

29933 - Environmental engineering

Información del Plan Docente

Academic Year	2016/17
Academic center	110 - Escuela de Ingeniería y Arquitectura
Degree	435 - Bachelor's Degree in Chemical Engineering
ECTS	6.0
Course	4
Period	Half-yearly
Subject Type	Compulsory
Module	---

1.Basic info

1.1.Recommendations to take this course

1.2.Activities and key dates for the course

2.Initiation

2.1.Learning outcomes that define the subject

2.2.Introduction

3.Context and competences

3.1.Goals

3.2.Context and meaning of the subject in the degree

3.3.Competences

3.4.Importance of learning outcomes

4.Evaluation

5.Activities and resources

5.1.General methodological presentation

This subject includes theory and practice and its learning process is based on 2.4 ECTS of work done in-person (60 hours) and 3.6 ECTS (90 hours) of self-guided study. The programmed activities are detailed below.

The class presentations and laboratory instructions are available for the students at the subject website (Moodle platform) that can be found at <http://moodle2.unizar.es/add/>

5.2.Learning activities

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On-site activities: 2.4 ECTS, 60 hours

1. Classroom based sessions (TP1): 30 hours, 2 per week. Sessions with theoretical and practical contents. The units are presented encouraging class participation, reflexive and proactive attitudes.
2. Problem solving and case studies (TP2): 15 hours, 1 per week. A case study will be defined encompassing a global strategy for the pollution control in an industrial process. Additionally, exercises and case studies will be done in order to complement theoretical sessions. The student should work on the preparation of these case studies previously, and participate in class.
3. Laboratory and simulation sessions (TP3): 10 hours divided in 5 sessions of 2 hours each. The student will develop practical skills related to pollution control processes, either based on simulation software or in laboratory work. The student should read the instructions for each sessions previously and be able to hand in the required report at the end of each session.
4. Evaluation (TP8): 5 hours. Besides obtaining a mark, evaluation is one of steps of the learning process, where the students can check their degree of understanding of the presented concepts and their acquirement of the required competencies.
5. If possible, some visits to environmental facilities will be planned during the semester. These visits are voluntary for the students. Attendance will account for approximately 5 hours of on-site activities.

Non on-site activities: 3.6 ECTS, 90 hours.

1. Study (TP7): 90 hours. Includes study and problem solving. Continuous work by the student will be encouraged. Tutorials are also included in this section.

5.3.Program

Module 1. Introduction. Environmental issues. Basics of prevention and control of pollution.

Module 2. Water pollution

Unit 1. Water cycle.

Unit 2. Types of water pollutants.

Unit 3. Physical processes/operations in water treatment.

Unit 4. Biological processes/operations in water treatment.

Unit 5. Chemical processes/operations in water treatment.

Unit 6. Water treatment facilities.

Module 3. Air pollution

Unit 1. The atmosphere and its pollution problems.

Unit 2. Types of air pollutants: Primary pollutants

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Unit 3. Pollutant measurements

Unit 4. Types of air pollutants: Secondary pollutants

Unit 5. Particle collection systems.

Unit 6. Pollutant control systems.

Module 4. Residues

Unit 1. Introduction.

Unit 2. Residues management and control

Unit 3. Recycling.

Unit 4. Biological treatments for residues.

Unit 5. Thermal treatment for residues.

Unit 6. Landfills.

Module 5. Environmental impact assessment (EIA) and environmental management systems (EMS): basic aspects.

Laboratory sessions

Lab session 1: Industrial wastewater treatment by physical/chemical processes.

Lab session 2: Use of software tools for the simulation and design of wastewater treatment facilities.

Lab session 3: Use of software tools for the simulation and design of gas pollution control facilities.

Lab session 4: Stabilization of residues containing dangerous substances.

Lab session 5: Use of software tools for the management of residues containing dangerous substances.

5.4.Planning and scheduling

Classroom based sessions (TP1). 30 hours total (2 per week)

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Problem solving and case studies (TP2). 15 hours total (1 per week)

Laboratory and computer sessions (TP3). 10 hours total (5 sessions, 2 hours each)

Evaluation (TP8): 5 hours total.

Home study (TP7): 90 hours estimated.

5.5. Bibliography and recommended resources

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|-----------|---|
| BB | 1. Mihelcic, James R. Environmental engineering : fundamentals, sustainability, design / authors and editors, James R. Mihelcic, Julie Beth Zimmerman ; contributing authors, Martin T. Auer ... [et al.] Hoboken, NJ : Wiley ; Chichester : John Wiley [distributor], cop. 2010 |
| BB | 2. Ingeniería de aguas residuales : tratamiento, vertido y reutilización / Metcalf and Eddy ; revisado por George Tchobanoglous, Franklin L. Burton ; traducción y revisión técnica, Juan de Dios Trillo Montsoriu, Ian Trillo Fox ; prólogo de Angel Cajigas . - 3a. ed., [reimpr.] Madrid [etc.] : McGraw-Hill, D.L. 2000 |
| BB | 3.1 Design of municipal wastewater treatment plants. Volume I, Planning and configuration of Wastewater treatment plants . - 4th ed. Alexandria, VA (U.S.A.) : Water environment federation ; Reston : American society of civil engineers, cop. 1998 |
| BB | 3.2 Design of municipal wastewater treatment plants. Volume II, Liquid treatment processes . - 4th ed. Alexandria, VA (U.S.A.) : Water environment federation ; Reston : American society of civil engineers, cop. 1998 |
| BB | 3.3 Design of municipal wastewater treatment plants. Volume III, Solids Processing and Disposal . - 4th ed. Alexandria, VA (U.S.A.) : Water environment federation ; Reston : American society of civil engineers, cop. 1998 |
| BB | 4. Wark, Kenneth. Contaminación del aire : origen y control / Kenneth Wark , Cecil F. Warner . - [Reimp.] México D. F. : Limusa, cop. 2006 |
| BB | 5. Nevers, Noel de. Ingeniería de control de la contaminación del aire / Noel de Nevers ; traducción, José Hernán Pérez Castellanos . - [1ª ed. en español] México |

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- BB** 6. Tchobanoglous, George. Gestión integral de residuos solidos / George Tchobanoglous, Hilary Theisen, Samuel Vigil ; traducción y revisión técnica Juan Ignacio Tejero Monzón, José Luis Gil Diaz, Marcel Szanto Narea . - [1a. ed. en español] Madrid [etc.] : McGraw-Hill, D.L.1994
- BB** 8. Gestión ambiental . 3ª ed. Madrid : AENOR, 2011
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- BC** Conesa Fernández-Vítora, Vicente. Guía metodológica para la evaluación del impacto ambiental / Vicente Conesa Fdez.-Vítora ; colaboradores, Vicente Conesa Ripoll, Luis A. Conesa Ripoll ; prólogos de María Teresa Estevan Bolea . - 4ª ed. Madrid: Mundi-Prensa, 2010
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- BC** Kiely, Gerard. Ingeniería ambiental : Fundamentos, entornos, tecnologías y sistemas de gestión / Gerard Kiely ; coordinador de la traducción y revisión técnica, José Miguel Veza . 1a ed. en español Madrid : McGraw-Hill, D.L. 1999
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BC

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