



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: 2019-20

Group(s): 40

Duration: C2

Second language:

English Friendly: Y

Bilingual: N

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	Monday, Wednesday and Thursday from 12 to 14 h. Arrange an appointment by email.	
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 and Wednesday from 12:00 to 14:00 and Thursday from 15:00 to 17:00 h. Arrange an appointment by email. previa cita por e-mail.	
Lecturer: NURIA RODRIGUEZ FARÍNAS - Group(s): 40					
Building/Office	Department	Phone number	Email	Office hours	
Sabatini/0.9	Q. ANALÍTICA Y TGIA. ALIMENTOS	5459	nuria.rodriguez@uclm.es	L-X de 12 a 2 previa cita por e-mail.	
Lecturer: ROSA DEL CARMEN RODRIGUEZ MARTIN-DOIMEADIOS - Group(s): 40					
Building/Office	Department	Phone number	Email	Office hours	
Sabatini/0.16	Q. ANALÍTICA Y TGIA. ALIMENTOS	5420	rosacarmen.rodriguez@uclm.es	Monday, Tuesday and Wednesday from 13 to 15 h. Arrange an appointment by email.	
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, Tuesday and Thursday from 12:00 to 14:00h. Arrange an appointment by email.	

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.
CB06	Students have developed the ability to work as a team and lead, direct, plan and supervise multidisciplinary teams
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
G01	Proficiency in a second foreign language at level B1 of the Common European Framework of Reference for Languages.
G03	Good 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 knows and identifies the main natural and anthropogenic air, soil and water pollutants and understands their dynamics and transformations in the environmental compartments.

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.

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	R	Description
Class Attendance (theory) [ON-SITE]	Lectures	E25 E26 G01	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	0.4	10	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 CB06 E04 E05 E06 E13 E25 E26 G03	0.62	15.5	Y	Y	N	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.
Other on-site activities [ON-SITE]	Assessment tests	CB02 E04 E05 E06 E25 E26 G03	0.04	1	Y	Y	Y	A written evaluation test about laboratory sessions will be performed.
Progress test [ON-SITE]	Assessment tests	CB02 E05 E06 E25 E26 G03	0.04	1	Y	N	-	A midterm progress test of the 4 first subjects (Air pollution) will be carried out. This test will evaluate both theoretical contents and problem solving ability.
Final test [ON-SITE]	Assessment tests	CB02 E05 E06 E25 E26 G03	0.08	2	Y	Y	Y	A final written test 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 G01	3.6	90	N	-	-	-
Other on-site activities [ON-SITE]	Other Methodologies	CB02 E05	0.2	5	Y	N	N	Questions of concern and/or scientific articles related to the proposed topics will be discussed.

Other on-site activities [ON-SITE]	Assessment tests	CB02 E05	0.02	0.5	Y	Y	N	An initial written evaluation test will be performed before the lab sessions.
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
R: Rescheduling training activity

8. Evaluation criteria and Grading System			
Evaluation System	Grading System		Description
	Face-to-Face	Self-Study Student	
Other methods of assessment	10.00%	0.00%	Participation in different activities that will be proposed during the course. These activities are not compulsory or recoverable.
Laboratory sessions	10.00%	0.00%	An initial written exam will be performed before the lab sessions in order to assess the comprehension about the lab guidelines.
Test	20.00%	0.00%	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%	0.00%	A final exam which include questions about the entire subject(air, water and soil pollution)and problems/exercises 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. In case of not passing the progress eliminatory progress exam, this final exam will be the 60% of the entire calification.To make an average between the grades obtained in the first four topics (Air Pollution) and the last three (pollution of soil and water)it is essential to obtain a minimum of 3.5 in each part.
Progress Tests	30.00%	0.00%	A midterm progress eliminatory test of the first four subjects (air pollution) will be done. A minimum of 5 points out to 10 will be required to exclude this part of the course contents from the final regular examination call.
Total:	100.00%	0.00%	

Evaluation criteria for the final 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.
A progress eliminatory exam of the first four subjects (air pollution) will be performed. A minimum of 5 points out to 10 will be required to exclude this part of the course contents from the final regular examination call.
In the final exam of the regular examination schedule, the students who have passed the midterm progress exam will only have to be examined from the contents corresponding to the subjects 5-7 (soil and water pollution). To average both marks (from air pollution and soil and water pollution tests), it is necessary to have a minimum of 3.5 out of 10 points in each part.
The final exam will consist of some questions about the theoretical contents and numerical cases studies. A minimum of 4 points out of 10 will be necessary to average the mark of this exam with the marks obtained in the rest of activities.

