



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: 2021-22
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	Tuesday and Thursday from 11:30 to 13:30
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	Tuesday and Thursday from 16:00 to 18:00

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 mechan

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	Capacity for the direction, of the activities object of the engineering projects described in the competence G1.
G02	Knowledge in basic and technological subjects, which enables them to learn new methods and theories, and give them versatility to adapt to new situations.
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.
G05	Ability to handle specifications, regulations and mandatory standards.
G06	Ability to analyze and assess the social and environmental impact of technical solutions.
G11	Proficiency in a second foreign language at level B1 of the Common European Framework of Reference for Languages
G20	Ability to learn and work autonomously

5. Objectives or Learning Outcomes

Course learning outcomes

Description

To know the attenuation 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 centrifuges

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	
Progress 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
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.
Progress Tests	70.00%	100.00%	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 the progress tests or in the final test.

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:

See course policy for details

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
Progress 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 centrifuges	
Activities	Hours
Class Attendance (theory) [PRESENCIAL][Lectures]	2
Study and Exam Preparation [AUTÓNOMA][Self-study]	3
Global activity	
Activities	hours
Laboratory practice or sessions [PRESENCIAL][Practical or hands-on activities]	10
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
Progress test [PRESENCIAL][Assessment tests]	2.5
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		0-13-359983-0	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	Butterworth 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	