

**1. General information****Course:** ENVIRONMENTAL TECHNOLOGY**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:** 57720**ECTS credits:** 6**Academic year:** 2022-23**Group(s):** 21 22**Duration:** First semester**Second language:** English**English Friendly:** Y**Bilingual:** N**Lecturer:** FRANCISCO JESUS FERNANDEZ MORALES - Group(s): 21

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ITQUIMA / 1	INGENIERÍA QUÍMICA	926 05 21 79	fcojesus.fmorales@uclm.es	monday to friday from 9 am to 10 am

Lecturer: JOSE VILLASEÑOR CAMACHO - Group(s): 21

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2. Pre-Requisites

Not established

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

The contamination of the environment is, at present, a subject of great importance directly related to the activities of the Chemical Engineer and the Chemical Industry. As a direct consequence, a compulsory subject is currently included in the degree program in Chemical Engineering called Environmental Technology. This subject belongs to the subject of the same name and is located in the module common to the industrial branch.

Taking into account that the students will deepen in some subjects included within the subject Environmental Technology when taking optional subjects, the following fundamental objectives of the subject have been considered:

1. Vision of environmental issues from a social and technical point of view, focusing on the three most basic blocks: water, air and solid waste.
2. Vision of the priorities in the possible actions of management against pollution, from the minimization in the generation of pollutants to the final disposal in landfills, through the possible treatments.
3. Characterization from a physical, chemical and biological point of view of the pollutants, and their sources and generation rates.
4. Basic vision of the existing treatments, applying in some cases the engineering knowledge for the modeling and design of an in-depth treatment.
5. Introduce the basic concepts of environmental management in companies and management tools as preventive or corrective instruments for pollution

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.
CB04	Transmit information, ideas, problems and solutions for both specialist and non-specialist audiences.
E16	Basic knowledge and application of environmental technologies and sustainability.
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.
G11	Proficiency in a second foreign language at level B1 of the Common European Framework of Reference for Languages
G17	Synthesis capacity
G19	Ability to analyze and solve problems

5. Objectives or Learning Outcomes**Course learning outcomes****Description**

To know the problems associated with air pollution, identifying the main polluting sources, the treatment technologies and the applicable legislation.

To have knowledge about the environmental problems of waste and soil contamination, exposing the current legislation and the different processing systems.

To have knowledge about the problem, characterization, applicable legislation, design and operation of wastewater treatment processes.

To be skilled with the basic aspects of environmental management in the company: legislation and methodology.

6. Units / Contents**Unit 1: Wastewater characterization**

Unit 2: Analytical techniques and regulation
Unit 3: Wastewater flow rates and pollutant loadings
Unit 4: Basic operations and depuration processes
Unit 5: Physical treatments
Unit 6: Chemical treatments
Unit 7: Biological treatments
Unit 8: Atmospheric pollution
Unit 9: Particulate removal in polluted air
Unit 10: Gaseous pollutant removal in polluted air
Unit 11: Solid waste characterization
Unit 12: Domestic solid waste management
Unit 13: Industrial waste management
Unit 14: Environmental Management concepts
Unit 15: Environmental Impact
Unit 16: Environmental management systems

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 CB04 E16 G03 G11 G17 G19	1.5	37.5	Y	N	Class attendance (theory and problems)
Workshops or seminars [ON-SITE]	Project/Problem Based Learning (PBL)	CB02 CB04 E16 G03 G11 G17 G19	0.6	15	Y	Y	Practical cases to be solved in class
Group tutoring sessions [ON-SITE]	Group tutoring sessions	CB02 CB04 E16 G03 G11 G17 G19	0.2	5	N	-	Group tutorial to solve unclear concepts
Final test [ON-SITE]	Assessment tests	CB02 CB04 E16 G03 G11 G17 G19	0.1	2.5	Y	Y	Definitive examination and partial evaluation activities
Study and Exam Preparation [OFF-SITE]	Self-study	CB02 CB04 E16 G03 G11 G17	3.6	90	N	-	Autonomous work by the students, out of class
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
Assessment of problem solving and/or case studies	25.00%	25.00%	The resolution of problems or cases is carried out in person in the classroom. The delivery of problems or resolved cases will be assessed if there is assistance with the use of said face-to-face activity. If continuous assessment is not followed, final evaluation will be done.
Final test	75.00%	75.00%	Examination: questions about theory and practice. Continuous assessment will consider partial tests. Otherwise, final examination will be done.
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:

- Exam with theoretical and practical questions about the contents taught in the subject (75% of the grade).
- Evaluation of the resolution of practical cases in the classroom (25% of the grade). The assistance with use, the quality of the work elaborated and delivered will be valued.

