

## SUBJECT TEACHING GUIDE

### 701 - Anaerobic Water, Sludge and Waste Treatment

#### Master's Degree in Environmental Engineering and Management

Academic year 2023-2024

1. IDENTIFYING DATA					
Degree	Master's Degree in Environmental Engineering and Management			Type and Year	Optional. Year 1
Faculty	School of civil Engineering				
Discipline	ENVIRONMENTAL TECHNOLOGIES				
Course unit title and code	701 - Anaerobic Water, Sludge and Waste Treatment				
Number of ECTS credits allocated	3	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					

### 3.1 LEARNING OUTCOMES

- Capacity for theoretical analysis of any Anaerobic Treatment Technology for Water , Sludge and Waste.
- Design capacity of any Anaerobic Treatment of Water , Sludge and Waste process.
- Ability to diagnose any digester operating problem and propose solutions.
- Ability to bibliographically research knowledge about any anaerobic treatment process or its problems or peculiarities.
- Ability to identify the characteristics that define the suitability of wastewater, sludge and waste that make the technical viability of anaerobic treatment processes.
- Ability to improve and optimize Anaerobic Water , Sludge and Waste Treatment processes.
- Ability to apply methods of measurement and evaluation of the operation of anaerobic treatment processes.

#### 4. OBJECTIVES

Describe and explain the basic terms and concepts related to anaerobic treatment of wastewater, sludge and waste, its design and operation, without the need for bibliographic support.

Analyze the anaerobic treatment processes of residual water, sludge and waste, identifying in each case the variables, processes, phenomena, behavior, design or operating parameters and elements of interest.

Sizing, with the help of any type of material, the facilities for any anaerobic digestion process or technology.

Diagnose and solve, with the help of any type of material, the operation of any anaerobic digestion process.

#### 6. SUBJECT PROGRAM

##### CONTENTS

1	Fundamentals of anaerobic processes
2	Operational parameters
3	Characteristics of wastes and wastewaters with regards to anaerobic process
4	Fundamentals of anaerobic reactors design
5	Start-up and operation of anaerobic reactors
6	Applications of anaerobic processes

#### 7. ASSESSMENT METHODS AND CRITERIA

Description	Type	Final Eval.	Reassessn	%
Description Practical cases	Others	No	Yes	50,00
Description Written exam	Written exam	Yes	Yes	50,00
<b>TOTAL</b>				<b>100,00</b>
Observations				
Observations for part-time students				
The part-time student will have to do the exam. The practical cases may be delivered after finishing the teaching of the subject.				

#### 8. BIBLIOGRAPHY AND TEACHING MATERIALS

##### BASIC

Dieter Deublein and Angelika Steinhauser (2008). Biogas from Waste and Renewable Resources: An Introduction. Wiley-VCH Verlag GmbH & Co. KGaA, Alemania.

Fachagentur Nachwachsende Rohstoffe (2012). Guide to Biogas: From production to use. FNR, Abt. Öffentlichkeitsarbeit, Alemania.

Tchobanoglous George, Burton Franklin L., Stensel H. David (2013) Wastewater engineering: treatment and resource recovery, 5th edition. Metcalf & Eddy, Inc. McGraw-Hill, Boston, Estados Unidos.

Van Lier, J.B., Mahmoud, N., Zeeman, G., 2008. Anaerobic Wastewater Treatment. In: M. Henze, M.C.M. van Loosdrecht, G.A. Ekama, D. Brdjanovic (eds.), Biological Wastewater Treatment, Principles, Modelling and Design, Chapter 16, IWA Publishing, London, UK, p. 415-456.

