UNIVERSIDAD DE CASTILLA - LA MANCHA

GUÍA DOCENTE

1. General information

Course: SIMULATION OF CHEMICAL AND ENVIRONMENTAL PROCESSES
Code: 57746
Type: ELECTIVE
ECTS credits: 6
Degree: 344 - CHEMICAL ENGINEERING
Academic year: 2022-23
Center: 1 - FACULTY OF SCIENCE AND CHEMICAL TECHNOLOGY
Group(s): 21
Year: 4
Duration: First semester
Main language: Spanish
Second language: English
Use of additional languages:
English Friendly: Y
Web site:
Bilingual: N

Lecturer: **ANA MARIA BORREGUERO SIMON** - Group(s): **21**

Building/Office	Department	Phone number	Email	Office hours
Enrique Costa Novella/Despacho 12	INGENIERÍA QUÍMICA	6353	anamaria.borreguero@uclm.es	Monday, Thursday and Friday from 12:00 to 13:00

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	Monday and tuesday from 9:30 to 12:30

2. Pre-Requisites

Not established

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

Justification in the curriculum and relationship with the profession

This subject allows to complete the training within the degree in Chemical Engineering in process simulation initiated in previous courses in subjects like METHODS AND COMPUTER APPLICATIONS IN CHEMICAL ENGINEERING, FLUID MECHANICS, HEAT TRANSMISSION, THERMOTECHNICS and INTEGRATED LABORATORY OF BASIC OPERATIONS AND ENGINEERING OF THE CHEMICAL REACTION, and will serve as a tool for others such as CARBON, OIL AND PETROLEOCHEMICAL TECHNOLOGY, PROJECTS and FINAL DEGREE WORK and other subject of the MASTER'S DEGREE IN CHEMICAL ENGINEERING. Undoubtedly the knowledge of the simulation of processes can be used profusely by future graduates to study the stationary and dynamic behavior of industrial chemical processes.

The main goal of this subject is that the students obtain a high skill in the use of the two main simulators of processes in stationary state: ASPEN HYSYS and ASPENPLUS. This training will be of great help for the course PROCESS DINAMICS. CONTROL OF INDUSTRIAL PLANTS that is taught in the aforementioned Master.

To this end, the subject is organized through the case method in order that students discover the peculiarities of the different modules used in the simulation of complex chemical processes and real plants.

4. Degree competences achieved in this course

Course competences

Code	Description
E26	Knowledge and capacity of management and specification of the main industrial equipment in the area of knowledge of chemical engineering
E44	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.
G01	Capacity for the direction, of the activities object of the engineering projects described in the competence G1.
G03	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.
G10	Knowledge, understanding and ability to apply the necessary legislation in the exercise of the profession of Industrial Technical Engineer
G12	Knowledge of Information and Communication Technologies (ICT).
G13	Proper oral and written communication
G14	ethical commitment and professional ethics
G16	Capacity for critical thinking and decision making
G17	Synthesis capacity
G18	Capacity for teamwork
G19	Ability to analyze and solve problems
G20	Ability to learn and work autonomously
G21	Ability to apply theoretical knowledge to practice
G22	Creativity and initiative
G23	Leadership

5. Objectives or Learning Outcomes

Course learning outcomes

Description

Be able to manage the basic concepts for the analysis, conceptual design, optimization and treatment of gaseous and liquid effluents, to account for the equivalent CO2 emissions generated by chemical processes, and to acquire data from simulators necessary to establish the life cycle analysis and the environmental impact of the same.

Be able to improve your simulation capabilities with HYSYS tools.

Be able to use the Aspen simulator in the simulation of basic fluid operations, heat and material transfer and in the calculation of reactors.

Be able to simulate known chemical and environmental processes with the two simulators listed above and comparison of results.

Be able to improve your simulation capabilities with HYSYS tools.

Be able to simulate known chemical and environmental processes with the two simulators listed above and comparison of results.

Be able to manage the basic concepts for the analysis, conceptual design, optimization and treatment of gaseous and liquid effluents, to account for the equivalent CO2 emissions generated by chemical processes, and to acquire data from simulators necessary to establish the life cycle analysis and the environmental impact of the same.

Be able to use the Aspen simulator in the simulation of basic fluid operations, heat and material transfer and in the calculation of reactors.

