

SUBJECT TEACHING GUIDE

M2125 - Anaerobic Water, Sludge and Waste Treatment

Master's Degree in Environmental Engineering and Management

Academic year 2022-2023

| 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 | M2125 - 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 |

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|------------------|--|--|--|--|--|
| 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. COURSE ORGANIZATION

| 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 | 20,00 |
| Description Team work | Work | No | Yes | 20,00 |
| Description Individual work | Work | No | Yes | 20,00 |
| Description Written exam | Written exam | Yes | Yes | 40,00 |
| TOTAL | | | | 100,00 |
| Observations | | | | |
| Observations for part-time students | | | | |
| The part-time student will have to do the exam, practical cases and individual work. It is free from group work. | | | | |

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.