UNIVERSIDAD DE CASTILLA - LA MANCHA

GUÍA DOCENTE

1. General information

Course: MATERIAL AND ENERGY BALANCES
Code: 57711
Type: CORE COURSE
ECTS credits: 6
Degree: 344 - CHEMICAL ENGINEERING
Academic year: 2022-23
Center: 1 - FACULTY OF SCIENCE AND CHEMICAL TECHNOLOGY
Group(s): 21
Year: 2
Duration: First semester
Main language: Spanish
Second language: English
Use of additional languages:
English Friendly: Y
Web site:
Bilingual: N

Lecturer: **PABLO CAÑIZARES CAÑIZARES** - Group(s): **21**

Building/Office	Department	Phone number	Email	Office hours
Edifico Enrique Costa / Despacho 9	INGENIERÍA QUÍMICA	3412	pablo.canizares@uclm.es	Monday, Thursday and Friday from 12:00 to 13:30

Lecturer: **ANA RAQUEL DE LA OSA PUEBLA** - Group(s): **21**

Building/Office	Department	Phone number	Email	Office hours
Enrique Costa. Despacho 16	INGENIERÍA QUÍMICA	+34926051963	anaraquel.osa@uclm.es	Monday to Thursday from 9:30 to 11:00

2. Pre-Requisites

Not established

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

It is a subject that describes the approach and resolution of both material and energy balances. The main objective of the course is that the student acquires the necessary knowledge to be able to apply the fundamental laws of conservation and to know how to solve the balance equations of material and energy. It is considered important for the student to know the theoretical and practical bases of the balances since they are one of the basic tools for the design, operation and control of chemical processes.

This subject, together with the Introduction to Chemical Engineering course, comprises the basis of Chemical Engineering belonging to the module of Specific Technology in Industrial Chemistry. Moreover, this subject is related to most of the Chemical Engineering subjects that the student will take later on, since balance sheets are an essential tool both for training and for the performance of the Chemical Engineering profession.

4. Degree competences achieved in this course

Course competences

Code	Description
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.
E31	Ability to manage information sources in chemical engineering. Properly handle the terminology of the profession in Spanish and English in the oral and written records
E32	Knowledge of the fundamentals and techniques of environmental analysis
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.
G04	Knowledge for the realization of measurements, calculations, valuations, appraisals, surveys, studies, reports, work plans and other analogous works.
G13	Proper oral and written communication
G14	ethical commitment and professional ethics
G16	Capacity for critical thinking and decision making
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
G26	Obtaining skills in interpersonal relationships.

5. Objectives or Learning Outcomes

Course learning outcomes

Description

To know the fundamental laws applicable to basic operations.

To have the ability to handle the sources of information of interest in Chemical Engineering, to prepare reports and to communicate and transmit ideas.

To have the ability to solve energy balances in processes with and without chemical reaction in a stationary and dynamic regime.

To have the ability to solve matter balances in processes with and without chemical reaction in a stationary and dynamic regime.

6. Units / Contents

Unit 1: LAWS OF CONSERVATION OF EXTENSIVE PROPERTIES

Unit 2: MATERIAL BALANCES IN NON-REACTING SYSTEMS AND IN STEADY-STATE REGIME

Unit 3: MATERIAL BALANCES IN CHEMICALLY REACTING AND STEADY-STATE PROCESSES

Unit 4: MATERIAL BALANCES BY ELEMENTS IN STEADY-STATE PROCESSES

Unit 5: ENERGY BALANCES FOR NON-REACTING PROCESSES IN STEADY STATE

Unit 6: ENERGY BALANCES FOR CHEMICALLY REACTING PROCESSES IN STEADY STATE

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	E19 E31 E32 G03 G13 G16 G18	1.2	30	N	-	Master classes on theory and problems.
Laboratory practice or sessions [ON-SITE]	Practical or hands-on activities	E32 G13 G14 G19 G20 G22 G26	0.35	8.75	Y	Y	Practical laboratory work on material and energy balances.
Study and Exam Preparation [OFF-SITE]	Self-study	E19 E31 E32 G03 G04 G13 G14 G16 G18 G19 G20 G21 G22 G26	3.6	90	Y	N	Study of the subject carried out by the student. Writing of reports on the practical work in which the obtained results and the questions posed in the course guides are included. Prior to the delivery of the report, a face-to-face session is scheduled with the lecturers to solve any possible doubts or difficulties the students may have.
Group tutoring sessions [ON-SITE]	Combination of methods	E19 E31 E32 G04 G19 G26	0.2	5	Y	N	Resolution of cases and debates in small groups.
Workshops or seminars [ON-SITE]	Combination of methods	E19 E31 E32 G03 G04 G19 G20 G22 G26	0.5	12.5	Y	N	Seminars or workshops to solve problems or cases of material and energy balances.
Final test [ON-SITE]	Assessment tests	E19 E31 E32 G03 G04 G13 G14 G16 G18 G19 G20 G21 G22 G26	0.15	3.75	Y	N	Final test to assess the competences acquired in the subject.
		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
Laboratory sessions	4.00%	4.00%	
Practicum and practical activities reports assessment	6.00%	6.00%	
Assessment of problem solving and/or case studies	20.00%	0.00%	
Final test	70.00%	90.00%	
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:

Continuous assessment includes the completion of different types of problems or cases (assesment of problem solving and/or case studies, 20%), a final exam (70% of the mark), with the remaining 10% corresponding to laboratory practicals. Students are required to get a minimum of 4 out of 10 in each activity and an average mark equal to or higher than 5 out of 10 to pass the course.

Non-continuous evaluation:

Students who do not pass the course through continuous assessment will take a final exam corresponding to 90% of the mark. The remaining 10% corresponds to the laboratory practicals. Both the final exam and the laboratory practicals will require a minimum of 4 out of 10. The minimum mark to pass the course will be 5.

Specifications for the resit/retake exam:

It will consist of a final exam, corresponding to 90% of the marks, which will be weighted with the qualification of the laboratory practicals, 10%.
Both the final exam and the laboratory practicals will require a minimum of 4 out of 10 in each part and an average mark equal to or higher than 5 out of 10.

Specifications for the second resit / retake exam:

It will consist of a final exam, corresponding to 90% of the marks, which will be weighted with the qualification of the laboratory practicals, 10%.
Both the final exam and the laboratory practicals will require a minimum of 4 out of 10 in each part and an average mark equal to or higher than 5 out of 10.

9. Assignments, course calendar and important dates

Not related to the syllabus/contents

Hours	hours

10. Bibliography and Sources

Author(s)	Title/Link	Publishing house	Citv	ISBN	Year	Description
Calleja, G.; García, F.; De Lucas, A. ;Iglesias, J.; Rodríguez, J.M.	Nueva Introducción a la ingeniería química	Síntesis		9788490773963	2016	
Costa Novella, E.	Ingeniería química. 1: Conceptos generales	PEARSON EDUCACION		9788420509907	2001	
Felder, Richard M.	Principios elementales de los procesos quimicos	Addison-Wesley Iberoamericana		968-444-379-X (Addis	1999	
PERRY, R.H. y GREEN, D.	Manual del ingeniero químico, 7ED	McGraw-Hill		9788448130084	2001	
Reklaitis, G. V.	Introduction to material and energy balances	John Wiley & Sons		0-471-04131-9	1983	
ULLMANN, F.	Ullmann's Encyclopedia of Industrial Chemistry	Wiley-VCH		3-527-30385-5	2003	