

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

<b>Code</b>	34759
<b>Name</b>	Environment and sustainability
<b>Cycle</b>	Grade
<b>ECTS Credits</b>	6.0
<b>Academic year</b>	2023 - 2024

**Study (s)**

<b>Degree</b>	<b>Center</b>	<b>Acad. year</b>	<b>Period</b>
1401 - Degree in Chemical Engineering	School of Engineering	2	First term
1934 - D.D. in Chemistry-Chemical Engineering	Faculty of Chemistry	2	First term

**Subject-matter**

<b>Degree</b>	<b>Subject-matter</b>	<b>Character</b>
1401 - Degree in Chemical Engineering	12 - Principles of environmental technologies and sustainability	Obligatory
1934 - D.D. in Chemistry-Chemical Engineering	2 - Segundo curso	Obligatory

**Coordination**

<b>Name</b>	<b>Department</b>
MARZAL DOMENECH, PAULA	245 - Chemical Engineering
PASTOR ALCANIZ, LAURA	245 - Chemical Engineering

**SUMMARY**

The main objective of the subject Environment and Sustainability is to gain a global view of the environmental pollution on the basis of its origins and problems, attending also to the sustainability principles, the environmental technologies and its application. It is a compulsory subject that is taught quarterly in the first semester of the second year of the Degree in Chemical Engineering. The subject consists of a total of 6 ECTS.

This subject aims for students to become aware of environmental problems, mainly those derived from industrial activities, and that they acquire the strategies and approaches to solve these problems from the



perspective of sustainable development principles, prevention of pollution, or, ultimately, from the application of remediation technologies.

The general objectives of the subject are:

- Introduce to students the origins of pollution, its problems and basic principles for its control.
- Ensure that the student understands the concept of sustainability and its integration in the industrial activity.
- To acquaint students with the tools of environmental management, and especially its application in industry.
- Introduce to students the different measures and technologies for the prevention and control of pollution.
- Stimulate and encourage the student those values and attitudes of respect for the environment that should be inherent to an engineer.

The subject contents are: **Sources of environmental pollution. Assessment of water quality. Types of waste and its characterization. Air pollutants. Measurement and control of air quality. Soil contamination. Legislative framework. Waste management strategies, wasted effluents and emissions. Concept of sustainability. Tools for sustainable development in the industry. Wastewater, waste and atmospheric emissions treatment schemes.**

**Observations:** The theory classes will be taught in Spanish and practical classes as stated in the course sheet available on the website of the degree.

## 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 basic knowledge of physics, chemistry and mass- and energy-balances.

## OUTCOMES

### 1401 - Degree in Chemical Engineering

- G3 - Knowledge of basic and technological subjects that allows students to learn new methods and theories and provides them with versatility to adapt to new situations.
- G4 - Ability to solve problems with initiative, decision-making skills, creativity and critical reasoning and to communicate and transmit knowledge, abilities and skills in the field of industrial engineering.



- G5 - Knowledge to carry out measurements, calculations, assessments, appraisals, surveys, studies, reports, work plans and analogous work.
- G6 - Ability to deal with specifications, regulations and mandatory standards.
- G7 - Ability to analyse and assess the social and environmental impact of technical solutions.
- G8 - Ability to apply the principles and methods of quality control.
- G11 - Knowledge, understanding and ability to apply the necessary legislation for practising professionally as a qualified industrial technical engineer.
- R10 - Basic and applied knowledge of environmental technologies and sustainability.

## LEARNING OUTCOMES

### Learning outcomes

- Know the origins of environmental contamination (Competences G3, G5 and R10).
- Establish the criteria for the evaluation of water quality (Competences G3, G4, G5, G6, G7, G8, G11 and R10).
- Acquire knowledge of the different types of discharges, waste and emissions into the atmosphere, and their problems (Competences G3, G4, G5, G6, G7, G11 and R10).
- Know the problem of soil contamination (Competences G3, G6 and G7).
- Establish the legislative framework in environmental matters (Competences G5, G6 and G11).
- Acquire knowledge of waste, effluent and emission management strategies (Competences G6, G7, G8, G11 and R10).
- Know the concept of sustainability and its application to the industry (Competences G3, G7 and R10).
- Acquire basic knowledge of water, waste and atmospheric emission treatment schemes (Competencies G3, G8 and R10). Skills to acquire

### The student must be able to:

- Recognize the origins and sources of polluting agents of water, the atmosphere and the soil. Understand the application of the principles of sustainability in production processes.
- Describe the objectives and characteristics of Environmental Management Systems.
- Identify the functions of the engineer in environmental aspects. Recognize the parameters for evaluating the quality of water, air and soil.
- Identify the different types of discharges, waste and emissions into the atmosphere and their problems.
- Collect and understand environmental regulations.
- Define the principles of environment-oriented design and the tools for its application.
- Consider the different options for waste and emissions management. List the principles of integrated pollution prevention. Gather information on Best Available Techniques.
- Recognize the main schemes for water treatment, waste and emissions into the atmosphere.