6. Units / Contents

Unit 1:
Unit 2:
Unit 3:
Unit 4:
Unit 5:
Unit 6:
Unit 7:
Unit 8:
Unit 9:
Unit 10:

7. Activities, Units/Modules and Methodology

Training Activity	Methodology	Related Competences (only degrees before RD 822/2021)	ECTS	Hours	As	Com	Description
Computer room practice [ON-SITE]	Practical or hands-on activities	E26 E44 G01 G03 G10 G12 G13 G16 G17 G18 G20 G21 G22 G23	2.1	52.5	N	-	
Study and Exam Preparation [OFF-SITE]	Self-study	E26 E44 G01 G03 G10 G12 G13 G16 G17 G18 G20 G21 G22 G23	3.6	90	Y	N	
Final test [ON-SITE]	Assessment tests	E26 E44 G01 G03 G10 G12 G13 G16 G17 G18 G19 G20 G21 G22 G23	0.1	2.5	Y	Y	
Group tutoring sessions [ON-SITE]	Project/Problem Based Learning (PBL)	E26 E44 G01 G03 G10 G12 G13 G16 G17 G18 G20 G21 G22 G23	0.1	2.5	N	-	
Workshops or seminars [ON-SITE]	Project/Problem Based Learning (PBL)	E26 E44 G01 G03 G10 G12 G13 G16 G17 G18 G20 G21 G22 G23	0.1	2.5	Y	N	
		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
Final test	40.00%	40.00%	
Assessment of problem solving and/or case studies	40.00%	40.00%	Includes the problems proposed for individual resolution and the problem of a more complex overall process proposed for group solution
Projects	20.00%	20.00%	Corresponds to the presentation and defense of the work presented in group.
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 evaluation of this course will require the completion of a series of activities to which corresponds the percentage weight previously indicated:
1. An exam with practical questions on the contents taught in the course.
2. Resolution of different simulation problems.
3. Resolution of a practical case solved in group and defended publicly.
Students qualify in case of obtaining a minimum grade of 4.0/10 on each one of these evaluation activities and an average value for all of them higher than 5.0/10.

Non-continuous evaluation:

In the final test, additional activities will be proposed to evaluate the competences referred to Problem Solving or Cases and the student will also have to present that day a work similar to the one proposed for the group.

Specifications for the resit/retake exam:

The evaluation of this course will require the completion of a series of activities to which corresponds the percentage weight previously indicated:
1. An exam with practical questions on the contents taught in the course.
2. Resolution of different simulation problems.
3. Resolution of a practical case solved in group and defended publicly.
Students qualify in case of obtaining a minimum grade of 4.0/10 on each one of these evaluation activities and an average value for all of them higher than 5.0/10.

Specifications for the second resit / retake exam:

No special criteria

9. Assignments, course calendar and important dates

Not related to the syllabus/contents

Hours	hours
Computer room practice [PRESENCIAL][Practical or hands-on activities]	52.5
Study and Exam Preparation [AUTÓNOMA][Self-study]	90
Final test [PRESENCIAL][Assessment tests]	2.5
Group tutoring sessions [PRESENCIAL][Project/Problem Based Learning (PBL)]	2.5
Workshops or seminars [PRESENCIAL][Project/Problem Based Learning (PBL)]	2.5

Global activity

Activities	hours
Computer room practice [PRESENCIAL][Practical or hands-on activities]	52.5
Study and Exam Preparation [AUTÓNOMA][Self-study]	90
Group tutoring sessions [PRESENCIAL][Project/Problem Based Learning (PBL)]	2.5
Workshops or seminars [PRESENCIAL][Project/Problem Based Learning (PBL)]	2.5
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	
Luyben, William L.	Distillation design and control using AspenTM simulation	John Wiley & Sons		0-471-77888-5	2006	
Shinskey, F. G.	Sistemas de control de procesos : aplicación, diseño y sinto	McGraw-Hill		970-10-0934-7	1996	
Douglas, James M.	Conceptual design of chemical procesesses	McGraw-Hill		0-07-017762-7	1988	
Luyben, William L.	Plantwide dynamic simulators in chemical processing and cont	Marcel Dekker		0-8247-0801-6	2002	
Luyben, William L.	Process modeling, simulation, and control for chemical engin	McGraw-Hill		0-07-039159-9	1990	