



1. General information

Course: ENVIRONMENTAL POLLUTION

Type: CORE COURSE

Degree: 340 - UNDERGRADUATE DEGREE PROGRAMME IN ENVIRONMENTAL SCIENCES

Center: 501 - FACULTY OF ENVIRONMENTAL SCIENCES AND BIOCHEMISTRY

Year: 3

Main language: Spanish

Use of additional languages:

Web site:

Code: 37324

ECTS credits: 6

Academic year: 2023-24

Group(s): 40

Duration: C2

Second language:

English Friendly: Y

Bilingual: N

Lecturer: ANA ISABEL CORPS RICARDO - Group(s): 40				
Building/Office	Department	Phone number	Email	Office hours
ICAM0.22	Q. ANALÍTICA Y TGIA. ALIMENTOS		Analsabel.Corps@uclm.es	
Lecturer: MARIA JIMENEZ MORENO - Group(s): 40				
Building/Office	Department	Phone number	Email	Office hours
Sabatini/0.8	Q. ANALÍTICA Y TGIA. ALIMENTOS	926051710	maria.jimenez@uclm.es	Tuesday, Wednesday and Thursday from 12:00 a.m. to 2:00 p.m. Arrange an appointment by mail.
Lecturer: ANA MARIA RODRIGUEZ CERVANTES - Group(s): 40				
Building/Office	Department	Phone number	Email	Office hours
Sabatini, despacho 0.222	QUÍMICA FÍSICA	5494	anamaria.rodriguez@uclm.es	Monday to Thursday from 10:00 a.m. to 6:00 p.m. Arrange an appointment by mail.
Lecturer: DIANA RODRIGUEZ RODRIGUEZ - Group(s): 40				
Building/Office	Department	Phone number	Email	Office hours
Sabatini, despacho 0.222	QUÍMICA FÍSICA	5463	diana.rodriguez@uclm.es	Monday to Thursday from 10:00 a.m. to 6:00 p.m. Arrange an appointment by mail.

2. Pre-Requisites

Not established

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

Nowadays, pollution is one of the most serious problems affecting both environmental compartments and humans. Thus, this subject presents a brief introduction of the scientific basis of air, water and soil pollution and the practical approaches that can be applied for it.

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.
E04	Ability to integrate experimental evidence found in field and/or laboratory studies with theoretical knowledge.
E05	Capacity for qualitative data interpretation.
E06	Capacity for quantitative data interpretation.
E13	Ability to handle software.
E25	Capacity to treat contaminated soil.
E26	Ability to assess air quality and purify air emissions.
T01	To know a second foreign language.
T03	To use a correct oral and written communication.

5. Objectives or Learning Outcomes

Course learning outcomes

Description

That the student knows and understands the main types of chemical balances and their implications in natural and/or industrial processes of both pollution and decontamination.

The student will be able to apply his or her knowledge to extract relevant information on the chemical nature of both the components of the natural environment and the pollutants, their reactivity in the environmental systems (atmosphere, soil, water and interfaces) and their toxicity or dangerousness as well as to evaluate different possibilities for their control, prevention, mitigation and remediation of pollution.

That the student is able to learn and work autonomously and to solve problems through the search for information, its analysis, interpretation and synthesis, as well as to transmit its ideas and conclusions correctly in oral and written form.

That the student is able to take and treat environmental and/or industrial samples for their control and analysis using the most appropriate analytical techniques in each case.

Additional outcomes

That the student will be able to evaluate and predict the dispersion of air pollutants in different situations regarding the source of emission and taking into account the local climate conditions.

That the student knows and identifies the main natural and anthropogenic air, soil and water pollutants and understands their dynamics and transformations in the environmental compartments.

6. Units / Contents

Unit 1: Introduction to environmental pollution.

Unit 2: Atmospheric circulation, transport, diffusion and dispersion of pollutants.

Unit 3: Air quality in Castilla-La Mancha.

Unit 4: Air pollution control strategies.

Unit 5: Water pollution: sources, transport, dispersion and effects of pollutants. Control and assessment.

Unit 6: Soil pollution: sources, transport, dispersion and effects of pollutants. Control and assessment.

Unit 7: Water and soil quality. Regulatory framework.

ADDITIONAL COMMENTS, REMARKS

Laboratory sessions:

A Simulation Program for Modelling Atmospheric Pollutant Dispersion.

Detection of Air Pollutants by Fourier Transform Infrared Spectrometry.

Catalytic Converter Efficiency in Cars.

Air Quality of University Campus de la Fábrica de Armas.

Extraction and determination of total and extractable zinc concentrations in soils by atomic absorption spectroscopy. Assessment of soil pollution by metals.

Spectrometric determination of trophic state indicators in natural waters and calculation of eutrophication index.

