

**COURSE DATA****Data Subject**

<b>Code</b>	33115
<b>Name</b>	Industrial pollution prevention
<b>Cycle</b>	Grade
<b>ECTS Credits</b>	6.0
<b>Academic year</b>	2022 - 2023

**Study (s)**

<b>Degree</b>	<b>Center</b>	<b>Acad. year</b>	<b>Period</b>
1104 - Degree in Environmental Sciences	Faculty of Biological Sciences	4	First term

**Subject-matter**

<b>Degree</b>	<b>Subject-matter</b>	<b>Character</b>
1104 - Degree in Environmental Sciences	183 - Industrial pollution prevention	Optional

**Coordination**

<b>Name</b>	<b>Department</b>
FRANCO VIÑUALES, CARLOS FRANCISCO	245 - Chemical Engineering

**SUMMARY**

The aim of the subject Industrial Pollution Prevention is that students acquire an overview of the problems of environmental pollution produced by industries, as well as to know the minimization tools and the remediation technologies. It is an elective course that is taught quarterly basis in the fourth year of the Degree in Environmental Sciences in the first quarter. The subject consists of a total of 6 ECTS.

The overall objectives of the course are to understand the different types of pollution due to industrial activity, and to know existing tools to minimize such contamination, in compliance with current regulations.

The specific objectives of the course are:

- Know the industry-environment interaction and become aware of the problem of industrial pollution and the need for cleaner production.
- Identify the source of the waste (liquid, solid and gaseous) and associated environmental problems and the techniques available for prevention and / or correction.
- Identify the source of noise pollution, energy consumption and radiation in the development of industrial activity.
- Locate the information available on its own production processes developed in the main sectors of



industrial production and understand this information in order to apply clean production and waste minimization techniques.

- Develop methodologies for clean production, ecodesign and waste minimization to address environmental issues specific to each industrial process.
- Establish specific solutions for particular industries and apply integrated actions following the methodology studied.

The course contents are: Industry and environment. Cleaner Production. Waste minimization in industry. Integrated prevention pollution and control. Legal framework. Environmental analysis and diagnosis of manufacturing processes. Strategies for minimization and clean production. Waste, wastewater and air emissions in the industry. Waste management schemes, water and air emissions in the industry. Case Studies.

## PREVIOUS KNOWLEDGE

### Relationship to other subjects of the same degree

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

### Other requirements

It is recommended that the student has acquired basic knowledge of physics and chemistry and have completed or be studying the subject "Technologies for pollution control" that is taught in the third year of the Degree in Environmental Sciences.

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

### 1104 - Degree in Environmental Sciences

- Capacidad de diseñar estrategias empresariales que permitan integrar de forma transversal la dimensión ambiental en la gestión empresarial.
- Capacidad de elaborar memorias de sostenibilidad para organizaciones.
- Capacidad de utilizar instrumentos de prevención y control contaminación: autorización ambiental integrada y comercio de derechos de emisión.
- Capacidad de aplicar los procedimientos de análisis y diagnóstico medioambiental en los procesos de producción y evaluar las estrategias de minimización y producción limpia.

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

- 1 Perform practical work involving problem solving, data analysis and critical interpretation.
- 2 Prepare and present short seminars, individually and in small groups, involving bibliographic searches, integrating information in Spanish and English, analysis and synthesis of it, oral presentations.



- 3** Use bibliographic databases in electronic form, access to magazines and other printed and electronic format, and use of at least one presentation software.
- 4** Use of the main tools and techniques for formulating and implementing business strategies that enable cross-integrate the environmental dimension in business management and its application to practical cases.
- 5** Knowledge of the methodology for the elaboration of sustainability reports for organizations.
- 6** Knowledge of administrative procedures related to the integrated environmental authorization and emission trading.
- 7** Use of diagnostic testing procedures and environmental production processes, incorporating the evaluation and selection of measures for cleaner production and waste minimization strategies.

## DESCRIPTION OF CONTENTS

### 1. Minimising waste in industry

Waste minimization program through DAOM (Environmental Diagnosis of Minimization Opportunities). Work stages.

### 2. Waste water in industry

Water uses in industry. Water quality assessment. Pollutants in industrial wastewater. Industrial wastewater problems. Industrial wastewater treatment schemes.

### 3. Industrial waste

Waste concept. Industrial waste. Identification and cataloguing of industrial waste: identification codes. Characterization of waste. Waste management. Integral Waste Plan (PIR). Technologies for the treatment of industrial waste.

### 4. Air emissions from industry

Main air pollutants: origin and danger. Legal framework. Quality standards. Schemes for the control and treatment of atmospheric emissions.

### 5. Other sources of industrial pollution

Otras fuentes de contaminación industrial: Contaminación acústica. Contaminación radiactiva. Contaminación energética.

