COURSE DATA

Data Subject	
Code	43820
Name	Prevention of industrial pollution
Cycle	Master's degree
ECTS Credits	3.0
Academic year	2022 - 2023

Study (s)

Degree	Center	Acad. year	Period
2227 - Master's Degree in Environmental Engineering	School of Engineering	2	First term
2250 - Master's Degree in Environmental Engineering	School of Engineering	2	First term

Subject-matter

Degree	Subject-matter	Character
2227 - Master's Degree in Environmental Engineering	6 - Optatividad para especialización	Optional
2250 - Master's Degree in Environmental Engineering	25 - Prevención de la contaminación industrial	Optional

Coordination

Name	Department
JIMENEZ BENITEZ, ANTONIO LUIS	245 - Chemical Engineering
ROBLES MARTINEZ, ANGEL	245 - Chemical Engineering

SUMMARY

Prevention of industrial pollution is an optional subject of 3 credits that is taught in the first semester of the second year of the Master in Environmental Engineering.

This subject aims to provide students with the knowledge and basic technical skills to analyze and project studies aimed to minimize industrial pollution. The students make use of the previous knowledge gained from different related core subjects: Water treatment; Control of atmospheric contamination; Management of contaminated soils and sediments; Analysis and application of environmental legislation and environmental impact assessment. This prior knowledge is taken as a starting point and is complemented by a description of the types and origins of pollution caused by industries in their production processes and the drafting of a series of tools and methodologies necessary to diagnose and carry out prevention studies. Students must be able to apply knowledge about the best available techniques, perform the analysis and environmental diagnosis of production processes, use minimization strategies and clean production, and apply recycling and recovery systems. The knowledge and skills acquired in this subject can be applied to any type of industry.

PREVIOUS KNOWLEDGE

Relationship to other subjects of the same degree

There are no specified enrollment restrictions with other subjects of the curriculum.

Other requirements

No enrollment restrictions have been specified with other subjects of the curriculum.

COMPETENCES (RD 1393/2007) // LEARNING OUTCOMES (RD 822/2021)

2227 - Master's Degree in Environmental Engineering

- Students should apply acquired knowledge to solve problems in unfamiliar contexts within their field of study, including multidisciplinary scenarios.
- Students should be able to integrate knowledge and address the complexity of making informed judgments based on incomplete or limited information, including reflections on the social and ethical responsibilities associated with the application of their knowledge and judgments.
- Students should communicate conclusions and underlying knowledge clearly and unambiguously to both specialized and non-specialized audiences.
- Students should demonstrate self-directed learning skills for continued academic growth.
- Students should possess and understand foundational knowledge that enables original thinking and research in the field.
- Identify and apply technologies, tools and techniques in the field of environmental engineering.
- Assume with responsibility and ethics the Environmental Engineer role in a professional context.
- Promote and apply the principles of sustainability.
- Adapt to changes, being able to apply the principles of Environmental Engineering to unknown cases and use new and advanced technologies and other relevant developments, with initiative and entrepreneurial spirit.

- Identify, declare and entirely analyze environmental problems.
- Assess the application of measures for the pollution prevention and the recovery, protection and improvement of environmental quality.
- Design and calculate engineering solutions to environmental problems, comparing and selecting technical alternatives and identifying emerging technologies.
- Understand and apply environmental national and international legislation, adapting environmental solutions to these regulations.
- Apply standard methodologies for the analysis and evaluation of environmental risks.
- Apply different tools and environmental management systems.
- Evaluate the treatment of emissions to the atmosphere to assess different alternatives and obtain the required information for the design of the selected treatment processes.
- Evaluate the treatment of wastewaters emissions to assess different alternatives and obtain the required information for the design of the selected treatment processes.
- Evaluate the treatment of solid wastes to assess different alternatives and obtain the required information for the design of the selected treatment processes.
- Design and manage wastewater treatment and treatment systems for atmospheric emissions.
- Design and manage wastewater treatment systems.
- Design and operate systems for waste management and treatment.
- Design and manage treatment systems for contaminated soils.

2250 - Master's Degree in Environmental Engineering

- Students should apply acquired knowledge to solve problems in unfamiliar contexts within their field of study, including multidisciplinary scenarios.
- Students should be able to integrate knowledge and address the complexity of making informed judgments based on incomplete or limited information, including reflections on the social and ethical responsibilities associated with the application of their knowledge and judgments.
- Students should communicate conclusions and underlying knowledge clearly and unambiguously to both specialized and non-specialized audiences.
- Students should demonstrate self-directed learning skills for continued academic growth.
- Students should possess and understand foundational knowledge that enables original thinking and research in the field.
- Identify, formulate and solve complex environmental engineering problems by applying engineering, scientific and mathematical principles.
- Apply environmental engineering designs to produce solutions that meet specific needs addressing public health, safety and welfare taking account of global, cultural, social, environmental and economic factors.

- Recognise the ethical and professional responsibilities of environmental engineering and make informed judgements considering the impact of engineering solutions in global, economic, environmental and social contexts.
- Work in a team effectively and with leadership, in a collaborative and inclusive environment, setting goals, planning tasks and meeting objectives.
- Learn and apply new knowledge, using appropriate learning strategies.
- Implement measures for preventing pollution and recovering, protecting and improving environmental quality.
- Develop and apply mathematical models for the simulation, optimisation or control of processes in the field of environmental engineering.
- Design, calculate and select engineering solutions to environmental problems, comparing alternatives that include emerging technologies under criteria of technical, social, economic and environmental viability.
- Interpret and apply national and international environmental legislation and adapt environmental solutions to these regulations.
- Apply tools for environmental assessment and management including environmental impact assessment and environmental risk assessment.
- Develop environmental solutions under the principles of circular economy and the sustainable development goals.

