

Academic Year/course: 2022/23

28809 - Environmental Engineering

Syllabus Information

Academic Year: 2022/23

Subject: 28809 - Environmental Engineering

Faculty / School: 175 - Escuela Universitaria Politécnica de La Almunia

Degree: 424 - Bachelor's Degree in Mechatronic Engineering

ECTS: 6.0

Year: 1

Semester: Second semester

Subject Type: Compulsory

Module:

1. General information

1.1. Aims of the course

On 25 September 2015, the United Nations General Assembly adopted the Resolution "*Transforming our world: the Agenda 2030 for Sustainable Development*". The Resolution, supported by the 193 member countries, includes two essential contents: the Agenda 2030 and the 17 SDG. Agenda 2030 is a roadmap that aims to achieve Sustainable Development by that date and, to achieve it, it sets out 17 objectives, the so-called Sustainable Development Goals.

The official implementation of Agenda 2030 began on 1 January 2016, and since then countries have carried out their gradual process of implementation and produced follow-up reports at the national and regional levels. The Agenda aims to respond to the most pressing challenges facing global society.

Aims:

1. To show the basic concepts of analysis of environmental factors and their interrelationship.
2. To show the concepts that allow the analysis of the interactions between the activity of the human being and the environment.
3. Show the tools for identification, assessment, mitigation of environmental impacts.
4. To show the general principles of the tools available for good environmental management
5. To make known the basic environmental regulations in place, (European, state and regional).
6. Ability to analyse social, economic and environmental realities and, therefore, to identify and characterise the challenges we must face
7. Ability to shape solutions to our society's problems.
8. Ability to promote critical and systemic thinking
9. Ability to exercise social leadership role.
10. Ability to become a reference in the implementation of sustainability oriented measures.
11. Capacity to generate new questions to inspire new lines of research and development of socially relevant and pertinent knowledge.
12. Potential to generate alliances with other social agents (Public Administrations, companies, social entities) for the joint development of knowledge and its practical application.

These approaches and objectives are aligned with the following Sustainable Development Goals (SDGs) of the United Nations 2030 Agenda in such a way that the acquisition of the subject learning outcomes provides training and competence to contribute to some extent to their achievement. <https://sdgs.un.org/goals>

- Goal 5: Achieve gender equality and empower all women and girls
- Goal 6: Ensure access to water and sanitation for all
- Goal 9: Build resilient infrastructure, promote sustainable industrialization and foster innovation.
- Goal 12: Ensure sustainable consumption and production patterns
- Goal 13: Take urgent action to combat climate change and its impacts

1.2. Context and importance of this course in the degree

The environment is a constant concern of our society. The environmental factors, the interrelationship between them, the interactions of the human species with its environment are the object of studies and analysis. One of the major interactions that take place between human beings and their environment is linked to industrial activity.

This course is primarily aimed at training engineers capable of identifying the environmental aspects and impacts of the industry, in order to minimize, prevent and solve them. To this end, the course begins by describing and studying the links between the company and the environment. Then, all the vectors of pollution and environmental technology are studied for each of them.

Finally, basic knowledge of environmental management (Environmental Regulations, Environmental Management Systems, Environmental Impact Assessment) is given so that the student knows the most useful and effective environmental tools for the industry.

The subject of Environmental Engineering is part of the Degree in Industrial Organization Engineering taught by the EUPLA, within the group of subjects that make up the module called Basic. It is a first year subject located in the second semester and of a compulsory nature (OB), with a teaching load of 6 ECTS credits.

The need for the subject within the curriculum of this degree is more than justified since, being a subject with a markedly transversal character, it influences the approach of the rest of the subjects taught, adding the environmental variable to them

1.3. Recommendations to take this course

The development of the subject of Environmental Engineering requires putting into play knowledge and strategies from subjects related to Social and Natural sciences

This course is part of the basic training to be studied in this grade and does not have any regulatory prerequisite or require specific complementary knowledge. Therefore, the above is understood from a formal point of view, although it is necessary to be clear that an adequate training base is needed in the above disciplines.

2. Learning goals

2.1. Competences

GI03: Knowledge in basic subjects and technology, which enables them to learn new methods and theories, and gives them versatility to adapt to new situations.

GI04: Ability to solve problems with initiative, decision making, creativity, critical reasoning and to communicate and transmit knowledge, skills and abilities in the field of Industrial Engineering and in particular in the field of industrial electronics.

