UNIVERSIDAD DE CASTILLA - LA MANCHA

GUÍA DOCENTE

1. General information

Course: PROCESS AND PRODUCT ENGINEERING
Code: 57726
Type: CORE COURSE
ECTS credits: 6
Degree: 344 - CHEMICAL ENGINEERING
Academic year: 2023-24
Center: 1 - FACULTY OF SCIENCE AND CHEMICAL TECHNOLOGY
Group(s): 21
Year: 3
Duration: C2
Main language: Spanish
Second language: English
Use of additional languages:
English Friendly: Y
Web site:
Bilingual: N

Lecturer: **MANUEL ANDRES RODRIGO RODRIGO** - Group(s): **21**

Building/Office	Department	Phone number	Email	Office hours
Enrique Costa. Despacho 01	INGENIERÍA QUÍMICA	3411	manuel.rodrigo@uclm.es	Monday, Wednesday and Friday 16:00-18:00 Please book with UCLM app for a better schedulling

Lecturer: **MARIA LUZ SANCHEZ SILVA** - Group(s): **21**

Building/Office	Department	Phone number	Email	Office hours
Enrique Costa. Despacho 12	INGENIERÍA QUÍMICA	6307	marialuz.sanchez@uclm.es	Tuesday, Wednesday and Thursday 10:00-11:00. Please book with UCLM app for a better schedulling

2. Pre-Requisites

Although there are no academic restrictions from the point of view of enrollment in the subject, teachers recommend to properly study the subject to have acquired knowledge about:

-use of the EXCEL tool

-solving of differential equations.

-operation of basic operations and reactors.

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

The analysis of the different problematic situations that can occur in the professional life of a chemical engineer (selection of a wastewater treatment process, an operational problem in a column, etc.), the approach of possible alternatives to solve these situations, and the selection of the best alternative are skills that a chemical engineer must acquire as soon as possible if he wants to succeed in his profession.

Likewise, the chemical engineer must combine this knowledge and skills with those necessary to provide the product manufactured in the process with the appropriate characteristics. These are the main objectives pursued in the subject

Relationship with other subjects of the Degree in Chemical Engineering:

Balances of Matería and Energy.
Introduction to Chemical Engineering
Fluid Mechanics
Heat Transmission
Separation Operations
Chemical Reaction Engineering
Economics and Chemical Industry
Computer Methods and Applications of Chemical Engineering

4. Degree competences achieved in this course

Course competences

Code	Description
CB02	Apply their knowledge to their job or vocation in a professional manner and show that they have the competences to construct and justify arguments and solve problems within their subject area.
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.
CB04	Transmit information, ideas, problems and solutions for both specialist and non-specialist audiences.
E19	Knowledge about material and energy balances, biotechnology, material transfer, separation operations, chemical reaction engineering, reactor design, and recovery and transformation of raw materials and energy resources.
E20	Capacity for analysis, design, simulation and optimization of processes and products.
E21	Capacity for the design and management of applied experimentation procedures, especially for the determination of thermodynamic and transport properties, and modeling of phenomena and systems in the field of chemical engineering, systems with fluid flow, heat

	transfer, mass transference, kinetics of chemical reactions and reactors.
E22	Ability to design, manage and operate simulation, control and instrumentation procedures of chemical processes.
E30	Knowledge of the theory and capacity of use of the procedures of change of scale
G01	Ability to write, sign and develop projects in the field of chemical engineering that are intended, according to the knowledge acquired as established in section 5 of order CIN / 351/2009 of February 9, construction, reform, repair, conservation, demolition, manufacture, installation, assembly or operation of: structures, mechanical equipment, energy installations, electrical and electronic installations, industrial facilities and processes and manufacturing and automation processes.
G02	Capacity for the direction, of the activities object of the engineering projects described in the competence G1.
G03	Knowledge in basic and technological subjects, which enables them to learn new methods and theories, and give them versatility to adapt to new situations.
G04	Ability to solve problems with initiative, decision making, creativity, critical reasoning and to communicate and transmit knowledge, skills and abilities in the field of Chemical Engineering.
G07	Ability to analyze and assess the social and environmental impact of technical solutions.
G10	Ability to work in a multilingual and multidisciplinary environment.
G12	Proficiency in a second foreign language at level B1 of the Common European Framework of Reference for Languages
G16	Management capacity and information planning
G19	Capacity for teamwork
G20	Ability to analyze and solve problems
G22	Ability to apply theoretical knowledge to practice
G23	Creativity and initiative

5. Objectives or Learning Outcomes

Course learning outcomes

Description

To know techniques of evolutionary operation.

To be able to integrate the basic operations of Chemical Engineering to design an industrial process

To have skills for the conceptual design of processes.

To have skills for programming simple process simulators.

To know the structure of a simulator.

To know the theory of scale change.

To be skilled in the application of the factorial design of experiments.

To have skills in the application of optimization procedures to industrial chemical processes.

6. Units / Contents

Unit 1: Product Engineering

Unit 2: Process conceptual design.

Unit 3: Analysis of industrial processes

Unit 4: Mathematical simulation

Unit 5: Mathematical optimization.

