

Course guide 33106 - AR - Water as a Resource

Academic year: 2024	ECTS Credits: 5.0	Languages: Spanish
Degree:	MASTER'S DEGREE IN NA	TURAL RESOURCE ENGINEERING (Syllabus 2015). (Compulsory subject).
Unit in charge: Teaching unit:	Manresa School of Engine 750 - EMIT - Department	eering of Mining, Industrial and ICT Engineering.

LECTURER

Coordinating lecturer:

MARIA DOLORS GRAU VILALTA

Others:

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Generical:

1. The ability to communicate effectively orally and in writing.

2. The ability to summarise and think critically. The ability to adapt to new technologies.

TEACHING METHODOLOGY

Face-to-face modality:

The teaching method consists in the professors presenting the topics using the materials that are available on the ATENEA virtual campus. The materials contain a large number of links to web pages belonging to companies and public administrations on the topics. Students must complete the information given in class with the information on these web pages.

Exercises are generally completed in class in small groups and are subject to continuous assessment.

Field trips organised to study real cases, and some experimentation session in the laboratory, are also subject to continuous assessment.

Non-face-to-face modality:

The teaching methodology will consist of students having to work on the presentation of the topics on their own using the material that will have been prepared and will be available to them on the Atenea Digital Campus. In the presentation of this material there will be a high number of links to Internet pages, both from companies and administrations related to the different topics. The student will try to complement the information given in class from these links.

The exercises section will be carried out based on a series of Activities that will have to be delivered in Atenea and that will allow the continuous evaluation to be carried out.

On the day of the in-person session, there will be a trip to the field, and the experiment will take place in the laboratory, as well as the evaluation of the subject.

LEARNING OBJECTIVES OF THE SUBJECT

1. To present water, one of the natural resources that is most relevant and most current, from a global perspective.

2. To explain various domestic and industrial forms of water treatment, with an emphasis on optimising its use.

3. To introduce students to the study of groundwater.



STUDY LOAD

Туре	Hours	Percentage
Hours large group	30,0	66.67
Hours medium group	15,0	33.33

Total learning time: 45 h

CONTENTS

DESCRIPTION

Description:

1. Water a limited resource - Water on the planet:

Problems of water on the planet and its unequal distribution. The Sustainable Development Goals and water. Virtual water and water footprint.

2. Characteristics and properties of water:

Chemical, physical and biological properties of water. Water anomalies. Water quality indexs. Analytical determinations to define the fluvial state.

3. The water cycle:

Hydrological cycle components. Evaporation and perspiration. Evapoperspiration. Surface and underground runoff. Water balance of a basin.

4. Origin, measurement and management of surface water:Climate data. Distribution of water in the soil. Methods for calculating evapoperspiration. Surface water. Water capacity.Hydrograms.

Groundwater, hydrogeological behavior, hydrogeochemistry, pollution:
Fundamental hydrological parameters. Kinds of aquifers. Hydrogeochemistry, chemical hydrograms. Groundwater pollution.
Relationship between groundwater and surface water.

6. Adaptation of water for use: water for human consumption - water for industry: Collection of water for urban cities. Water use in industry.

7. Drinking Water Treatments, Drinking Water Treatment Station: Parameters of control and analysis of drinking water, legislation. Origin of the water supplied to the cities. Treatment operations: roughing, pre-disinfection, coagulation-flocculation, sedimentation, filtration, disinfection.

8. Water treatment in the industry: Boiler water - Cooling water - Water / Energy binomial: Water uses in industry. Energy use. Water / Energy binomial. Kinds of boilers and cooling towers. Water problems: corrosion and inlays. Water treatment of boilers and cooling circuits.

9. Treatments with membranes:

Separation potential of different techniques. Treatments: reverse osmosis, electrodialysis, reversible electrodialysis. Desalination of seawater. Future trends.

10. Techniques for optimizing and saving water use:

Saving water in urban centers. Water saving in industry. Water management in agriculture. Reuse of water in urban centers. Energy use of wastewater. Water reuse in industry.

Full-or-part-time: 45h Theory classes: 30h Practical classes: 15h



GRADING SYSTEM

Face-to-face and Non face-to-face assessment system:

- Written test (40%)
- Internet research and oral presentation of detailed information on a chosen topic (30%)

- Exercises (30%)

BIBLIOGRAPHY

Basic:

- American Water Works Association. Calidad y tratamiento del agua: manual de suministros de agua comunitaria. Madrid: McGraw-Hill, 2002. ISBN 8448132106.

- American Water Works Association. Tratamiento del agua por procesos de membrana: principios, procesos y aplicaciones. Madrid: McGraw-Hill, 1998. ISBN 8448112067.

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- Cheremisinoff, Paul N. Handbook of water and wastewater treatment technology [on line]. New York: Marcel Dekker, 1995 [Consultation: 10/06/2022]. Available on: https://www-sciencedirect-com.recursos.biblioteca.upc.edu/book/9780750674980/handbook-of-water-and-wastewater-treatment-tec

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- Hidrogeología: conceptos básicos de hidrología subterránea. Barcelona: Fundación Centro Internacional de Hidrología Subterránea, 2009. ISBN 9788492146918.

- Custodio, E.; Llamas, M. R., eds. Hidrología subterránea. 2ª ed. corr. Barcelona: Omega, 2001. ISBN 8428204462.

- Water treatment handbook. 7th ed. Malmaison Cedex: Degrémont, 2007. ISBN 9782743009700.

- González Fernández, José A., coord. Teoría y práctica de la lucha contra la corrosión. Madrid: Consejo Superior de Investigaciones Científicas. Centro Nacional de Investigaciones Metalúrgicas, 1984. ISBN 8400056701.

- Gray, N. F. Calidad del agua potable: problemas y soluciones. Zaragoza: Acribia, 1996. ISBN 8420008214.

- Howd, Robert A.; Fan, Anna M., eds. Risk assessment for chemicals in drinking water [on line]. Hoboken: John Wiley, 2008 [Consultation: 25/11/2022]. Available on:

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- Kawamura, Susumu. Integrated design and operation of water treatment facilities. 2nd ed. New York: Wiley, 2000. ISBN 0471350931.

Martí Deulofeu, José M^a. Stenco water treatment = Tratamientos de aguas = Tractaments d'aigües. 4^a ed. Barcelona: Stenco, 2007.
Metcalf and Eddy. Ingeniería de aguas residuales: tratamiento, vertido y reutilización. 3^a ed. Madrid: McGraw-Hill, 1995. ISBN 8448116070.