LEARNING OUTCOMES (RD 1393/2007) // NO CONTENT (RD 822/2021)

1 To understand the industry-environment interaction and become aware of the problem of pollution of industrial origin, as well as the need for cleaner production.

2 To locate the available information on the production processes of the main industrial sectors.

3 Identify the origin of waste generated (liquid, solid and gaseous) in industry, in order to address the particular environmental problems of different industrial sectors.

4 Apply industrial pollution prevention and minimization techniques for the integration of clean production in the company.

5 Apply methodologies for environmental diagnosis of industrial pollution prevention and minimization opportunities.

6 Establish particular solutions for specific industrial cases, as well as integrated actions following the studied methodology.

DESCRIPTION OF CONTENTS

1. Integrated pollution prevention and control

Introduction to industrial pollution. Industry-environment interactions. Industrial sustainability. Green Industry. Industrial Ecology. Legal framework, the IPPC Directive. Best available techniques.

2. Analysis and environmental diagnosis of production processes.

Sources of contamination in the industry, origin and characterization. Mass and Energy balances in industry. Flowsheet analysis. Environmental diagnosis of prevention and minimization opportunities.

3. Minimization strategies and clean production.

Clean Production: incentives and barriers. Clean Production Techniques: Changes in product, substitution of raw materials, good practices, process modifications, recovery in origin. Integration of Clean Production in the company.

4. Case studies.

Practical cases of prevention and minimization of industrial pollution.

WORKLOAD

ACTIVITY	Hours	% To be attended
Computer classroom practice	12,00	100
Classroom practices	8,00	100
Theory classes	6,00	100
Theoretical and practical classes	2,00	100
Seminars	2,00	100
Development of group work	30,00	0
Study and independent work	10,00	0
Resolution of case studies	5,00	0
TOTAL	**75,00**	

TEACHING METHODOLOGY

- Theoretical activities.

In the theoretical classes the topics will be developed providing a global and integrative vision, analyzing in greater detail the key and more complex integrating, analyzing in greater detail the key and more complex aspects, encouraging, at all times, the student's participation.

- Practical activities.

They complement the theoretical activities with the objective of applying the basic concepts and expanding them with the knowledge and experience acquired during the realization of the proposed works. Learning through problem solving, exercises and case studies through which competences on the different aspects of the subject are acquired.

- Work in the computer classroom.

Learning through activities developed individually or in small groups and carried out in computer classrooms. Resolution of case studies through which competences on the different aspects of the subject are acquired.

- Personal work of the student.

Resolution of practical cases, and autonomous study and work. This task will be carried out individually and tries to promote autonomous work.

- Work in small groups.

Work in small groups (2-4 students), including problem solving outside the classroom. This task complements the individual work and promotes the capacity of integration in work teams.

- Evaluation.

Individual evaluation tests in the classroom with the presence of the teacher. teacher's presence.

- Use of resources.

The e-learning platform (Virtual Classroom of the University of Valencia) will be used as a support for communication with students. Through it, students will have access to the didactic material used in class, as well as the problems and exercises to be solved.

EVALUATION

To evaluate the students' learning, the objective test methodology will be used, consisting of one or several exams that will consist of both theoretical-practical questions and problems, with a weight in the final grade of 30%. The rest of the grade will be obtained from the evaluation of the practical activities based on the elaboration of papers, reports, case studies and/or oral presentations, with a weight in the final grade of 60%, as well as the continuous evaluation of each student, based on the participation and degree of involvement of the student in the teaching-learning process, taking into account the regular attendance to the scheduled classroom activities and the resolution of questions and problems proposed periodically, with a weight in the final grade of 10%.

The planned activities that the student must carry out outside the classroom attendance will be coordinated between the different subjects of the master's degree coordinated among the different subjects of the Master and under the supervision of the Academic Coordination Committee of the Master.

In any case, the evaluation system will be governed by the provisions of the Reglament de Avaluació i Qualificació de la Universitat de València per a títols de Grau i Màster (http://links.uv.es/7S40pjF).

REFERENCES

Basic

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- Tratamiento de vertidos industriales y peligrosos. Nemerow. Diaz de Santos. (1998)
- Producció més neta. Miquel Rigola. Generalitat Catalunya. (1998)
- Manual de prevención de la contaminación Industrial. Freeman. McGraw-Hill (1998)
- Industrial water reuse and wastewater minimization. Mann. Ed. McGraw-Hill. (1999)
- Pollution Prevention through Process Integration. El-Halwagi. Ed. Academic Press. (1997)
- Waste minimization through process design. Rossiter. Ed. McGraw-Hill. (1995)
- Aguas residuales industriales: Minimización y tratamiento. Consejo de Cámaras de Comercio de la Comunidad Valenciana. (1994)
- Residuos industriales: Minimización y tratamiento. Consejo de Cámaras de Comercio de la Comunidad Valenciana. (1994)
- Contaminación e Ingeniería Ambiental. Bueno J.L. FICYT. Oviedo. (1997)
- Hazardous Waste Managenment. LaGrega, M.D y col. Waveland Pr Inc. (2001)
- Elías, X. (2009) Reciclaje de residuos industriales. Residuos sólidos urbanos y fangos de depuradora.

Additional

- Manuals de cogestió (Generalitat de Catalunya)
- Guias tecnológicas, BREFs, mejores técnicas disponibles
- Libros blancos sectoriales (IHOBE, Gobierno Vasco)
- Revista Reútil (Consejo de Cámaras)