Química	Síntesis,	Madrid	978-84-9077-39	2016
Calleja, G; García F.; de Lucas A.; Rodríguez J.M.	Introducción a la Ingeniería Química	Síntesis	Madrid	84-7738-664-1	1999
Costa, J.Cervera Cunill, F.; Esplugas S.; Mans C.; Mata J.	Curso de Ingeniería Química: Introducción a los procesos.	REverté	Barcelona	84-291-7126-6	2002
Costa Novella, E	Ingeniería Química	Alhambra		84-205-0989-2	1983
Coulson J.M.	Chemical Engineering (v 5)	Butterworth-Heinemann		0-7506-2612-7	2003
Coulson J.M.	Ingeniería Química. Tomo II: Unidades SI, operaciones básicas	Reverté		978-84-291-7136-5	2003
Coulson J.M.	Ingeniería Química. Tomo I: Unidades SI, flujo de fluidos	REverté		978-84-291-7135-8	2008

Libro de consulta con ejercicios resueltos de la mayoría de los Temas que se ven en la Asignatura.