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	E25 E26 T01		1	25	N	Teaching classes will be developed in an interactive way with the students including open discussion. The presentations to follow the classes will be available at the Moodle virtual platform for download.
Problem solving and/or case studies [ON-SITE]	Problem solving and exercises	CB02 E04 E05 E06	0.5	12.5	N		These sessions pretend to improve the comprehension of the studied topics through the execution of exercises and cases studies.
Laboratory practice or sessions [ON-SITE]	Practical or hands-on activities	CB02 E04 E05 E06 E13 E25 E26 T03	0.67	16.75	Y	Y	Practical sessions will be compulsory and will be organized in working groups. These practical sessions will enable the students to apply the theoretical concepts to real situations. In addition, an educational trip will be carried out. Both lab sessions and educational trip will be compulsory and not recoverable, but the evaluation of this activity could be recovered in the different calls.
Other on-site activities [ON-SITE]	Assessment tests	CB02 E04 E05 E06 E25 E26 T03	0.04	1	Y	Y	A written evaluation test about laboratory sessions will be performed on a date close to the end of the sessions.
Final test [ON-SITE]	Assessment tests	CB02 E05 E06 E25 E26 T03	0.12	3	Y	Y	A final written test including two different exams (theory and problems solving) will be performed. This final test will evaluate both theoretical contents and problem solving ability.
Study and Exam Preparation [OFF-SITE]	Self-study	CB02 E04 E05 E06 T01	2.8	70	N	-	
Other on-site activities [ON-SITE]	Other Methodologies	CB02 E05	0.05	1.25	Y	N	Questions of concern related to the proposed topics will be discussed at classes with Turning Point.
Other on-site activities [ON-SITE]	Assessment tests	CB02 E05	0.02	0.5	Y	Y	An initial written evaluation test will be performed before the lab sessions. This activity will be compulsory and unrecoverable.
Other off-site activity [OFF-SITE]	Collaborative on line international learning (COIL)	CB02 E05 E06 E13 T01 T03	0.7	17.5	Y	N	Collaborative learning activities.
On-line debates and forums [OFF-SITE]	Collaborative on line international learning (COIL)	E25 E26 T01	0.1	2.5	N		Group tutorials will be carried out with international students. The development of the COIL activity will be conditioned to

Total:		6	150	the number of international students.
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
Other methods of assessment	20.00%	0.00%	Participation in thedifferent activities that will be proposed during the course, including those of collaborative on line international learning (COLL). These activities are not compulsory nor recoverable.
Laboratory sessions	10.00%	10.00%	An initial written exam will be performed before the lab sessions in order to assess the comprehension about the lab guidelines. This activity will be compulsory and unrecoverable.
Test	10.00%	10.00%	A written exam about laboratory sessions will be performed. A minimum grade of 4.0 points out of 10 will be required to make average with the qualifications obtained in the rest of activities.
Final test	30.00%	40.00%	A final exam of theoretical concepts which include questions about the entire subject (air, water and soil pollution) will be performed. A minimum of 4.0 points out to 10 will be required to be able to sum the rest of the activities.
Final test	30.00%	40.00%	A final exam of problems/exercises related to all types of pollution will be performed. A minimum of 4.0 points out to 10 will be required to be able to sum the rest of the activities.
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:**
By default, the modality assigned to the student will be the continuous assessment. The students may request the change to the non-continuous assessment modality (before the end of the class period) by sending an email to the teacher, only if the student has not completed the 50% of the evaluable activities. In order to pass the subject, it will be compulsory to have completed and passed the lab work. For that purpose, attendance to all laboratory sessions will be compulsory. In addition, the evaluation test of the laboratory sessions must also be passed. Lab work mark will be kept the next academic year if the subject is not passed. Two final exams will be performed: one of them will include some questions about the theoretical contents, and the other some numerical cases studies. A minimum of 4 points out of 10 in both parts will be necessary to average the mark of this exam with the marks obtained in the rest of activities. In any case, the subject will be passed if the global mark of the overall assessable activities are 5 or higher over 10.
- Non-continuous evaluation:**
In this modality, the attendance to the lab sessions is compulsory and non-recoverable activity in order to pass the subject. The assessment will be recoverable, both in the resit and special retake exam. In order to pass the subject, it will be compulsory to have completed and passed the lab work. For that purpose, attendance to all laboratory sessions will be compulsory. In addition, the evaluation test of the laboratory sessions must also be passed. Lab work mark will be kept the next academic year if the subject is not passed.
Two final exams will be performed: one of them will include some questions about the theoretical contents, and the other some numerical cases studies. A minimum of 4 points out of 10 in both parts will be necessary to average the mark of this exam with the marks obtained in the rest of activities. In any case, the subject will be passed if the global mark of the overall assessable activities are 5 or higher over 10.

Specifications for the resit/retake exam:
The resit/retake exam will consist of some questions about the topics of the subject (theoretical concepts and problems/exercises) and the lab work (if it has not been previously passed). In this resit/retake exam, a minimum of 4 points out to 10 must be required to sum the marks obtained in the rest of activities. In any case, the subject will be passed if the global mark of the overall assessable activities are 5 or higher over 10.

Specifications for the second resit / retake exam:
The special retake exam will consist of some questions about the topics of the subject (theoretical concepts and problems/exercises) and the lab work (if it has not been previously passed). In the special retake exam, a minimum of 4 points out to 10 must be required in both theory and lab exams to pass the subject.

