

## SUBJECT TEACHING GUIDE

M1457 - Environmental Engineering

Master's Degree in Civil Engineering

Academic year 2019-2020

1. IDENTIFYING DATA					
Degree	Master's Degree in Civil Engineering			Type and Year	Compulsory. Year 2
Faculty	School of civil Engineering				
Discipline	Environmental Engineering				
Course unit title and code	M1457 - Environmental Engineering				
Number of ECTS credits allocated	6	Term	Semester based (1)		
Web	<a href="http://moodle.unican.es/moodle27/my/">http://moodle.unican.es/moodle27/my/</a>				
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	JUAN IGNACIO TEJERO MONZON				
E-mail	juan.tejero@unican.es				
Office	E.T.S. de Ingenieros de Caminos, Canales y Puertos. Planta: + 2. DESPACHO - ING. SANITARIA (2026)				
Other lecturers	RAMON COLLADO LARA AMAYA LOBO GARCIA DE CORTAZAR ANA LORENA ESTEBAN GARCIA				

### 3.1 LEARNING OUTCOMES

- Ability to design and size Water and Wastewater Treatment Systems and to manage and design Solid Waste Systems.
- Ability to design and implement Water Treatment Works, including Desalination and Wastewater Reuse. Solid Waste (urban, industrial or hazardous): Collection and Treatment.

#### 4. OBJECTIVES

The student must be able to:

- a) Explain and apply basic concepts and terms of the subject, without any help (books, notes, etc.)
- b) Evaluate a water, waste or contaminated soil.
- c) Predict the behavior of a natural aquatic environment
- d) Design, size, plan, manage and exploit, with the help of material, on the following topics:
  - Water treatment plants
  - Wastewater treatment plants
  - Waste recovery or treatment Installations, contaminated soils remediation systems
  - Waste disposal systems, like sanitary landfills
  - Other components of waste management (collection, transportation ..)

#### 6. COURSE ORGANIZATION

##### CONTENTS

1	SECTION 1. ENVIRONMENTAL ENGINEERING. WATER QUALITY Basics of Sanitary and Environmental Engineering. Water cycles. Water use. Water consumption. Integrated analysis of water pollution. Impurities and contaminants. Water quality and pollution indexes and parameters. Sources of water pollution. Pollution loads. Water quality control. Water use. Discharge limits. Natural aquatic environments. Water quality objectives. Self-purification. Eutrophication. Legislation.
2	SECTION 2. SUPPLY WATER TREATMENT. Drinking water. Water Reuse. Objectives and treatment schemes and layouts. Process design of coagulation-flocculation, settling, filtration, disinfection, adsorption, oxidation. Water desalination. Precipitation, ion exchange, reverse osmosis.
3	SECTION 3. WASTEWATER TREATMENT. Urban and industrial wastewater. Treatment schemes and layouts. Design of pretreatments, primary sedimentation, physical-chemical treatment. Biological treatment processes (Bases; Biokinetics); Activated sludge; Biofilm. Design of sludge treatment processes: production, thickening, stabilization (Anaerobic; Aerobic; Chemical), conditioning, dewatering. Disposal.
4	SECTION 4. INTRODUCTION TO WASTE AND SOIL MANAGEMENT. Characterization of Municipal and Industrial waste. Hazardous Wastes. Waste Classification. Waste evaluation. Specific productions. Recovery and Valuation. Urban surface cleaning. Collection and Transport. Contaminated Soils Management. Potentially polluting activities. Toxicological characterization. Land use. Generic reference levels: determination. Contaminated soil evaluation: criteria. Environmental risk assessment.
5	SECTION 5. WASTE TREATMENT AND SOIL REMEDIATION. Design of Waste Treatment Technologies. Physical treatments: material recovery and separation. Pretreatment Solids Separation. Chemical treatments: Inertization, Biological Treatment: Compost / Biocells, Anaerobic Digestion. Sanitary Landfill Engineering: non-hazardous, hazardous, inert. Design of contaminated soil Treatment and Remediation Systems: on site, off site; in situ, ex situ. Physical, chemical, biological treatments. Bioremediation.

### 7. ASSESSMENT METHODS AND CRITERIA

Description	Type	Final Eval.	Reassessn	%
Exam of Sections 1 and 2	Written exam	No	Yes	28,00
Exam of Section 3	Written exam	No	Yes	28,00
Exam of Sections 4 and 5	Written exam	Yes	Yes	29,00
Laboratory and visits	Work	No	No	10,00
Class participation	Others	No	No	5,00
TOTAL				100,00
Observations				
Observations for part-time students				
Part-time students will be exempt from attending class, but they must take partial exams (each counts 30%). Laboratory practices/visits could be evaluated with reports.				

### 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, I.; SUÁREZ, J.; JÁCOME, A.; TEMPRANO, J. Y GARCÍA, C. (2000). "PROBLEMAS DE INGENIERÍA SANITARIA Y AMBIENTAL". E.T.S. DE INGENIEROS DE CAMINOS, CANALES Y PUERTOS, UNIVERSIDAD DE CANTABRIA - UNIVERSIDADE DA CORUÑA. ISBN: 84-60709-83-3.
- TCHOBANOGLIOUS, G. Y SCHROEDER, E. (1987). "WATER QUALITY". ADDISON WESLEY PUBLISHING COMPANY. ISBN: 0-201-05433-7.
- 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 INTERAMERICANA DE ESPAÑA. ISBN: 84-481-3210-6.
- METCALF & EDDY, INC. (1995): "INGENIERÍA DE AGUAS RESIDUALES: TRATAMIENTO, VERTIDO Y REUTILIZACIÓN." MCGRAW-HILL, D.L. ISBN: 84-481-1607-0.
- TCHOBANOGLIOUS, G; THEISEN, H.; VIGIL, S. (1994). "GESTIÓN INTEGRAL DE RESIDUOS SÓLIDOS". MCGRAW-HILL, D.L. ISBN: 84-481-1830-8.