VNIVERSITAT DE VALÈNCIA

Course Guide
43807 Water treatment

COURSE DATA

Data Subject	
Code	43807
Name	Water treatment
Cycle	Master's degree
ECTS Credits	9.0
Academic year	2020 - 2021

Study (s)

Degree	Center	Acad. year	Period
2227 - M.U. en Ingeniería Ambiental	School of Engineering	1	First term

Subject-matter

Degree	Subject-matter	Character
2227 - M.U. en Ingeniería Ambiental	2 - Water treatment	Obligatory

Coordination

Name	Department
SECO TORRECILLAS, AURORA	245 - Chemical Engineering

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”.

PREVIOUS KNOWLEDGE

Relationship to other subjects of the same degree

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

Other requirements

The subject of Water Treatment serves as the basis for the compulsory subject Advanced modeling of water treatments (taught in the second semester), as well as the optional Sewage treatment plant management and Simulation and advanced design of sewage treatment plants , taught within the specialty in EDAR Management.

Environmental quality assessment

OUTCOMES

2172 - M.U. en Ingeniería Ambiental

- 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.
- Identify and apply technologies, tools and techniques in the field of environmental engineering.
- Assume with responsibility and ethics the Environmental Engineer role in a professional context.
- Adapt to changes, being able to apply the principles of Environmental Engineering to unknown cases and use new and advanced technologies and other relevant developments, with initiative and entrepreneurial spirit.
- Identify, declare and entirely analyze environmental problems.
- Design and calculate engineering solutions to environmental problems, comparing and selecting technical alternatives and identifying emerging technologies.
- Understand and apply environmental national and international legislation, adapting environmental solutions to these regulations.

- Evaluate the environmental quality of water from a global point of view, especially when there is a risk to public health.
- Be able to characterize the emissions to water, coming from the anthropogenic activity.
- Evaluate the treatment of wastewaters emissions to assess different alternatives and obtain the required information for the design of the selected treatment processes.
- Design and manage wastewater treatment systems.

LEARNING OUTCOMES

1 Establish the criteria for the evaluation of water quality.

2 Apply the principles of sustainability to water treatment processes.

3 Know the possibilities of using wastewater as a source of resources.

4 Know and apply the different physical, chemical and biological processes for water treatment.

5 Evaluate different treatment alternatives from a technical, economic and social point of view.

6 Acquire the ability to plan, design and operate facilities for water treatment.

7 Know and apply advanced technologies for the treatment of persistent and emerging pollutants.

8 Know and apply advanced technologies for the minimization of sludge production and for its valorisation.

9 Know the importance of control in treatment plants.

10 Acquire a global vision of a treatment plant integrating the different processes and lines of treatment involved.

11 Acquire experience at the laboratory level on the operation of water treatment plants.

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

6. Biological suspended growth processes I

Activated Sludge. Removal of organic matter. Nitrification. Denitrification. Advanced treatments: aerobic biomembrane reactors, SHARON process, ANAMMOX, BABE. Biological phosphorus removal. Wastewater treatment plants for biological nutrient removal.

7. Procesos biológicos de cultivo en suspensión II

Digestión aerobia de fangos. Tratamientos anaerobios de cultivo en suspensión. Reactores de biomembranas anaerobios. Digestión anaerobia de fangos.

8. Fixed-deb biological processes

Trickling filters. Rotating biological contactors. Peat beds. Fixed-bed anaerobic processes.

9. 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

ACTIVITY	Hours	% To be attended
Theory classes	34,00	100
Laboratory practices	28,00	100
Classroom practices	19,00	100
Theoretical and practical classes	5,00	100
Tutorials	4,00	100
Attendance at events and external activities	5,00	0
Development of group work	45,00	0
Study and independent work	10,00	0
Preparation of evaluation activities	30,00	0
Preparing lectures	20,00	0
Preparation of practical classes and problem	25,00	0
TOTAL	**225,00**	

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 and questions in the classroom
- 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 done from the evaluation of the corresponding reports. It will be valued with 30% of the final grade. It will be necessary to obtain at least 35 points out of 100 in each of the memories for averaging. In any case, it will be necessary to obtain at least 50 points out of 100 to compute in the final grade.

Work: the student must perform a work proposed by the teacher that will be assessed with 35% of the final grade. It will be necessary to obtain 50 points out of 100 to be taken into account in the final grade.