9. Assignments, course calendar and important dates	
Not related to the syllabus/contents	
Hours	hours
Problem solving and/or case studies [PRESENCIAL][Problem solving and exercises]	12.5
Laboratory practice or sessions [PRESENCIAL][Practical or hands-on activities]	16.75
Other on-site activities [PRESENCIAL][Assessment tests]	1
Final test [PRESENCIAL][Assessment tests]	3
Study and Exam Preparation [AUTÓNOMA][Self-study]	70
Other on-site activities [PRESENCIAL][Other Methodologies]	1.25
Other on-site activities [PRESENCIAL][Assessment tests]	.5
Other off-site activity [AUTÓNOMA][Collaborative on line international learning (COLL)]	17.5
On-line debates and forums [AUTÓNOMA][Collaborative on line international learning (COLL)]	2.5
Unit 1 (de 7): Introduction to environmental pollution.	
Activities	Hours
Class Attendance (theory) [PRESENCIAL][Lectures]	2
Unit 2 (de 7): Atmospheric circulation, transport, diffusion and dispersion of pollutants.	
Activities	Hours
Class Attendance (theory) [PRESENCIAL][Lectures]	1.5
Unit 3 (de 7): Air quality in Castilla-La Mancha.	
Activities	Hours
Class Attendance (theory) [PRESENCIAL][Lectures]	2
Unit 4 (de 7): Air pollution control strategies.	
Activities	Hours
Class Attendance (theory) [PRESENCIAL][Lectures]	7
Unit 5 (de 7): Water pollution: sources, transport,dispersion and effects of pollutants. Control and assessment.	
Activities	Hours
Class Attendance (theory) [PRESENCIAL][Lectures]	5.5
Unit 6 (de 7): Soil pollution: sources, transport, dispersion and effects of pollutants. Control and assessment.	
Activities	Hours
Class Attendance (theory) [PRESENCIAL][Lectures]	5.5
Unit 7 (de 7): Water and soil quality. Regulatory framework.	
Activities	Hours
Class Attendance (theory) [PRESENCIAL][Lectures]	1.5
Global activity	
Activities	hours
Problem solving and/or case studies [PRESENCIAL][Problem solving and exercises]	12.5
Class Attendance (theory) [PRESENCIAL][Lectures]	25
Laboratory practice or sessions [PRESENCIAL][Practical or hands-on activities]	16.75
Other on-site activities [PRESENCIAL][Assessment tests]	1
Final test [PRESENCIAL][Assessment tests]	3
Other on-site activities [PRESENCIAL][Other Methodologies]	1.25
Other on-site activities [PRESENCIAL][Assessment tests]	0.5
Study and Exam Preparation [AUTÓNOMA][Self-study]	70
On-line debates and forums [AUTÓNOMA][Collaborative on line international learning (COLL)]	2.5
Other off-site activity [AUTÓNOMA][Collaborative on line international learning (COLL)]	17.5
Total horas: 150	

10. Bibliography and Sources						
Author(s)	Title/Link	Publishing house	City	ISBN	Year	Description
Domènech, Xavier	Química ambiental de sistemas terrestres	Reverté		84-291-7906-2	2006	
Manahan, Stanley E.	Introducción a la química ambiental	Universidad Nacional Autónoma de México Rever		968-6708-60-X	2007	
Marín García, María Luisa	Análisis químico de suelos y aguas: manual de laboratorio	Universidad Politécnica. Departamento de Química,		84-9705-242-0	2002	
Marín García, María Luisa	Análisis químico de suelos y aguas: transparencias y problemas	Universidad Politécnica de Valencia. Servicio de P		978-84-9705-448-5	2003	
Mirsal, Ibrahim A.	Soil pollution: origin, monitoring & remediation	Springer		978-3-540-70775-2	2008	
Orozco Barrenetxea, Carmen y otros	Contaminación ambiental: una visión desde la química	Thomson		978-84-9732-178-5	2008	
Cruz-Guzmán Alcalá, Marta	La contaminación de suelos y aguas: su prevención con nuevas sustancias naturales	Universidad de Sevilla, Secretariado de Publica		978-84-472-0926-2	2007	
Orozco Barrenetxea, Carmen y otros	Problemas resueltos de contaminación ambiental	Thomson editores		84-9732-188-X	2003	
Vallero, Daniel A.	Environmental contaminants: assessment and control	Academic Press		0-12-710057-1	2004	
Vicent Espert y P. Amparo López	Dispersión de contaminantes en el aire	UNIVERSIDAD POLITECNICA DE VALENCIA. SERVICIO DE PUBLICACION		9788477219149	2000	
Wark Warner	Contaminación del aire. Origen y control	Limusa		968-18-1954-3		
	Manual de contaminación ambiental	Fundación Mapfre		84-7100-801-7	2000	
	Portal de información ambiental					
	http://pagina.jccm.es/medioambiente/rvcal/calidadaire.htm					