Unit 6: Scale up of industrial process

Unit 7: Physical optimization. Factorial design and EVOP techniques

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	CB02 CB03 CB04 E19 E20 E21 E22 E30 G01 G02 G03 G04 G07 G22	1.4	35	N	-	Face-to-face teaching, teaching theoretical classes and solving exercises
Problem solving and/or case studies [ON-SITE]	Workshops and Seminars	CB02 CB03 CB04 E19 E20 E21 E22 E30 G01 G02 G03 G04 G07 G12 G19 G20 G22 G23	0.8	20	Y	N	Seminars of problems and practical cases including conceptual design of a process, programming of a simulator and optimization of a small industrial chemical process. The seminars will be conducted in English. If there are students with a level lower than desirable, the information will be repeated in Spanish.
Group tutoring sessions [ON-SITE]	Cooperative / Collaborative Learning	CB02 CB03 CB04 E19 E20 E21 E22 G01 G02 G03 G04 G07 G19 G23	0.1	2.5	N	-	
Other off-site activity [OFF-SITE]	Other Methodologies	CB02 CB03 CB04 E19 E20 E21 E22 G01 G02 G03 G04 G07 G12 G16 G19 G20 G22 G23	3.6	90	N	-	
Final test [ON-SITE]	Assessment tests	CB02 CB03 CB04 E19 E20 E21 E22 G01 G02 G03 G04 G07 G12 G19 G20 G22 G23	0.1	2.5	Y	Y	
		Total:	**6**	**150**			
		Total credits of in-class work: 2.4					**Total class time hours: 60**

Total credits of out of class work: 3.6 **Total hours of out of class work: 90**

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
Assessment of problem solving and/or case studies	20.00%	20.00%	focused on optimization (balance reconciliation)
Test	40.00%	40.00%	Test covering all contents of the course
Assessment of problem solving and/or case studies	20.00%	20.00%	Focused on conceptual desing
Assessment of problem solving and/or case studies	20.00%	20.00%	Focused on the development of a process simulator
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:

Minimum grade 4.0/10 in each of the evaluation systems and average value higher than 5.0/10.

Non-continuous evaluation:

Students who have not done the corresponding part of problems or cases of the subject, will be evaluated of these competences in the final exam.

Specifications for the resit/retake exam:

There are no particularities. The grades obtained in the problems or cases are maintained for the students who have passed them in the ordinary call

Specifications for the second resit / retake exam:

There are no particularities.

9. Assignments, course calendar and important dates

Not related to the syllabus/contents

Hours	hours
Class Attendance (theory) [PRESENCIAL][Lectures]	35
Problem solving and/or case studies [PRESENCIAL][Workshops and Seminars]	20
Group tutoring sessions [PRESENCIAL][Cooperative / Collaborative Learning]	2.5
Other off-site activity [AUTÓNOMA][Other Methodologies]	90
Final test [PRESENCIAL][Assessment tests]	2.5

General comments about the planning: The assignment of hours to specific topics is not an element that the teacher considers relevant in the programming of the course, since some of the training activities correspond to several topics simultaneously. In the corresponding course planning guide, agreed in the title commission, all the dates of classes and seminars are collected, although they can be slightly modified according to situations that make it necessary.

Global activity

Activities	hours
Problem solving and/or case studies [PRESENCIAL][Workshops and Seminars]	20
Class Attendance (theory) [PRESENCIAL][Lectures]	35
Group tutoring sessions [PRESENCIAL][Cooperative / Collaborative Learning]	2.5
Other off-site activity [AUTÓNOMA][Other Methodologies]	90
Final test [PRESENCIAL][Assessment tests]	2.5
Total horas:	150

10. Bibliography and Sources

Author(s)	Title/Link	Publishing house	Citv	ISBN	Year	Description
Biegler, L. T.	Systematic methods of chemical process design	Prentice Hall		0-13-492422-3	1997	
Douglas, James M.	Conceptual design of chemical procesesses	McGraw-Hill		0-07-017762-7	1988	
HIMMELBLAU, David M.	Análisis y simulación de procesos	Reverté		84-291-7235-1	1976	
M.A. Rodrigo	Tecnicas de optimización para Ingenieros Químicos	Puntoicoma soluciones graficas		978-84-615-4081-5	2011	
Rudd, Dale F.	Estrategia en ingenieria de procesos	Alhambra		84-205-0307-X	1976	
Seider, Warren D.	Process design principles : synthesis, analysis and evaluati	John Wiley and Sons		0-471-24321-4	1998	
Valiente Bardenas, M.C.	Manual Del Ingeniero Quimico			9789681844875	2009	
Vian Ortuño, Angel	El pronostico economico en química industrial /	Alhambra,		84-205-0185-9	1975	
Luis Puigjaner Pedro Ollero César de Prada Laureano Jiménez	Estrategias de modelado, simulación y optimización de proces	Síntesis		84-9756-404-9	2006	
	Perry's chemical engineers' handbook /	McGraw-Hill Book Company,		978-0-07-142294-9	2008	
Fernando Gutierrez Martin	Ingenieria de Procesos y Productos	Síntesis S.A.		978-84-1357-034-1	2020	

Pedro Partal Lopez	La Ingeniería del Producto Químico. Un paradigma de la Ingeniería Química	Uhu.es publicaciones	978-84-18280-23-8	2020
W.D. Seider; D. R. Lewin; J.D. Seader; S. Widagno; R. Gani; K.M. Ng	Product and process design principles synthesis, analysis, and Evaluation	John Wiley & Sons,	978-1-119-58800-9 (	2017