SUBJECT TEACHING GUIDE

674 - Water Pollution

Master's Degree in Environmental Engineering and Management

Academic year 2026 - 2027

1. IDENTIFYING DATA					
Degree	Master's Degree in Environmental Engineering and Management			Type and Year	Compulsory. Year 1
Faculty	School of civil Engineering				
Discipline	Basis of Environmental Engineering				
Course unit title and code	674 - Water Pollution				
Number of ECTS credits allocated	7,5	Term		Semester based (2)	
Web					
Language of instruction	Spanish	English Friendly	Yes	Mode of delivery	Face-to-face

Department	DPTO. CIENCIAS Y TECNICAS DEL AGUA Y DEL MEDIO AMBIENTE
Name of lecturer	CARLOS RICO DE LA HERA
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Office	E.T.S. de Ingenieros de Caminos, Canales y Puertos. Planta: + 2. DESPACHO (2032)
Other lecturers	ANA LORENA ESTEBAN GARCIA RUBEN DIEZ MONTERO

3.1 LEARNING OUTCOMES
To Interpret and assess a water quality analysis, estimate its origin, evaluate its potential use, analyze the possible effects of its use, and determine possible non-compliance with its discharge or use.
Carry out, in a critical way, simplifications of reality and propose mathematical models of natural or artificial systems, especially through mass balance, to estimate the transformation of pollutants.
Carry out tests to characterize the water and define its traceability.
Design and size, with the help of all kinds of material, any water treatment process (purification for discharge, reuse or purification) or sludge, within the main water circuit.
Evaluate the operation, with the help of all types of material, of any water or sludge treatment process and propose improvement solutions

4. OBJECTIVES

Know the legislation related to water quality.
Raise mathematical models of physical systems especially through mass balance.
Carry out, critically, simplifications of reality to obtain models that make it possible to obtain a solution to the problem posed.
Understand the different variables that affect the quality of water in different receiving environments and propose solutions (based on mathematical models) in the event that water quality should be improved.
Sizing and evaluating, with the help of all kinds of material, any treatment process (purification for discharge or reuse) within the main water circuit.
Expose and explain the basic terms and concepts of the subject taught in the classes without the need for any help such as books or notes.

6. COURSE ORGANIZATION

CONTENTS	
1	1.- Water management. Water needs. Natural water. Impurities. Water pollution. Pollutants Sewage water or wastewater. Water quality parameters.
2	2.- Water quality control. Use. Applications. Natural waters. Wastewater discharges. Diffuse pollution.
3	3.- Effects of contamination in receiving environments. Self-purification. The quality of the water in the rivers. pollution of lakes and reservoirs. Water quality in estuaries. Wastewater discharge into the sea. Water quality models.
4	4.- Drinking water treatment and reuse: Objectives. Regeneration and purification of water
5	5.-WTP: Water Treatment Plants: Clarification processes. Sedimentation. Coagulation. Flocculation. Reagents. Settling tanks
6	6.- WTP: Filtration. Disinfection. Adsorption. Oxidation. Desalination.
7	7.- Wastewater treatment: Objectives. Treatment schemes. Purification of urban and industrial wastewater.
8	8.- WWTP: Pretreatments and Primary Treatments. Physical-Chemical Treatment. Chemical precipitation. Other treatment processes: flotation, ion exchange, membrane processes. Aeration and gas transfer
9	9.- WWTP, Biological Treatments: Fundamentals of biological processes. Suspension culture treatments. The active sludge process. Nutrient removal.
10	10.- WWTP, Biological Treatments: Fixed culture treatments, or biofilm processes. Trickling filters. Rotatory Biological Contractors or biodiscs. Tertiary treatment processes. Reuse of water.
11	11.- WWTP: Disposal and Treatment of Sludge. Goals. Production and characteristics. Introduction to sludge treatment. Processes of thickening, conditioning, stabilization, anaerobic digestion, dehydration. Final disposal and use. Normative. Pre-design of a sludge line.
12	12.-Wastewater Treatment in small communities.

7. ASSESSMENT METHODS AND CRITERIA

Description	Type	Final Eval.	Reassessment	%
Written exam	Written exam	No	Yes	60,00
Laboratory practices	Laboratory evaluation	No	No	10,00
Visits to facilities	Others	No	No	10,00
Resolution of practical case studies.	Work	No	Yes	20,00
TOTAL				100,00

Observations

Partial exams will be conducted by blocks throughout the course. These may exempt students from certain parts of the final exam, in which case the grade obtained in the exempted sections will be retained.Laboratory practicals will be carried out in the teaching laboratory and will be assessed through a report that students must prepare. The visits will take place throughout the subject and will be evaluated through reports prepared by the students.

Observations for part-time students
In the event that a part-time student is unable to complete the laboratory practicals and visits, these activities may be evaluated through additional assignments related to the laboratory practicals or the facilities visited.Attendance at the written exams cannot be substituted by any other activity.

8. BIBLIOGRAPHY AND TEACHING MATERIALS

BASIC

TEJERO, I., SUÁREZ, J., JÁCOME, A. Y TEMPRANO, J. (2004). INTRODUCCIÓN A LA INGENIERÍA SANITARIA Y AMBIENTAL. 2 VOL. E.T.S. DE INGENIEROS DE CAMINOS, CANALES Y PUERTOS. ISBN: 84-89627-68-1

TEJERO, IÑAKI; SUÁREZ, JOAQUÍN; JÁCOME, ALFREDO; TEMPRANO, JAVIER Y GARCÍA, CARMEN (2000): "PROBLEMAS DE INGENIERÍA SANITARIA Y AMBIENTAL". E.T.S. DE INGENIEROS DE CAMINOS, CANALES Y PUERTOS, UNIVERSIDAD DE CANTABRIA - UNIVERSIDADE DA CORUÑA.

TCHOBANOGLOUS, G. Y SCHROEDER, E. (1985). WATER QUALITY. ADDISON WESLEY. EE. UU. ISBN0-201-05433-7

CHAPRA, S. C. (1997). SURFACE WATER-QUALITY MODELING. MCGRAW-HILL. EE. UU. ISBN: 0-07-115242-3.

AWWA (AMERICAN WATER WORKS ASSOCIATION) (2002). CALIDAD Y TRATAMIENTO DEL AGUA. MANUAL DE SUMINISTROS DE AGUA COMUNITARIA. MCGRAW-HILL. MADRID.

METCALF & EDDY, INC. (1995): "INGENIERÍA DE AGUAS RESIDUALES: TRATAMIENTO, VERTIDO Y REUTILIZACIÓN." MCGRAW-HILL/INTERAMERICANA DE ESPAÑA, S.A., ARAVACA.