Final exam: the student must take a written exam at the end of the semester that will be assessed with 30% of the grade. To compute in the final grade must be obtained at least 35 points out of 100.

Continuous evaluation: based on the participation and degree of involvement of the student in the teaching-learning process, taking into account the 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 reach any of the minimum qualifications exposed will mean suspending the subject. To pass the subject it will be necessary to obtain at least 50 points out of 100 in the final grade.

Minimum attendance at the practices: 100%

REFERENCES

Basic

- Ferrer Polo, J., y Seco Torrecillas, A. Introducción a los tratamientos de aguas. Editorial UPV (309), 2011.
Ferrer Polo, J., y Seco Torrecillas, A. Tratamientos físicos y químicos de aguas residuales. Editorial UPV (197), 2011.
Ferrer Polo, J., y Seco Torrecillas, A. Tratamientos biológicos de aguas residuales. Editorial UPV (358), 2018.
Leslie Grady Jr. C.P.,. Daigger G.T., Lim, H.C.. Biological Wastewater Treatment. Marcel Dekker, Inc. New York, 1999.
Metcalf & Eddy. Wastewater Engineering: Treatment and reuse. 4th Ed. McGraw Hill, New York, 2003.
Water Environmental Federation. Wastewater Treatment Plant Design. WEF and IWA Publishing, Alexandria, 2003.
Changes in the Biochemical Oxygen Demand Procedure in the 21st Edition of Standard Methods for the Examination of Water and Wastewater (Young, James | Clesceri, Lenore | Kamhawy, Sabry | Young, James)

Additional

- American Public Health Association, American Water Works Association and Water Environment Federation. Standard Methods for the Examination of Water and Wastewater 20th edn, Washington DC, USA, 2005.
Cervantes, F., Pavlostathis, S., van Haandel, A. Advanced Biological Treatment Processes for Industrial Wastewaters. Principles & application. IWA Publishing, 2006.IWA. Process Science and Engineering for Water and Wastewater Treatment. IWAPublishing, London, 2002.
Seviour, R. And Nielsen, P.H. Microbial Ecology of Activated Sludge. IWA Publishing,London, 2010.
Gabriel Bitton. Wastewater microbiology. Wiley-Liss, cop. New York. 2005.

ADDENDUM COVID-19

This addendum will only be activated if the health situation requires so and with the prior agreement of the Governing Council

Contents
The contents initially collected in the teaching guide are maintained.

Volume of work and temporary planning of teaching

Regarding the workload:
One of the activities described in the Teaching Guide is eliminated: Visit to water treatment facilities. It is replaced by 5 hours of regulated tutoring.

Regarding the temporary planning of teaching
The material for the monitoring of classroom theory / practical classes allows to continue with the temporary teaching planning both in days and in hours, both if the teaching is in the classroom or not.

Teaching methodology
In the theory and classroom practices classes will tend to the maximum possible attendance, always respecting the sanitary restrictions. Depending on the capacity of the classroom and the number of students enrolled, it may be necessary to distribute the students into two groups. In this case, the subject will be taught in classrooms with streaming teaching capacity, with students being able to attend online and face-to-face simultaneously.

A rotation system will be established once the actual enrollment data is known, guaranteeing, in any case, that the attendance percentage of all the students enrolled in the subject is the same.

With respect to laboratory practices, attendance at sessions scheduled in the schedule will be totally face-to-face.

Once the actual enrollment data is available and the availability of spaces is known, the Academic Committee of the Degree will approve the Teaching Model of the Degree and its adaptation to each subject, establishing in said model the specific conditions in which it will be developed teaching the subject.

If there is a closure of the facilities for sanitary reasons that totally or partially affects the classes of the subject, these will be replaced by non-contact sessions following the established schedules.

Evaluation

The evaluation system described in the Teaching Guide of the subject in which the different evaluable activities have been specified as well as their contribution to the final grade of the subject is maintained. If there is a closure of the facilities for sanitary reasons that affects the development of any face-to-face evaluable activity of the subject, it will be replaced by a test of a similar nature that will be carried out in virtual mode using the computer tools licensed by the University of Valencia or by the Polytechnic University of Valencia. The contribution of each evaluable activity to the final grade for the course will remain unchanged, as established in this guide.

Bibliography
The bibliography recommended in the Teaching Guide is kept as it is accessible.