UNIVERSIDAD DE CASTILLA - LA MANCHA

GUÍA DOCENTE

1. General information

Course: DESIGN OF EQUIPMENT AND INSTALLATIONS
Type: CORE COURSE
Degree: 344 - CHEMICAL ENGINEERING
Center: 1 - FACULTY OF SCIENCE AND CHEMICAL TECHNOLOGY
Year: 3
Main language: Spanish
Use of additional languages:
Web site:

Code: 57727
ECTS credits: 6
Academic year: 2023-24
Group(s): 21
Duration: C2
Second language:
English Friendly: Y
Bilingual: N

Lecturer: **JAVIER LLANOS LOPEZ** - Group(s): **21**

Building/Office	Department	Phone number	Email	Office hours
Enrique Costa/Despacho 7	INGENIERÍA QUÍMICA	3508	javier.llanos@uclm.es	Monday, Tuesday and Wednesday from 12:00 to 14:00. Preferable to make an appointment by email.

Lecturer: **ANGEL PEREZ MARTINEZ** - Group(s): **21**

Building/Office	Department	Phone number	Email	Office hours
E. Costa / despacho 13	INGENIERÍA QUÍMICA	3413	angel.perez@uclm.es	Monday, Tuesday and Wednesday from 9 a.m. to 11 a.m. Preferable to make an appointment by email.

Lecturer: **ALBERTO RODRÍGUEZ GÓMEZ** - Group(s): **21**

Building/Office	Department	Phone number	Email	Office hours
	INGENIERÍA QUÍMICA		Alberto.RGomez@uclm.es	Monday, Tuesday and Wednesday from 9 a.m. to 11 a.m. Preferable to make an appointment by email.

2. Pre-Requisites

Not established

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

This subject belongs to Module 2 (Common to the Industrial Branch). It is especially related to the subjects of Materials in Chemical Engineering and Fundamentals of Mechanical Design. This subject applies the previously learned concepts to carry out the mechani

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.
E13	Knowledge of the principles of machine theory and mechanisms.
E14	Knowledge and use of the principles of the resistance of materials.
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.
G05	Knowledge for the realization of measurements, calculations, valuations, appraisals, surveys, studies, reports, work plans and other analogous works.
G06	Ability to handle specifications, regulations and mandatory standards.
G11	Knowledge, understanding and ability to apply the necessary legislation in the exercise of the profession of Industrial Technical Engineer
G20	Ability to analyze and solve problems

5. Objectives or Learning Outcomes

Course learning outcomes

Description

To know the atenuation techniques and the anticorrosive design principles.

To know the selection criteria of the construction materials of the chemical industry equipment and the causes and mechanisms of their deterioration, or of their corrosion.

To understand the fundamentals of mechanical design and know the standardized procedures (ASME, API) necessary to carry out the analysis or design of internal and external pressure vessels, storage tanks, etc.

6. Units / Contents

Unit 1: Corrosion and degradation of materials.
Unit 2: Materials selection in chemical engineering.
Unit 3: Thermodynamics and kinetics of aqueous and hot corrosion.
Unit 4: Corrosion prevention and protection.
Unit 5: Corrosion types and failure analysis.
Unit 6: Mechanical design of process equipment: fundamental principles and general considerations.
Unit 7: Vessel design under internal pressure: shells, bottoms and heads.
Unit 8: Vessels design under external pressure: shells, bottoms and heads.
Unit 9: Design of oil storage tanks.
Unit 10: Vessel supports, flanges and reinforcements.
Unit 11: Mechanical design of heat exchangers and centrifugues

ADDITIONAL COMMENTS, REMARKS

Topics 1 to 5 belong to Didactic Unit 1: "Deterioration, corrosion and methods of protection of construction materials in the chemical industry".

Topics 6 to 11 belong to Didactic Unit 2: "Mechanical design of chemical equipment"

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 E13 E14 G01 G02 G03 G05 G06 G11 G20	1.2	30	N	-	
Laboratory practice or sessions [ON-SITE]	Practical or hands-on activities	CB02 CB03 E13 E14 G01 G02 G03 G05 G20	0.4	10	Y	N	
Workshops or seminars [ON-SITE]	Project/Problem Based Learning (PBL)	CB02 CB03 E13 E14 G01 G02 G03 G05 G06 G11 G20	0.6	15	Y	N	
Group tutoring sessions [ON-SITE]	project-based learning	CB02 CB03 E13 E14 G01 G02 G03 G05 G06 G11 G20	0.1	2.5	Y	N	
Mid-term test [ON-SITE]	Assessment tests	CB02 CB03 E13 E14 G01 G02 G05 G20	0.1	2.5	Y	N	
Study and Exam Preparation [OFF-SITE]	Self-study	CB02 CB03 E13 E14 G01 G02 G03 G05 G06 G11 G20	3.6	90	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	35.00%	100.00%	
Practicum and practical activities reports assessment	10.00%	0.00%	Active participation in the laboratory and the computer classroom will be positively valued. A small report written by each group of practices will be evaluated
Assessment of problem solving and/or case studies	20.00%	0.00%	Carry out properly the problems proposed in group, assessing the correctness in the approach, in the development and in the final result. Concept errors and errors in basic mathematical operations will involve penalties.
Mid-term tests	35.00%	0.00%	Correctly and reasonably answer the theory questions, as well as adequately carry out the exercises proposed in the partial exam on concepts in unit 1. Students who obtain a grade of 4/10 both in theory and in problems release this matter for the exam Ordinary. Resolution of proposals for calculating equipment whose design is dealt with in Unit 2. The evaluation of Unit 2 will be carried out in the ordinary exam.
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:

To pass the course in the ordinary call, a minimum average mark of 5/10 is necessary and a minimum mark of 4/10 in all evaluable activities.

