COURSE DATA

Data Subject	
Code	43820
Name	Prevention of industrial pollution
Cycle	Master's degree
ECTS Credits	3.0
Academic year	2019 - 2020

Study (s)

Degree	Center	Acad. year	Period
2227 - 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

Coordination

Name	Department
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)

2172 - 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 manage treatment systems for contaminated soils.

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

• Understand the interaction between industry and the environment and become aware of the problem of pollution of industrial origin, as well as the need for cleaner production (G2, CB6, E19).

• Implement the methodologies for the integration of clean production and for environmental diagnosis in the company in order to address the particular environmental problems of each industrial process (G1, G3, CB7, E21, E22).

• Identify the origin of the waste generated (liquid, solid and gaseous) and associated environmental problems as well as the techniques available for its prevention and / or correction (G2, G4, CB6, CB8, CB10, E1, E10, E11, E13).

• Identify the origin of pollution caused by noise, energy consumption and radiation in the development of industrial activity (G2, G4, CB6, CB10, E1).

• Locate the available information on the production processes of the main industrial sectors and interpret this information with a view to clean production and waste minimization (G4, CB10, E10, E11, E13, E19).

• Implement the best available techniques to the different industrial sectors (G1, G3, CB7, E21, E22).

• Analyze a variety of minimization solutions adopted in real cases (G2, G4, CB6, CB8, E8, E19).

• Establish particular solutions for specific industry cases as well as integrated actions following the methodology studied (G1, G3, CB7, CB9, E8, E14, E15, E16, E17, E18).

DESCRIPTION OF CONTENTS

1. Integrated pollution prevention and control

Overview of the main environmental problems. Industry and environment. Risks evaluation. Introduction to industrial pollution. Industry-environment interactions. Industrial sustainability. 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. Tools for the estimation of risks in ecosystems and environmental persistence. Evaluation of exposure to pollutants. Environmental diagnosis of prevention and minimization opportunities. Analysis of flow diagram. Tools for the quantification of environmental impacts.

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.

WORKLOAD

ACTIVITY	Hours	% To be attended
Theory classes	15,00	100
Classroom practices	8,00	100
Group work	4,00	100
Theoretical and practical classes	3,00	100
Development of group work	15,00	0
Development of individual work	5,00	0
Study and independent work	10,00	0
Readings supplementary material	3,00	0
Preparation of evaluation activities	10,00	0
Resolution of online questionnaires	2,00	0
TOTAL	**75,00**	

TEACHING METHODOLOGY

The formative activities will be developed according to the following distribution:

· **Theoretical activities.**

Description: In the theoretical classes, the topics will be developed providing a holistic vision of the matter, analyzing in detail the key aspects and of greater complexity, encouraging, at all time, the participation of the student.

· **Practical activities.**

Description: They complement the theoretical activities in order to apply the basic concepts and expand them with the knowledge and experience that they acquire during the realization of the proposed works. They include the following types of face-to-face activities:

• Work on problems and questions in the classroom

• Discussion and problem solving sessions and exercises previously worked by the students

• Practices in computer lab.

• Programmed tutoring (individualized or in groups)

· **Student's personal work.**

Description: Realization (outside the classroom) of monographic works, directed bibliographic search, resolution of issues and problems, as well as the preparation of classes and exams (study). This task will be carried out individually and tries to promote autonomous work.

· **Work in small groups.**

Description: Realization, by small groups of students (2-5) of work and problem solving outside the classroom. This task complements the individual work and fosters the capacity for integration in work groups.

· **Evaluation.**

Description: Completion of individual evaluation questionnaires in the classroom with the presence of teacher. The e-learning platform (Aula Virtual of the Universitat de València and / or PoliformaT of the Polytechnic University of Valencia) will be used as a communication support with the students. Through it you will have access to the didactic material used in class, as well as the problems and exercises to solve.

EVALUATION

The evaluation of student learning will be carried out following two models:

A) Through the evaluation of the activities carried out by the students and the exam note that is made.

B) From the grade obtained in the final exam.

To qualify for the evaluation modality A) the student must have completed at least 80% of the proposed scoring activities. To evaluate the learning of the students in this modality, a final exam will be carried out that will have a weight in the final grade of 50%. The rest of the note will be obtained from the evaluation of practical activities from the preparation of papers, reports and / or oral presentations (40%), as well as the continuous evolution of each student, based on regular attendance at the classes face-to-face, participation and degree of involvement of the student in the teaching-learning process (10%).

In mode B) the final grade will be obtained from the average mark of a final exam (100%).

The planned activities that the student must do outside the attendance will be

coordinated among the different subjects of the master's degree and under the supervision of the Academic Coordination Committee of the Master.

o pass the subject it will be necessary that the average (weighted, if applicable) of the different parts of the exam is equal to or greater than 50 points (out of 100).

In any case, the evaluation system will be governed by the provisions of the Regulation of Appraisal and Qualification of the University of Valencia per a títols de Grau i Màster (http://links.uv.es/7S40pjF).

REFERENCES

Basic

- - Tratamiento de aguas industriales: Aguas de proceso y residuales. Miguel Rigola Lapeña. Marcombo, Cop. (1989)
- 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. Ed. Diaz de Santos.

Additional

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

ADDENDUM COVID-19

This addendum will only be activated if the health situation requires so and with the prior agreement of the Governing Council

English version is not available