COURSE DATA

DATA SUBJECT

Code: 36486
Name: Water treatment technologies
Cycle: Undergraduate Studies
ECTS Credits: 4.5
Academic year: 2026-27

STUDY (S)

Degree	Center	Acad. year	Period
1401 - Degree in Chemical Engineering	Escola Tècnica Superior d'Enginyeria	4	Second quarter

SUBJECT-MATTER

Degree	Subject-matter	Character
1401 - Degree in Chemical Engineering	Optional subjects	ELECTIVES

COORDINATION

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SUMMARY

The subject **Water Treatment** is an elective four-monthly subject that is taught in the fourth year and second semester of the Degree in Chemical Engineering. The subject is part of the group of subjects focused on Environmental Engineering taught in the Chemical Engineering Degree and complete the knowledge acquired in the subjects Sustainability and Environment and Environmental Pollution Engineering, both compulsory and taught in the second and third degree course, respectively.

The subject, of 4.5 ECTS, includes theoretical and practical tasks, so that the theoretical knowledge is complemented by the resolution of problems and by carrying out different assignments. This subject aims to provide students with the knowledge and skills necessary for the preliminary design of water treatment facilities for human consumption or provision of facilities and treatments applied in the purification of urban and industrial wastewater.

To do this, firstly, the most common physical and chemical methods for treatment of water and wastewater are developed in detail. This is followed by a thorough study of the biological treatments, which are widespread used in the treatment of urban and industrial wastewater. The complexity of these processes justifies the importance of a detailed study of them. Aspects concerning the process microbiology, kinetics and stoichiometry of biochemical reactions, types of processes, process schemes, applicability, etc. are included in. Emphasis will be placed on

technologies aimed at the simultaneous removal of organic matter and nutrients. Finally, the problem of sludge production and the existing treatment methods are studied. The knowledge will be consolidated through class exercises involving the completion of the preliminary design of various wastewater treatment plants.

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 in the curriculum. In order to successfully tackle the subject, it is advisable that the student has passed or is studying the subjects Environment and Sustainability and Environmental Pollution Engineering, as well as other fundamental subjects of Chemical Engineering such as Basis of Chemical Engineering I, Unit Operations of Chemical Engineering and Chemical Reaction Engineering addressed in previous semesters.

COMPETENCES / LEARNING OUTCOMES

1401 - Degree in Chemical Engineering

Act autonomously in learning, make informed decisions in different contexts, issue judgements based on experimentation and analysis and transfer knowledge to new situations.

Contribute to the design, development and implementation of solutions that respond to social demands, guided by the Sustainable Development Goals.

Demonstrate critical and self-critical thinking, considering professional ethics, moral values and social implications of the different activities carried out throughout the degree.

Propose creative and innovative solutions to complex situations or problems, typical of the area of ¿¿¿¿connection, to donate responses to the various professional and social needs

Recognise and apply the basic principles of the various subjects within this applied and professional field to deepen the learning outcomes already covered in the core subjects.

DESCRIPTION OF CONTENTS

1. Water treatment introduction

Importance of water treatment. Legislation. Water treatment methods. Treatment schemes. Sustainable

management of water quality. Water and SDG.

2. Physical treatment of waters

Screening. Flow equalization. Mixing. Flocculation. Sedimentation. Flotation. Aeration. Filtration. Membrane processes.

3. Chemical treatment of waters

Precipitation. Coagulation. Adsorption. Oxidation. Ion exchange. Disinfection.

4. Physical and chemical treatment of sludge

Thickening. Stabilization. Dehydration. Minimization.

5. Biological methods for wastewater treatment

Introduction to biological treatments. Microbiology of treatment processes. Kinetics and stoichiometry of the reactions.

6. Suspended-growth biological processes I

Activated sludge. Organic matter removal. Nitrification. Denitrification. Advanced treatment: aerobic/anaerobic membrane bioreactors, SHARON process, ANAMMOX, BABE. Biological phosphorus removal. Wastewater treatment plants for biological nutrient removal. Water resource recovery facilities.

7. Suspended-growth biological processes II

Aerobic digestion of sludge. Anaerobic suspended-growth treatments. Anaerobic membranes bioreactors. Anaerobic digestion of sludge.

WORKLOAD

PRESENCIAL ACTIVITIES

Activity	Hours
Theory	25,00
Classroom practices	20,00
Total hours	**45,00**

NON PRESENCIAL ACTIVITIES

Activity	Hours

Attendance at other activities	0,00
Individual or group project	20,00
Independent study and work	20,00
Preparation of lessons	12,50
Preparation for assessment activities	10,00
Resolution of case studies	5,00
Total hours	**67,50**

TEACHING METHODOLOGY

The development of the subject is structured around four axes: the lecture sessions, practical activities, the fulfilment of an individual project and tutorials:

Lecture sessions: A combination of a lecture and a flipped classroom will be used, where the teacher will give a global and integrating vision of the subject, emphasizing the key aspects for understanding it, encouraging student participation at all times. Likewise, the appropriate resources will be recommended for the subsequent deepening of the subject by the Student.

Practical activities: activities will complement the lecture sessions with the aim of applying the basics and expand the knowledge and experience acquired during the realization of the work proposed. These activities include one or more of the following types of classroom activities: classes of problems, discussion sessions, problem solving exercises and solving of previously worked problems by the students. Also, a visit to one or more wastewater treatment plants in the area of Valencia will be planned.

Fulfilment of projects: Students must take a compulsory project that will be delivered on the agreed date.

Tutorials: The tutorials will arise as sessions to resolve any doubts arising from the resolution of the problems or work that students must perform on their own. In addition, the teacher will guide the student on the most appropriate methodology for learning basic knowledge of the subject. Tutorials will be conducted both individually and at the group level with the frequency that the teacher deems appropriate. In the latter, the main difficulties encountered in solving a number of problems that students have solved and delivered previously will discuss.

EVALUATION

Method of evaluation A:

Assessment of learning by the students will take place through continuous assessment and a final

assessment that will include:

Individual project: the student must fulfil an individual project proposed by the teacher which will be valued at 45% of the final grade (minimum grade to pass the subject is 5.0).

Final exam: the student will have to take a final exam where the fundamental concepts of the subject will be evaluated. The exam will be assessed with 35% of the final grade. The minimum grade of the exam to pass the subject will be 5.0.

Continuous assessment: based on the participation and degree of involvement of the student in the teaching-learning process, considering the resolution of questions and problems proposed (20%).

In order to be eligible for mode A, a minimum of 80% of the proposed activities must be completed.

Assessment modality B:

Alternatively, to the assessment method described above, the assessment may be carried out by means of a final assessment which will include the submission of a paper which will have a weight of 55% and a final exam which will have a weight of 45%. The minimum marks for the paper and final exam must be 5.0 in order to pass the course.

The final grade will be considered the maximum of the two modalities, as long as you can opt for evaluation modality A.

The copy or plagiarism of any activity that is part of the evaluation will mean the impossibility of passing the subject, being subsequently subjected to the appropriate disciplinary procedures indicated in the PROTOCOL OF ACTION AGAINST FRAUDULENT PRACTICES AT THE UNIVERSITAT DE VALÈNCIA (ACGUV 123/2020).

In any case, the evaluation system will be governed by the provisions of the Regulation of evaluation and grading of the University of Valencia for bachelor's and master's degrees (ACGUV 108/2017).

REFERENCES

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