Non-continuous evaluation:

For people who have not attended the practices or submitted problems / cases, 100% of the skills will be evaluated with theoretical questions in the final exam.

Specifications for the resit/retake exam:

The same as ordinary call

9. Assignments, course calendar and important dates

Not related to the syllabus/contents	
Hours	**hours**
Laboratory practice or sessions [PRESENCIAL][Practical or hands-on activities]	10
Group tutoring sessions [PRESENCIAL][project-based learning]	2.5
Mid-term test [PRESENCIAL][Assessment tests]	2.5
Study and Exam Preparation [AUTÓNOMA][Self-study]	24
Unit 1 (de 11): Corrosion and degradation of materials.	
Activities	**Hours**
Class Attendance (theory) [PRESENCIAL][Lectures]	3
Study and Exam Preparation [AUTÓNOMA][Self-study]	4.5
Unit 2 (de 11): Materials selection in chemical engineering.	
Activities	**Hours**
Class Attendance (theory) [PRESENCIAL][Lectures]	3
Workshops or seminars [PRESENCIAL][Project/Problem Based Learning (PBL)]	2
Study and Exam Preparation [AUTÓNOMA][Self-study]	7.5
Unit 3 (de 11): Thermodynamics and kinetics of aqueous and hot corrosion.	
Activities	**Hours**
Class Attendance (theory) [PRESENCIAL][Lectures]	3
Workshops or seminars [PRESENCIAL][Project/Problem Based Learning (PBL)]	2
Study and Exam Preparation [AUTÓNOMA][Self-study]	7.5
Unit 4 (de 11): Corrosion prevention and protection.	
Activities	**Hours**
Class Attendance (theory) [PRESENCIAL][Lectures]	3
Workshops or seminars [PRESENCIAL][Project/Problem Based Learning (PBL)]	2
Study and Exam Preparation [AUTÓNOMA][Self-study]	7.5
Unit 5 (de 11): Corrosion types and failure analysis.	
Activities	**Hours**
Class Attendance (theory) [PRESENCIAL][Lectures]	3
Workshops or seminars [PRESENCIAL][Project/Problem Based Learning (PBL)]	2
Study and Exam Preparation [AUTÓNOMA][Self-study]	7.5
Unit 6 (de 11): Mechanical design of process equipment: fundamental principles and general considerations.	
Activities	**Hours**
Class Attendance (theory) [PRESENCIAL][Lectures]	3
Workshops or seminars [PRESENCIAL][Project/Problem Based Learning (PBL)]	1
Study and Exam Preparation [AUTÓNOMA][Self-study]	4.5
Unit 7 (de 11): Vessel design under internal pressure: shells, bottoms and heads.	
Activities	**Hours**
Class Attendance (theory) [PRESENCIAL][Lectures]	2
Workshops or seminars [PRESENCIAL][Project/Problem Based Learning (PBL)]	2
Study and Exam Preparation [AUTÓNOMA][Self-study]	6
Unit 8 (de 11): Vessels design under external pressure: shells, bottoms and heads.	
Activities	**Hours**
Class Attendance (theory) [PRESENCIAL][Lectures]	2
Workshops or seminars [PRESENCIAL][Project/Problem Based Learning (PBL)]	2
Study and Exam Preparation [AUTÓNOMA][Self-study]	6
Unit 9 (de 11): Design of oil storage tanks.	
Activities	**Hours**
Class Attendance (theory) [PRESENCIAL][Lectures]	4
Workshops or seminars [PRESENCIAL][Project/Problem Based Learning (PBL)]	2
Study and Exam Preparation [AUTÓNOMA][Self-study]	9
Unit 10 (de 11): Vessel supports, flanges and reinforcements.	
Activities	**Hours**
Class Attendance (theory) [PRESENCIAL][Lectures]	2
Study and Exam Preparation [AUTÓNOMA][Self-study]	3
Unit 11 (de 11): Mechanical design of heat exchangers and centrifugues	
Activities	**Hours**
Class Attendance (theory) [PRESENCIAL][Lectures]	2
Study and Exam Preparation [AUTÓNOMA][Self-study]	3
Global activity	
Activities	**hours**
Mid-term test [PRESENCIAL][Assessment tests]	2.5
Workshops or seminars [PRESENCIAL][Project/Problem Based Learning (PBL)]	15
Group tutoring sessions [PRESENCIAL][project-based learning]	2.5
Study and Exam Preparation [AUTÓNOMA][Self-study]	90
Class Attendance (theory) [PRESENCIAL][Lectures]	30
Laboratory practice or sessions [PRESENCIAL][Practical or hands-on activities]	10
Total horas:	150

10. Bibliography and Sources

Author(s)	Title/Link	Publishing house	City	ISBN	Year	Description
Beer, Ferdinand P.	Mecánica de materiales	McGraw-Hill		970-10-3950-5	2004	
Dennis, R. Moss	Pressure Vessel design manual : illustrated precedures for s	Gulf Publishing Company		0-87201-719-2	1987	
Jones, Denny A.	Principles and prevention of corrosion	Prentice Hall		0-13-359993-0	1996	
MEGYESY, Eugene F.	Manual de recipientes a presión : diseño y cálculo	Noriega Limusa		968-18-1985-3	1990	
Otero Huerta, Enrique	Corrosión y degradación de materiales	Síntesis		84-7738-518-1	2001	
Sinnott, R. K.	Chemical engineering design	Butterwoth Heinemann		0-7506-2557-0	1996	
TRETHEWEY, Kenneth R.	Corrosion : for students of science and engineering	Longman Scientific and Technical		0-582-45089-6	1990	
Ashby, Michael F.	Materials selection in mechanical design	Butterworth-Heinemann		0-7506-4357-9	1999	