VNIVERSITAT DE VALÈNCIA

Course Guide
33093 Technology for pollution control

COURSE DATA

Data Subject	
Code	33093
Name	Technology for pollution control
Cycle	Grade
ECTS Credits	9.0
Academic year	2022 - 2023

Study (s)

Degree	Center	Acad. year	Period
1104 - Degree in Environmental Sciences	Faculty of Biological Sciences	3	First term

Subject-matter

Degree	Subject-matter	Character
1104 - Degree in Environmental Sciences	146 - Technologies for pollution control	Obligatory

Coordination

Name	Department
IZQUIERDO SANCHIS, MARTA	245 - Chemical Engineering
MARTI ORTEGA, NURIA	245 - Chemical Engineering

SUMMARY

The course Pollution Control Technologies is a mandatory course in the first quarter of the third degree course in Environmental Sciences. This course consists of 9 ECTS and is integrated on the Environmental Technology module (second and third year).

The course, based on previously developed skills in previously studied modules (general scientific bases, environmental microbiology, soil science, hydrology, meteorology, climatology and environmental regulations) together with the knowledge acquired in the subjects of the same module during the previous year (assessment of pollution and environmental engineering fundamentals), introduces the basic skills needed to understand and propose solutions from a technical perspective, environmental problems, once they have been generated.

The course addresses globally and integrally the different control systems related to water treatment and wastewater treatment, waste management and treatment, treatment of contaminated soils and control of atmospheric emissions.

The general objective of this subject is to know the fundamentals, field of application and necessary equipment related to the different physical, chemical and biological processes involved in the treatment of pollutants in water, soil and air, as well as to master the principles of management and treatment of waste. To achieve this general objective the student should be able to:

• Know the different water and wastewater treatment schemes and evaluate their applicability depending on the characteristics of the water to be treated and the quality objective pursued.

• Know all waste management operations, from generation to final destination. For a given residue, establish the most appropriate management scheme according to the existing conditions.

• Know the principles of action before a contaminated soil as well as the technical bases of the different treatments applicable to contaminated soils.

• Know the operation of the different equipment for purifying pollutants in air emissions, as well as the configurations adopted for the control of multiple pollutants.

The contents of the course are: Legal. Water treatment and wastewater treatment. Air pollution control. Waste management. Clean up of contaminated soils.

PREVIOUS KNOWLEDGE

Relationship to other subjects of the same degree

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

Other requirements

To have completed or be enrolled in all subjects of the modules " General Scientific Basis"and " Scientific bases of the natural environment "and the subject "Environmental Law and public administration ".

COMPETENCES (RD 1393/2007) // LEARNING OUTCOMES (RD 822/2021)

1104 - Degree in Environmental Sciences

- Conocer las técnicas de análisis y cuantificación de la contaminación.

LEARNING OUTCOMES (RD 1393/2007) // NO CONTENT (RD 822/2021)

- Know the engineering principles associated with technologies for pollution control.
- Know the technical limitations involving the application of legal regulations related to pollution control.
- Assess potential water and waste water treatment according to their characteristics and their post- use. Select alternatives. Select treatment plant schemes.
- Know the principles of waste management and the basis for developing waste management plans.
- Evaluate and select alternative waste treatment according to their characteristics.
- Be able to establish the right combination for the cleanup of contaminated soil.
- Establish the right schemes for air pollution control.
- Become familiar with specialized bibliographic sources to find, select and understand the information.
- Critically analyze the results in practical applications

DESCRIPTION OF CONTENTS

1. Waste and Wastewater Treatment

Unit 1.- Overview to water treatment.
Unit 2.- Standards of water quality.
Unit 3.- Flow and characteristics of wastewaters. Emission criteria.
Unit 4.- Physical and chemical water treatments.
Unit 5.- Biological wastewater treatments.
Unit 6.- Advanced treatments of wastewater.
Unit 7.- Sludge treatment.

2. Waste Management

Unit 8.- Waste generation.
Unit 9.- Waste management.
Unit 10.- Biodegradation treatment of organic waste.
Unit 11.- Thermal recovery from waste.
Unit 12.- Hazardous waste treatment and management.
Unit 13.- Landfill.

3. Clean up of contaminated soils

Unit 14.- General principles.
Unit 15.- Containment techniques.
Unit 16.- Physical and chemical treatment of contaminated soils.
Unit 17.- Bioremediation.
Unit 18.- Extraction and treatment of groundwater.

4. Air pollution control

Unit 19.- Air pollution control. Emission limits.
Unit 20.- Particulate control.
Unit 21.- Control of sulfur oxides and oxides of nitrogen.
Unit 22.- Control of VOC and odours.

5. Laboratory

Physical and chemical water treatment.
Biological wastewater treatment
Solidification/stabilization of hazardous waste.