GI06: Capacity to handle specifications, regulations and standards of obligatory compliance. GI07: Ability to analyze and assess the social and environmental impact of technical solutions

GI11: Knowledge, understanding and ability to apply the necessary legislation in the exercise of the profession of Industrial Technical Engineer in the field of industrial electronics.

GC02: Interpret experimental data, contrast it with theoretical data and draw conclusions. GC03: Ability to abstract and reason logically

GC04: Ability to learn continuously, self-directed and autonomous GC05: Ability to evaluate alternatives.

GC06: Ability to adapt to rapidly evolving technologies

GC07: Ability to lead a team as well as to be a committed member of the team GC08: Ability to locate technical information and understand and evaluate it.

GC09: Positive attitude towards technological innovations.

GC10: Ability to write technical documentation and to present it with the help of appropriate computer tools.

GC11: Ability to communicate their reasoning and design clearly to specialized and non-specialized audiences

GC12: Knowledge of safety, certification, industrial property and environmental impacts E110: Basic knowledge and application of environmental technologies and sustainability

2.2. Learning goals

In order to pass this course, the student must demonstrate the following results...

- It recognizes and knows how to assess the effect that pollutants produce on the receiving environment: atmosphere, water and soil.
- Knows how to analyse an industrial activity and identify the environmental problems that it may generate Knows how to analyse an industrial activity and identify the environmental problems that it may generate Knows how to plan a strategy for the prevention and control of pollution in specific cases
- He knows how to select the most appropriate technique for purification and/or contamination control in specific cases.
- It is capable of sizing simple water, air and soil pollution control installations.

- Analyses the impact of different industrial activities on the environment.
- It is capable of applying the foundations of an Environmental Management System in an industrial activity.
- Knows the basic regulations related to the environment (spills, atmosphere, waste, impact and integrated pollution control) and the obligations arising therefrom.
- Knows and applies the DSG

2.3. Importance of learning goals

This course offers a holistic view of the environment. In the development of it, a global vision of the knowledge and interrelation of environmental factors is given.

This course will allow students to integrate the environmental variable in all the activities of the company, with this action it will be possible to determine and prevent the environmental impacts of the industrial activity before they occur. As well as using tools of minimization and correction once produced.

3. Assessment (1st and 2nd call)

3.1. Assessment tasks (description of tasks, marking system and assessment criteria)

The student must demonstrate that he/she has achieved the intended learning outcomes through the following assessment activities

The evaluation process will include two types of action:

A system of continuous evaluation, which will be carried out throughout the learning period.

A comprehensive assessment test reflecting the achievement of learning outcomes, at the end of the teaching period.

1.- Continuous evaluation system.

The system of continuous evaluation will have the following group of qualifying activities:

- Individual and group activities in class.
- Exercises, theoretical questions and proposed works.
- Written assessment tests: these will be carried out in order to regulate learning, stimulate the distribution of effort over time and provide a more individualised assessment tool for the educational process. These tests will include theoretical and/or practical questions on the different subjects to be evaluated. The total number of tests will be two, spread out over the entire semester and will last a maximum of two hours.

To pass the course it will be necessary to have a score of 4 points in each of the theoretical exams that make up the course, since with lower scores it will not be averaged with the practical part.

A fundamental requirement for passing the course by continuous assessment is to attend a minimum of 80% of the course's classroom activities.

2.- Overall final evaluation test.

As in the previous assessment methodology, the overall final assessment test should aim to check whether the learning outcomes have been achieved, as well as to contribute to the acquisition of the various competences, if possible through more objective activities.

The overall assessment test will have the same groups of activities. Students who are going to use this assessment system will have to hand in the same papers prepared in the continuous assessment system and take the same exams as those taken in the continuous system, only that they are taken in the same examination session.

4. Methodology, learning tasks, syllabus and resources

4.1. Methodological overview

Strong interaction between the teacher/student. This interaction is brought into being through a division of work and responsibilities between the students and the teacher. Nevertheless, it must be taken into account that, to a certain degree, students can set their learning pace based on their own needs and availability, following the guidelines set by the teacher.

The current subject is conceived as a stand-alone combination of contents, yet organized into three fundamental and complementary forms, which are: the theoretical concepts of each teaching unit, the solving of problems or resolution of questions and laboratory work, at the same time supported by other activities

The organization of teaching will be carried out using the following steps:

- **Lectures:** Theoretical activities carried out mainly through exposition by the teacher, where the theoretical supports

of the subject are displayed, highlighting the fundamental, structuring them in topics and or sections, interrelating them.

