

**COURSE DATA****DATA SUBJECT**

**Code:** 43807  
**Name:** Water treatment  
**Cycle:** Master's Degree  
**ECTS Credits:** 9  
**Academic year:** 2026-27

**STUDY (S)**

Degree	Center	Acad. year	Period
2250 - Master's Degree in Environmental Engineering	Escola Tècnica Superior d'Enginyeria	1	First quarter

**SUBJECT-MATTER**

Degree	Subject-matter	Character
2250 - Master's Degree in Environmental Engineering	Tratamiento de aguas	COMPULSORY

**COORDINATION**

RUANO GARCIA MARIA VICTORIA

BORRAS FALOMIR LUIS

**SUMMARY**

Professors UPV: Ramón Barat Baviera y Arcadio Agustín Pascual López

The subject Water treatments is a compulsory subject of four-monthly character that is taught in the first semester of the Master in Environmental Engineering. The subject, of 9 ECTS, has a theoretical-practical nature, so the theoretical knowledge is complemented both with the resolution of issues and problems and with the realization of lab work and practices. The subject aims to provide the student with the knowledge and skills necessary for the pre-design of water treatment facilities for human consumption or supply to facilities as well as the treatments applied in the treatment of urban and industrial wastewater. Therefore, the subject serves as the basis for the mandatory subject "Advanced modeling of water treatments", as well as the optional "Management of sewage treatment plants" and "Simulation and advanced design of sewage treatment plants".

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**PREVIOUS KNOWLEDGE**



## RELATIONSHIP TO OTHER SUBJECTS OF THE SAME DEGREE

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

## OTHER REQUIREMENTS

RELATIONSHIP WITH OTHER SUBJECTS IN THE SAME DEGREE: Recommended knowledge: Environmental Quality Assessment

The Water Treatment course serves as the basis for the compulsory course Advanced Water Treatment Modeling (taught in the second semester), as well as the elective courses Wastewater Treatment Plant Management and Advanced Simulation and Design of Wastewater Treatment Plants, taught within the WWTP Management specialization (in the third semester).

## COMPETENCES / LEARNING OUTCOMES

### 2250 - Master's Degree in Environmental Engineering

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.

Carry out a comprehensive assessment of environmental water quality.

Characterise emissions to water.

Conduct appropriate experimentation, analyse and interpret data and use environmental engineering knowledge to draw conclusions.

Design, calculate and select engineering solutions to environmental problems, comparing alternatives that include emerging technologies under criteria of technical, social, economic and environmental viability.

Develop and apply mathematical models for the simulation, optimisation or control of processes in the field of environmental engineering.

Develop environmental solutions under the principles of circular economy and the sustainable development goals.

Identify, formulate and solve complex environmental engineering problems by applying engineering, scientific and mathematical principles.

Implement measures for preventing pollution and recovering, protecting and improving environmental quality.

Interpret and apply national and international environmental legislation and adapt environmental solutions to these regulations.

Learn and apply new knowledge, using appropriate learning strategies.

Manage and operate treatment and/or purification systems in the field of environmental engineering



Prepare and draft technical reports and/or environmental engineering projects considering technical, economic, social, energy and/or environmental aspects.

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.

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.

Work in a team effectively and with leadership, in a collaborative and inclusive environment, setting goals, planning tasks and meeting objectives.

## DESCRIPTION OF CONTENTS

### 1. Introduction to water treatment

Importance of water treatment. Legislation. Characterization of water. Methods for water treatment. Schemes of treatment. Sustainable management of water quality.

### 2. Physical treatments of water

Screening. Homogenization. Mixing. Flocculation. Sedimentation. Floatation. Aeration. Filtration. Membrane processes.

### 3. Chemical treatments of water

Precipitation. Coagulation. Adsorption. Oxidation. Ionic change. Disinfection.



## 4. Physical and chemical treatments of sludge

Introduction. Microbiology of processes. Kinetics and stoichiometry of the reactions.

## 5. Biological methods of wastewater treatment

5.1. Biological processes of suspension culture: Activated sludge. Removal of organic matter. Nitrification. Denitrification. Advanced treatments: Aerobic biomembrane reactors, SHARON Process, ANAMMOX, BABE. Biological removal of phosphorus. Wastewater treatment plants for the biological removal of nutrients. Aerobic digestion of sludge. Anaerobic treatment of suspension culture. Anaerobic membrane bioreactors. Anaerobic digestion of sludge.

5.2. Biological Processes of Solid Support: Tricking filters. Rotating biological contactors. Peat beds. Anaerobic processes of fixed biomass.

## 6. The new WWTP as resource recovery plant

## 7. Laboratory practices

Jar-test.

Study of the activated sludge process in a pilot plant.

Study of the zonal sedimentation process.

Calibration of the parameters of the biological model of the activated sludge process.

## WORKLOAD

### PRESENCIAL ACTIVITIES

Activity	Hours
Tutorials	4,00
Theory	30,00
Theoretical and practical classes	2,00
Seminar	2,00
Laboratory	28,00
Classroom practices	24,00
<b>Total hours</b>	<b>90,00</b>

### NON PRESENCIAL ACTIVITIES

Activity	Hours
Attendance at other activities	5,00
Individual or group project	45,00
Independent study and work	10,00



Preparation of lessons	35,00
Preparation for assessment activities	30,00
Resolution of case studies	10,00
<b>Total hours</b>	<b>135,00</b>

## TEACHING METHODOLOGY

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

### ¿ Theoretical activities.

Description: In the theoretical classes the topics will be developed providing a global and integrating vision, analyzing in greater detail the key aspects and of greater complexity, promoting, at all times, 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:

- Classes of problems, questions in the classroom and resolution of practical cases including the use of specific software
- Discussion sessions and problem solving and exercises previously worked by the students
- Laboratory practices Visits to water treatment facilities
- Conferences and seminars
- Programmed tutoring (individualized or in groups)
- Realization of individual evaluation questionnaires in the classroom with the presence of the teacher.

### ¿ Student's personal work.

Description: Realization (outside the classroom) of monographic works, directed bibliographic search, 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 (2-4) of work, issues, problems outside the classroom. This task complements the individual work and fosters the capacity for integration in work groups.

The e-learning platform (Virtual Classroom 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

Evaluation of laboratory practices: It will be carried out based on the evaluation of the corresponding reports. It will be valued at 30% of the final grade. In any case, it will be necessary to obtain at least 40 points out of 100 for it to count in the final grade. Attendance at laboratory practice sessions is mandatory. (Recoverable act)

Work: the student must complete one or two works proposed by the teacher that will be valued at 35% of the final grade. It will be necessary to obtain 50 points out of 100 in each of them for it to be taken into account in the final grade. (Recoverable act)

Final exam: the student must take a written exam at the end of the semester that will be valued at 30% of the grade. For it to count in the final grade, a minimum of 40 points out of 100 must be obtained. (Recoverable act)

Continuous evaluation: based on the student's participation and degree of involvement in the teaching-learning process, taking into account regular attendance at the planned face-to-face activities and the resolution of proposed issues and problems. It will be valued with 5% of the final grade.

Failure to achieve any of the minimum qualifications stated will mean failing the subject. For Passing the subject will require obtaining at least 50 points out of 100 in the final grade.

Copying or plagiarism of any activity that is part of the evaluation will result in the impossibility of passing the course, and the student will then be subject to the appropriate disciplinary procedures indicated in the ACTION PROTOCOL FOR FRAUDULENT PRACTICES AT THE UNIVERSITY OF VALENCIA (ACGUV 123/2020).

## REFERENCES

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