In addition to the specific objectives indicated above, during the course the development of various



social and technical skills will be encouraged, among which it is worth highlighting:

- Critical analysis and synthesis capacity
- Appropriate use of scientific-technical terms
- Oral and written communication skills
- Skills in interpersonal relationships
- Ability to learn autonomously
- Creativity
- Ability to explore new situations

## **DESCRIPTION OF CONTENTS**

### **1. ORIGINS AND PROBLEMS OF ENVIRONMENTAL POLLUTION**

Economy, Society and Environment. Interaction between industry and environment. Concept of sustainability and its integration into production processes. Tools for sustainable development in the industry. Environmental Management Systems. Functions of the engineer.

### **2. WASTE AND EMISSIONS MANAGEMENT STRATEGIES**

Waste and air emissions. Legal Framework. Prevention/minimization, reuse, recycling, valorization, final treatment.

### **3. DESIGN FOR ENVIRONMENT**

Integrated Product Policy. Life cycle analysis. Ecodesign. Design for X.

### **4. INTEGRATED POLLUTION PREVENTION IN INDUSTRIAL PROCESSES**

Legal Framework. Types of actions. Best available technologies. Lines of action.

### **5. POLLUTION CHARACTERIZATION**

Assessment of water quality. Types of waste and characterization. Air pollutants. Measurement and control of air quality. Soil contamination. Other types of pollution.

### **6. TECHNOLOGIES FOR THE MANAGEMENT AND TREATMENT OF WASTE AND EMISSIONS**

Wastewater, waste and atmospheric emissions treatment schemes.



## WORKLOAD

ACTIVITY	Hours	% To be attended
Theory classes	45,00	100
Classroom practices	15,00	100
Development of group work	15,00	0
Development of individual work	15,00	0
Preparation of evaluation activities	20,00	0
Preparing lectures	20,00	0
Preparation of practical classes and problem	20,00	0
<b>TOTAL</b>	<b>150,00</b>	

## TEACHING METHODOLOGY

The methodology used in the course will consider the following aspects:

**Classroom Sessions:** a global view of each part will be offered to the students, and they will be focused on those key concepts that will be developed as well as resources to be used for further preparation of the subject in depth. These sessions will present examples and some practical applications, will solve problems and will include presentations and work on groups to enhance the assimilation of the concepts introduced (Skills G3, G5, G6, G7, G8, G11 and R10).

**Practical Activities:** includes practical classes and seminars that will include, under the supervision of the teacher, practical problems and presentations (Skills G3, G4, G5, G6, G7, G8, G11 and R10).

## EVALUATION

Subject evaluation system

The subject will be evaluated, both in the first and second call, by continuous evaluation and by conducting a final objective test on the date of official call.

- Continuous evaluation: It consists of the realization and delivery of activities, not recoverable, in which the theoretical concepts studied in the classroom are worked on. Some of these activities must be carried out in the classroom sessions, while others consist on deliverable homework.
- Objective test: consists of an exam composed of a part of theory and a part of problems. To pass this test the student must obtain, at least 5 points out of 10.

The final grade will be obtained as the maximum grade of:

- Average of the grade of the activities delivered (50%) and the grade of the objective test (50%)





- Grade obtained in the objective test (100%)

The minimum grade to pass the subject is 5 points out of 10. The final grade of students who have not passed the course for having obtained in the objective test a mark less than 5 points out of 10, will be the grade obtained in the objective test.

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

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- Capuz, S.; Gómez, T. et al. (2002): ECODISEÑO. Ingeniería del ciclo de vida para el desarrollo de productos sostenibles". Editorial Universidad Politécnica de Valencia, Ref.: 2002.675. Valencia.
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- Rieradevall, J.; Vinyets, J. (1999): Ecodiseño y ecoproductos. Ed. Rubes. Barcelona
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- Weiner, R.F., Peirce, J.J., Vesilind, P.A. (1997) Environmental Pollution and Control. Ed. Butterworth-Heinemann. (Texto completo en línea)

### Additional

- Clemente, G.; Sanjuan, N. y Vivancos, J.L. (2005) Análisis de ciclo de vida: aspectos metodológicos y casos prácticos. Editorial Universidad Politécnica de Valencia, Ref.: 200.2533. Valencia.
- Elías, X. (2009) Reciclaje de residuos industriales. Residuos sólidos urbanos y fangos de depuradora. Ed. Diaz de Dantos



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- Vesilind, P.A. (2003) Wastewater treatment plant design. Ed. IWA Publishing
- Wark, K.; Warner, C.F.; Davis, W.T. (1998) Air pollution. Its origin and control. Ed. Addison-Wesley
- Woodard & Curran, Inc. (2005) Industrial Waste Treatment Handbook. Ed. Butterworth-Heinemann.(Texto completo en línea)