To pass the subject a minimum of 4.0 / 10 will be required in each of the evaluable parts (exam and case study) and a 5.0 / 10 in the final grade point of the subject.

Non-continuous evaluation:

Exam with theoretical and practical questions about (1) the contents taught in the subject (75% of the grade) and (2) the resolution of practical cases in the classroom (25% of the grade).

To pass the subject a minimum of 4.0 / 10 will be required in each of the 2 evaluable parts (theory/problems, and case study), and a 5.0 / 10 in the final grade point of the subject.

Specifications for the resit/retake exam:

Exam with theoretical and practical questions about (1) the contents taught in the subject (75% of the grade) and (2) the resolution of practical cases in the classroom (25% of the grade).

To pass the subject a minimum of 4.0 / 10 will be required in each of the 2 evaluable parts (theory/problems, and case study), and a 5.0 / 10 in the final grade point of the subject.

Specifications for the second resit / retake exam:

Exam with theoretical and practical questions about (1) the contents taught in the subject (75% of the grade) and (2) the resolution of practical cases in the classroom (25% of the grade).

To pass the subject a minimum of 4.0 / 10 will be required in each of the 2 evaluable parts (theory/problems, and case study), and a 5.0 / 10 in the final grade point of the subject.

9. Assignments, course calendar and important dates	
Not related to the syllabus/contents	
Hours	hours
Class Attendance (theory) [PRESENCIAL][Lectures]	37.5
Workshops or seminars [PRESENCIAL][Project/Problem Based Learning (PBL)]	15
Group tutoring sessions [PRESENCIAL][Group tutoring sessions]	5
Final test [PRESENCIAL][Assessment tests]	2.5
Study and Exam Preparation [AUTÓNOMA][Self-study]	90
Global activity	
Activities	hours
Group tutoring sessions [PRESENCIAL][Group tutoring sessions]	5
Final test [PRESENCIAL][Assessment tests]	2.5
Study and Exam Preparation [AUTÓNOMA][Self-study]	90
Workshops or seminars [PRESENCIAL][Project/Problem Based Learning (PBL)]	15
Class Attendance (theory) [PRESENCIAL][Lectures]	37.5
Total horas: 150	

10. Bibliography and Sources						
Author(s)	Title/Link	Publishing house	Cítv	ISBN	Year	Description
Francisco José Colomer, Antonio Gallardo	Tratamiento y Gestión de Residuos Sólidos	Universidad Politécnica de Valencia		978-84-8363-071-6	2007	
Kiely, Gerard	Ingeniería ambiental: fundamentos, entornos, tecnologías y s	McGraw-Hill		84-481-2039-6	2003	
Masters, Gilbert M.	Introduction to environmental engineering and science /	New Jersey Prentice Hall,		978-1-292-02575-9	2014	
Metcalf & Eddy	Ingeniería de aguas residuales : tratamiento, vertido y reut	McGraw-Hill		84-481-1607-0	2000	
Parker, Albert	Contaminación del aire por la industria	Reverté		978-84-291-7464-9	2001	
Prieto, María José.	Sistemas de gestión ambiental /	AENOR,		978-84-8143-648-8	2011	
Ramalho, Ruben S.	Tratamiento de aguas residuales	Reverté		84-291-7975-5	2003	
Tchobanoglous, George	Gestión integral de residuos sólidos	McGraw-Hill Interamericana de España		84-481-1830-8	1994	
Wark, Kenneth	Contaminación del aire : origen y control	Limusa		968-18-1954-3	2000	
Alfonso Contreras; Mariano Molero	Ciencia y Tecnología del Medioambiente	UNED		84-362-5296-9	2006	
Miranda Carreño, Rubén; Oliet Palá, Mercedes; Pérez Corona, Teresa; Alonso Rubio, María Virginia; Madrid Albarrán, Yolanda; Domínguez Sánchez, Juan Carlos; García, Patricia.	Tratamiento de aguas. Ejercicios resueltos y prácticas de laboratorio.	Dextra		978-84-16898-49-7	2019	