Specifications for the resit/retake exam:

The resit/retake exam will consist of some questions about the topics of the subject 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 the resit/retake exam, students who have passed the progress exam (four first topics) will only have to be examined from the contents corresponding to the subjects 5-7 (soil and water pollution). To average both marks (from air pollution and soil and water pollution tests), it is necessary to have a minimum of 3.5 out of 10 points in each part.

Specifications for the second resit / retake exam:

To pass this special call, a final test will be performed and will represent 100% of the mark. In addition, it will be compulsory to have attended and passed the laboratory sessions.

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]	16
Other on-site activities [PRESENCIAL][Assessment tests]	1
Progress test [PRESENCIAL][Assessment tests]	1
Final test [PRESENCIAL][Assessment tests]	2
Study and Exam Preparation [AUTÓNOMA][Self-study]	75
Unit 1 (de 7): Introduction to environmental pollution.	
Activities	Hours
Class Attendance (theory) [PRESENCIAL][Lectures]	2
Problem solving and/or case studies [PRESENCIAL][Problem solving and exercises]	1
Unit 2 (de 7): Atmospheric circulation, transport, diffusion and dispersion of pollutants.	
Activities	Hours
Class Attendance (theory) [PRESENCIAL][Lectures]	1.5
Problem solving and/or case studies [PRESENCIAL][Problem solving and exercises]	1
Other on-site activities [PRESENCIAL][Other Methodologies]	.5
Unit 3 (de 7): Air quality in Castilla-La Mancha.	
Activities	Hours
Class Attendance (theory) [PRESENCIAL][Lectures]	2
Other on-site activities [PRESENCIAL][Other Methodologies]	1
Unit 4 (de 7): Air pollution control strategies.	
Activities	Hours
Class Attendance (theory) [PRESENCIAL][Lectures]	7
Problem solving and/or case studies [PRESENCIAL][Problem solving and exercises]	3
Other on-site activities [PRESENCIAL][Other Methodologies]	1
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
Problem solving and/or case studies [PRESENCIAL][Problem solving and exercises]	2.5
Other on-site activities [PRESENCIAL][Other Methodologies]	1
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
Problem solving and/or case studies [PRESENCIAL][Problem solving and exercises]	2
Other on-site activities [PRESENCIAL][Other Methodologies]	1
Unit 7 (de 7): Water and soil quality. Regulatory framework.	
Activities	Hours
Class Attendance (theory) [PRESENCIAL][Lectures]	1.5
Other on-site activities [PRESENCIAL][Other Methodologies]	.5
Global activity	
Activities	hours
Class Attendance (theory) [PRESENCIAL][Lectures]	25
Problem solving and/or case studies [PRESENCIAL][Problem solving and exercises]	9.5
Laboratory practice or sessions [PRESENCIAL][Practical or hands-on activities]	16
Other on-site activities [PRESENCIAL][Assessment tests]	1
Progress test [PRESENCIAL][Assessment tests]	1
Final test [PRESENCIAL][Assessment tests]	2
Study and Exam Preparation [AUTÓNOMA][Self-study]	75
Other on-site activities [PRESENCIAL][Other Methodologies]	5
Total horas: 134.5	

10. Bibliography and Sources						
Author(s)	Title/Link	Publishing house	Cítv	ISBN	Year	Description
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	
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	
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 Manual de contaminación ambiental	Limusa Fundación Mapfre	968-18-1954-3 84-7100-801-7	2000	Portal de información ambiental
	http://pagina.jccm.es/medioambiente/rvca/calidadaire.htm				Grupo intergubernamental de expertos sobre el cambio climático
	http://www.ipcc.ch/				