- **Practice Sessions:** The teacher resolves practical problems or cases for demonstrative purposes. This type of teaching complements the theory shown in the lectures with practical aspects.
- **Laboratory Workshop:** The lecture group is divided up into various groups, according to the number of registered students, but never with more than 20 students, in order to make up smaller sized groups.
- **Individual Tutorials:** Those carried out giving individual, personalized attention with a teacher from the department. Said tutorials may be in person or online.

The approach, methodology and assessment of this guide are intended to be the same for any teaching scenarios. They will be adapted to the social-health situation at any particular time, as well as to the instructions given by the authorities concerned.

4.2. Learning tasks

Involves the active participation of the student, in a way that the results achieved in the learning process are developed, not taking away from those already set out, the activities are the following:

? **Face-to-face generic activities:**

? **Theory Classes:** The theoretical concepts of the subject are explained and illustrative examples are developed as a support to the theory when necessary.

? **Practical Classes:** Problems and practical cases are carried out, complementary to the theoretical concepts studied.

? **Laboratory Workshop:** This work is tutored by a teacher, in groups of no more than 20 students.

? **Generic non-class activities:**

? Study and understanding of the theory taught in the lectures.

? Understanding and assimilation of the problems and practical cases solved in the practical classes.

? Preparation of seminars, solutions to proposed problems, etc.

? Preparation of laboratory workshops, preparation of summaries and reports.

? Preparation of the written tests for continuous assessment and final exams.

The subject has 6 ECTS credits, which represents 150 hours of student work in the subject during the trimester, in other words, 10 hours per week for 15 weeks of class.

A summary of a weekly timetable guide can be seen in the following table. These figures are obtained from the subject file in the Accreditation Report of the degree, taking into account the level of experimentation considered for the said subject is moderate.

Activity	Weekly school hours
Lectures	3
Laboratory Workshop	1
Other Activities	6

4.3. Syllabus

1.- THEORETICAL CONTENTS

The subject matter of the course is developed around the following thematic blocks:

Topic 1 Introduction to the Environment. Environmental regulations.

- Introduction: environment and sustainable development
- Risk and globalization
- Environmental crisis and prospects for analysis
- Environmental problems, human problems

Topic 2 Environment and enterprise.

- Introduction Environmental economics
- The evolution of environmental issues in economic thought
- Environmental economics: principles and applications
- Neoclassical internationalisation of externalities: PIGOU and COASE models Ecological economics vs. environmental economics
- The environmentalization of the company Life cycle analysis
- The Green Economy

Item 3 Pollution

- Air pollution
- Water pollution
- Waste

Theme 4 Environmental Policies.

- Environmental law and the right to sustainability
- Environmental law in the EU
- Environmental law in Spain
 - Environmental Liability Act
 - Integrated Pollution Prevention and Control Act
 - Environmental Impact Assessment of Projects Act

Theme 5 Environmental Management Introduction

- Environmental Management Systems (EMS)
- Advantages and disadvantages of applying an EMS
- Standard UNE in ISO 14.001 and European regulation (EMAS)

2.- PRACTICAL CONTENTS

Each topic exposed in the previous section, has associated practical exercises on real cases of application in different companies of the sector: engineering, industries and the free exercise of the profession.

4.4. Course planning and calendar

The planning orientation is shown below

Week/Topic

- 1st Introduction.
- 2nd Introduction.
- 3rd Introduction.
- 4th Environment and Business.
- 5th Environment and Business.
- 6th Atmospheric Pollution.
- 7th Atmospheric Pollution
- 8th Atmospheric Pollution
- 9th Waste
- 10th Water.
- 11th Water
- 12th Environmental Policies.
- 13th Environmental Policies.
- 14th Environmental Management Systems
- 15th Environmental Management Systems

MATERIAL RESOURCES

Material	Format
Topic theory notes Topic problems	Paper/repository
Topic theory notes Topic presentations Topic problems Related links	Digital/Moodle E-Mail
Educational software	Web page

The timetables and dates of the final exams will be those published officially at:

<https://eupla.unizar.es/asuntos-academicos/calendario-y-horarios>

<https://eupla.unizar.es/asuntos-academicos/examenes>

4.5. Bibliography and recommended resources

<http://psfunizar10.unizar.es/br13/egAsignaturas.php?codigo=28809>