WORKLOAD

ACTIVITY	Hours	% To be attended
Theory classes	56,00	100
Classroom practices	14,00	100
Laboratory practices	12,00	100
Tutorials	4,00	100
Computer classroom practice	4,00	100
Study and independent work	55,00	0
Preparing lectures	40,00	0
Preparation of practical classes and problem	40,00	0
TOTAL	**225,00**	

TEACHING METHODOLOGY

The methodology to be used in the subject will consider the following aspects:

Theoretical sessions: Students will be offered a global vision of the topic to be addressed and will focus on the key concepts that must be developed, as well as the resources to be used for the subsequent preparation of the subject in depth. In the case of an eminently applied subject, these sessions will consider, as an example, some practical applications in order to enhance the assimilation of the concepts introduced. The theory classes will be taught in a single group.

Practical classes sessions: In these sessions, on the one hand the teacher will make a series of problems-type of each of the contents that are developed. On the other hand, students will work similar problems supervised by the teacher. In addition, practical applications for the autonomous work of the students will be proposed. These sessions will take place in the classroom (with groups of 40 students).

Practical laboratory and computer classroom sessions: The student will perform three practical laboratory sessions of 4 hours. The students will perform in teams of 4 people maximum. Before each laboratory session, students must respond individually to a pre-preparation questionnaire for each practice. After completing the experimental part, 4 hours of work will be planned in the computer room in order to prepare the calculations associated with the results obtained in the laboratory (EXCEL spreadsheet). Finally, each team must present a report that integrates and encompasses all aspects covered in each of the sessions. Participation in all sessions is mandatory.

Visits: If sanitary conditions allow it, visits will be planned to industrial facilities in the metropolitan area of Valencia where you can visit up to two centers to choose between:

- Manises potabilization plant.

- Quart-Benager or Carraixet wastewater treatment plant.

- Los Hornillos waste and composting treatment plant.

- Picassent light packaging classification plant.

- Visit to a contaminated site.

Tutorials: students will be divided into small groups and participate in 4 sessions of 60 minutes that will take place at the end of each of the thematic modules. In them, the teacher will try to clarify concepts and solve doubts and propose the resolution and delivery of practical exercises.

EVALUATION

The evaluation of the subject is based on the following aspects:

1. **1. Follow-up evaluation (5%).** It will take into account mainly the face-to-face activities proposed by the faculty and the visits to industrial facilities.
2. **2. Questionnaires in virtual classroom (10%).** Individual questionnaires will be carried out to evaluate the content of each thematic block through the Virtual Classroom. The final grade will be the average of the questionnaires proposed.
3. **3. Practical classroom activities (10%).** Individual problems in the classroom or through Aula Virtual, proposed by the faculty will be evaluated. The final grade will be the average of the

proposed problems.

4. **4. Practical laboratory activities (20%).** The laboratory reports of each practice delivered as a team and the individual questionnaires of previous preparation of each laboratory session will be evaluated. The final grade will correspond to the average of the note of the reports. The minimum grade for each report must be equal to or higher than 3.5 out of 10, and the average score equal to or greater than 5.0 out of 10. Failure to pass the previous questionnaires will reduce the report's score by 1 point out of 10. Missing reports must be submitted again on second call.
5. **5. Exam (55%)**. There will be a written exam that will consist of theoretical-practical questions.

The subject will be considered passed when the weighted average grade is equal to or higher than 5 out of 10, as long as in the objective test a grade equal to or higher than 4.5 out of 10 is obtained. If the grade of the objective test is lower than 4.5 on 10, the qualification of the subject will be the grade obtained in the objective test. If the grade of a laboratory report is less than 3.5 out of 10, the final grade will be that of the report.

To request the advance notice of this subject, the student must take into account that he / she must have completed the compulsory activities indicated in the teaching guide.

The lack of attendance to the laboratory sessions and computer classroom is a non-recoverable activity.

REFERENCES

Basic

- Ingeniería Ambiental. G. Kiely (McGraw-Hill)
- Environmental Engineering. H.S. Peavy, D.R. Rowe, G. Tchobanoglous (McGraw-Hill)
- Contaminacion ambiental. Una vision desde la Química. Orozco y col. (Thomson)
- Ingeniería de aguas residuales. Tratamiento, vertido y reutilización. Metcalf & Eddy, Inc. (McGraw-Hill)
- Gestión de Residuos Tóxicos. Tratamiento, eliminación y recuperación de suelos. Lagrega, M.D., Buckingham, P.L. y Evans, J.C. (McGraw-Hill)
- Gestión integral de residuos sólidos. G. Tchobanoglous, H. Theisen, S.A. Vigil (McGraw-Hill)
- Ingeniería de control de la contaminación del aire. N. de Nevers (McGraw-Hill)
- Christensen, Thomas, Ed., 2010. Solid Waste Technology and Management, Wiley Online Library. Libro electrónico disponible en el Servei de Biblioteques UV

Additional

- Process Science and Engineering for Water and Wastewater Treatment. IWA (IWA Publishing)
- Tratamiento y valorización energética de residuos. X.E. Castells (Díaz de Santos)
- Soil Pollution. Origin, Monitoring & Remediation. I.A. Mirsal (Springer-Verlag)
- Air Pollution Control Engineering. L.K. Wang, N.C. Pereira, Y-T Hung (Humana Press)