**6. Environmental trends**

The industrial process. Introduction to industrial pollution. Historical evolution of the environmental approach in industry. Industry-environment interactions. Cleaner production. Eco-efficiency. Industrial ecology.

**7. Product-based prevention of pollution**

Ecodesign. Methodologies for ecodesign. Life Cycle Analysis (LCA). LCA applications. Ecoindicators. Case studies. Use of LCA software.

**8. Process-based prevention of pollution**

Process boundaries. Process changes. Use of environmental indicators. Design, simulation and control of industrial processes.

**WORKLOAD**

ACTIVITY	Hours	% To be attended
Theory classes	36,00	100
Classroom practices	12,00	100
Computer classroom practice	9,00	100
Tutorials	3,00	100
Development of group work	15,00	0
Development of individual work	5,00	0
Study and independent work	4,00	0
Readings supplementary material	4,00	0
Preparation of evaluation activities	15,00	0
Preparing lectures	15,00	0
Preparation of practical classes and problem	15,00	0
Resolution of case studies	15,00	0
Resolution of online questionnaires	2,00	0
<b>TOTAL</b>	<b>150,00</b>	

**TEACHING METHODOLOGY**



The methodology used in the course considers the following aspects:

**Theoretical and practical sessions:** Students will be offered with an overview of the subject matter and the key concepts to be developed will be explained, as well as resources to be used for further preparation of the subject in depth. In these sessions examples and practical applications will be presented, numerical problems will be solved and oral presentations and group work will be carried out in order to enhance the assimilation of the concepts introduced. The goal of classroom practices is to deepen and strengthen the knowledge and theoretical concepts covered in the course.

**Minimization project:** Students will perform in groups of 3 to 6 people, a draft waste minimization for a real industry selected. In this project the knowledge gained throughout the course will be applied. Each group will conduct technical visits to the selected industry in order to collect the information needed to prepare the draft. Each group will be supervised in the tutorial hours and / or during school hours. The project will be mainly carried out in the sessions and computer sessions.

Each group will prepare a technical report that will be monitored and evaluated by the teacher and finally the results will be presented to the rest of the class in specific sessions for work presentations.

**Group tutorials:** 2 sessions will be scheduled for group tutorials along the course in which the teacher will try to clarify concepts and resolve any doubts that may have arisen during the resolution of the proposed problems along the course and the minimization project.

## EVALUATION

The evaluation of the knowledge acquired by the students will be carried out based on the qualifications obtained in the final exam, the preliminary project carried out in group and the presentation of the preliminary project. The final grade for the course will be obtained from the following weighting:

- Written exam on the contents of the subject (55% of the grade). It will be necessary to obtain a minimum of 4 to be able to make an average.
- Realization of the draft minimization (35% of the mark).
- Carrying out and presenting activities in class (10% of the grade).

Important: Both collaboration and active participation, and on the contrary, bad behavior or lack of education during the course of the subject will influence the possible adjustment of the final grade.

To request an early call for this subject, the student must take into account that he/she must have completed the compulsory activities indicated in the teaching guide for the subject.





## REFERENCES

### Basic

- 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)
- Ingeniería Ambiental. Kiely. Ed. McGraw-Hill.(1999)
- Llibre Didàctic d'Anàlisi del Cicle de Vida (ACV). Rita Puig. Xarxa Temàtica Catalana d'ACV.
- Manual Práctico de Ecodiseño. Operativa de Implantación en 7 pasos, (IHOBE S.A, 2000). Disponible en: <http://www.ihobe.es/>
- Ecodiseño. Ingeniería del ciclo de vida para el desarrollo de productos sostenibles. Salvador Capuz Rizo y Tomás Gómez Navarro. (Universidad Politécnica de Valencia, 2002)
- Análisis del Ciclo de Vida: Aspectos Metodológicos y Casos Prácticos. Gabriela Clemente, Neus Sanjuán y José Luis Vivancos. (Universidad Politécnica de Valencia, 2005)

### Additional

- Organic Waste Recycling. Polprasert. IWA Publishing. (2007)
- Waste minimization through process design. Rossiter. Ed. McGraw-Hill. (1995)
- Pollution Prevention through Process Integration. El-Halwagi. Ed. Academic Press. (1997)
- Industrial water reuse and wastewater minimization. Mann. Ed. McGraw-Hill. (1999)
- Ecodiseño y Ecoproductos. Joan Rieradevall y Joan Vinyets (Rubes, 1999)
- Análisis de ciclo de vida. Pere Fullana y Rita Puig. (Rubes 1997)
- Manual de prevención de la contaminación Industrial. Freeman. McGraw-Hill (1998)
- Producció més neta. Miquel Rigola. Generalitat Catalunya. (1998)