

**1. General information****Course:** MANAGEMENT OF CONTAMINATED RESIDUES AND SOILS**Type:** ELECTIVE**Degree:** 344 - CHEMICAL ENGINEERING**Center:** 1 - FACULTY OF SCIENCE AND CHEMICAL TECHNOLOGY**Year:** 4**Main language:** Spanish**Use of additional languages:****Web site:****Code:** 57745**ECTS credits:** 6**Academic year:** 2023-24**Group(s):** 21**Duration:** C2**Second language:****English Friendly:** Y**Bilingual:** N**Lecturer:** CRISTINA SAEZ JIMENEZ - Group(s): 21

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2. Pre-Requisites

Those established in general for the Degree

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

This subject is taught in the fourth year of the Degree and consists of a single subject that will be taught in the second semester. The student who has access to this subject has a great background in Chemical and Environmental Engineering and only needs to make their knowledge more practical. In this sense, the objective with which it is proposed is to provide the chemical engineer in training with the necessary knowledge to assess the environmental problems of solid waste and contaminated soils, addressing aspects of: Regulations and applicable legislation; Collection systems, transfer and transport of solid waste; Technologies for the treatment of solid waste and contaminated soil; Basic dimensioning of waste treatment systems and contaminated soils

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.
E26	Knowledge about integration of processes and operations
E28	Ability to compare and select between technological alternatives
E36	Capacity for calculation and design, and knowledge on the operation, of industrial waste management systems
E37	Capacity for calculation and design, and knowledge about the operation, of urban solid waste management systems
E38	Capacity for calculation and design, and knowledge about the mode of operation, of remediation processes of contaminated soils
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.
G07	Ability to analyze and assess the social and environmental impact of technical solutions.
G11	Knowledge, understanding and ability to apply the necessary legislation in the exercise of the profession of Industrial Technical Engineer
G15	ethical commitment and professional ethics
G16	Management capacity and information planning
G17	Capacity for critical thinking and decision making
G18	Synthesis capacity
G19	Capacity for teamwork
G21	Ability to learn and work autonomously
G23	Creativity and initiative
G26	Obtaining skills in interpersonal relationships.

5. Objectives or Learning Outcomes

Course learning outcomes

Description

To be able to design and operate processes of waste treatment and contaminated soils.

To be able to have the whole vision of the residue from before it is generated up to its final destination and the different disciplines of engineering involved.

To be aware of the current regulations and legislation on the treatment and management of contaminated waste and soils.

To know the most widely used treatment systems in industrial practice for the management of contaminated soils and wastes.

To have the capacity for basic sizing of contaminated waste and soil treatment systems.

6. Units / Contents

Unit 1: Overview of the generation of wastes

Unit 2: Regulations and legislations

Unit 3: Waste management

Unit 4: Treatment of urban wastes

Unit 5: Treatment of industrial wastes

Unit 6: Dumps

Unit 7: Pollution of soils and groundwater

Unit 8: Soil remediation: immobilization technologies

Unit 9: Soil remediation: separation technologies

Unit 10: Soil remediation: degradation technologies

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 E26 E28 E36 E37 E38 G01 G02 G03 G07 G11 G15 G16 G17 G18 G23	1.2	30	N	-	
Workshops or seminars [ON-SITE]	Project/Problem Based Learning (PBL)	CB02 CB03 CB04 E26 E28 E36 E37 E38 G01 G02 G03 G07 G11 G15 G16 G17 G18 G19 G21 G23 G26	1	25	Y	Y	
Group tutoring sessions [ON-SITE]	Project/Problem Based Learning (PBL)	CB02 CB03 CB04 E26 E28 E36 E37 E38 G01 G02 G03 G07 G11 G15 G16 G17 G18 G21 G23	0.1	2.5	N	-	
Study and Exam Preparation [OFF-SITE]	Self-study	CB02 CB03 CB04 E26 E28 E36 E37 E38 G01 G02 G03 G07 G11 G15 G16 G17 G18 G19 G21 G23 G26	3.6	90	N	-	
Final test [ON-SITE]	Assessment tests	CB02 CB03 E26 E28 E36 E37 E38 G03 G07 G11 G15 G16 G17 G18 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
Final test	60.00%	100.00%	Test with theoretical-practical questions
Assessment of problem solving and/or case studies	40.00%	0.00%	Resolution of cases of study individually and/or in groups
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 subject in each of the sections will require a minimum of 4.0 / 10 and the average must be equal to or greater than 5.0 / 10.

Non-continuous evaluation:

It will be considered that the student follows non-continuous evaluation if he/she has not delivered at least 80% of the proposed problems/cases of study.

The final test will allow the evaluation of 100% of the competences.

The pass the final test a minimum grade of 5 out of 10 must be attained.

9. Assignments, course calendar and important dates

Not related to the syllabus/contents

Hours

hours

Class Attendance (theory) [PRESENCIAL][Lectures]	30
Workshops or seminars [PRESENCIAL][Project/Problem Based Learning (PBL)]	25
Group tutoring sessions [PRESENCIAL][Project/Problem Based Learning (PBL)]	2.5
Study and Exam Preparation [AUTÓNOMA][Self-study]	90
Final test [PRESENCIAL][Assessment tests]	2.5
Global activity	
Activities	hours
Class Attendance (theory) [PRESENCIAL][Lectures]	30
Workshops or seminars [PRESENCIAL][Project/Problem Based Learning (PBL)]	25
Group tutoring sessions [PRESENCIAL][Project/Problem Based Learning (PBL)]	2.5
Study and Exam Preparation [AUTÓNOMA][Self-study]	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	
Herbert, F. Lung	Manual del Reciclaje	McGraw-Hill			1996		
Tchobanoglous, G., Theisen H., Vigil, S.	Gestión integral de residuos sólidos	McGraw-Hill			1995		
Lagrega, M.D., Buckingham, P.L., Evans, J.C.	Gestión de residuos tóxicos. Tratamiento, eliminación y recuperación de suelos	McGraw-Hill	Madrid		1996		
Salvato, J.A.	Environmental Engineering	Wiley	New Jersey		2003		
Rodríguez, J.J.	Gestión sostenible de los residuos peligrosos	Síntesis	Madrid		2013		
Lee, C.C.	Handbook of Environmental Engineering Calculations	McGraw-Hill	Madrid		2007		
Seoánez Calvo, M.	Contaminación del suelo: estudios, tratamiento y gestión	Ed. Mundi-Prensa	Madrid		1999		