Course guide
295506 - TMSQ - Environmental Technologies and Sustainability

Last modified: 04/06/2026

Unit in charge: Barcelona East School of Engineering
Teaching unit: 713 - EQ - Department of Chemical Engineering.

Degree: BACHELOR'S DEGREE IN CHEMICAL ENGINEERING (Syllabus 2009). (Compulsory subject).

Academic year: 2026 **ECTS Credits:** 6.0 **Languages:** Catalan, Spanish

LECTURER

Coordinating lecturer: VICENÇ MARTI GREGORIO

Others:

Primer quadrimestre:
ELENA GUILLEN BURRIEZA - Grup: M1
JULIO LÓPEZ RODRÍGUEZ - Grup: M1
VICENÇ MARTI GREGORIO - Grup: M1

Segon quadrimestre:
ELENA GUILLEN BURRIEZA - Grup: T1
VICENÇ MARTI GREGORIO - Grup: T1
MÒNICA REIG I AMAT - Grup: T1

PRIOR SKILLS

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Specific:
CEI-16. Understand the basic applications of environmental technologies and sustainability principles.

Transversal:
02 SCS N1. SUSTAINABILITY AND SOCIAL COMMITMENT - Level 1. Analyzing the world¿s situation critically and systemically, while taking an interdisciplinary approach to sustainability and adhering to the principles of sustainable human development. Recognizing the social and environmental implications of a particular professional activity.

TEACHING METHODOLOGY

The course is based on a exhibition methodology (lecture) using as support PowerPoint slides to teach the theoretical part (20%), a methodology of exhibition / participation to solve the practical problems related to the theory (16%), active and collaborative learning to perform different practices throughout the year (4%) and independent learning (60%).
The practices, which are of compulsory attendance, will be in groups of two people during class time devoted to this activity.
Depending on the type of practice and prior to its completion, students must submit an individual report on the practice, following the indications of its script. The report is required for the practice to be evaluated. After the class, students will deliver, a report with the resolution of the problem solved during the practice. The average of the ratings of these reports constitutes the practices grade (NP).
The unjustified assistance to a practice means a zero of it.

LEARNING OBJECTIVES OF THE SUBJECT

General objective:
Introduce the student to the study of the environmental problems, especially in those aspects related to industrial activity.
Specific objectives:
Introduce the bases to be able to carry out environmental studies, reduce waste generated and provide basic knowledge about the treatment of the different types of polluting tributaries.

STUDY LOAD

Type	Hours	Percentage
Hours large group	54,0	36.00
Self study	90,0	60.00
Hours small group	6,0	4.00

Total learning time: 150 h

CONTENTS

Tema 1 INTRODUCTION

Description:
Introduction to the subject: the environment; impact of man on the environment; technology and the environment; globalization and the environment; sustainable development. Environmental management systems. Tools for environmental management. Integrated pollution prevention and control: legislation. Balance of matter and energy.

Full-or-part-time: 6h
Theory classes: 6h

Tema 2 Water contamination. Prevention and treatments.

Description:
The hydrologic cycle of water: use of water. The quality of water: physical, chemical and biological parameters; Water quality indicators. Natural mechanisms of water purification: classification of the different mechanisms; DBO and COD; Kinetic of aerobic degradation of organic matter; effect of organic matter on rivers; eutrophication. Treatments for water supply: water purification and conditioning; treatments for surface and underground waters. treatment for wastewater: characteristics of wastewater; pretreatments; primary treatments; secondary treatments; tertiary treatments; reuse Management of sludge. The sanitation plan and its financing.

Full-or-part-time: 17h
Theory classes: 17h

Tema 3 Atmospheric contamination. Prevention and treatments.

Description:
Atmospheric pollution: types of contaminants; Air quality (ICQA). Atmospheric pollutants: origin, characteristics and effects. Natural air purification mechanisms: weather factors; pollutant dispersion mechanisms; dispersion models of pollutants. Mechanisms for the prevention, control and correction of pollution: types of equipment and selection; equipment for the control of particle emission; equipment for controlling the emission of gases.

Full-or-part-time: 14h
Theory classes: 14h

Tema 4 Soil and gropundwater contamination

Description:
Soil and groundwater: flow of groundwater, Darcy's law. Soil degradation: degradation mechanisms; heavy metals; hydrocarbons; other toxic compounds. Natural mechanisms that affect contaminants in the soil: transport by advection, dispersion and diffusion; Retention: adsorption, precipitation and chemical reaction; attenuation. Treatments for soil recovery: classification and selection; removal and deposition in landfill; stabilization and confinement; physicochemical, biological and thermal treatments. Treatments for the recovery of groundwater.

Full-or-part-time: 8h
Theory classes: 8h

Tema 5 Accidental environmental impact

Description:
Introduction: definition of risk, types and measurement parameters. Serious risks: legislation. Risk analysis: risk identification methods: historical analysis; risk index; HAZOP; failure trees. Type of accidents: fires; explosions; BLEVE-ball of fire; dispersion of toxic clouds; the danger of inert gases. Consequence evaluation: vulnerability models (Probit).

Full-or-part-time: 9h
Theory classes: 9h

Tema 6 Wastes: minimization and treatment

Description:
The definition of waste: the problem of solid waste. Classification of waste. Waste management: minimization, valuation, reuse and recycling, energy use. Urban solid waste treatment (RSU): characteristics of the RSU; selective collection; biological treatment: composting; heat treatment; landfills. Industrial waste and its treatment: characteristics; the waste catalog; physicochemical and biological treatments; thermal treatments; stabilization and solidification; landfills. Radioactive waste.

Full-or-part-time: 6h
Theory classes: 6h

GRADING SYSTEM

Any academic fraud, plagiarism or use or possession of unauthorised means in an assessment activity leads to a mark of zero (0) for the affected test or assignment. Furthermore, in accordance with the University's regulations, if disciplinary proceedings are initiated the subject is recorded as "Pending Assessment" until a decision is reached. These incidents are managed in accordance with the **Action Framework for Academic Integrity in Assessment at the UPC**.

The final course grade will be calculated according to the following formula, taking into account that the final exam includes the whole course content:
FINAL NOTE : NF = 0.1*NP + 0.25*NEP1 + 0.25*NEP2 + 0.4*NEF
where:
NP : practice note
NEP1 and NEP2 : note of the partial tests
NEF : Final exam

The students will be able to access the re-assessment test that meets the requirements set by the EEBE in its Assessment and Permanence Regulations.

If reevaluation exam is undertaken, the grade obtained (REA) will replace the 90% of the reevaluable part . The 10% corresponding to NP is not reevaluable.

NF' = 0,1*NP + 0,9*REA

EXAMINATION RULES.

In both partial and final exams, part of the teaching material of the course can be used (problems books).

BIBLIOGRAPHY

Basic:
- Arnaldos, Josep. Tecnologia del medi ambient : fonaments, problemes i qüestions. Barcelona: Kit-book, 2016. ISBN 9788494576225.
- Arnaldos, Josep [et al.]. Transparències de teoria. Reprografia EEBE,
- Arnaldos, Josep [et al.]. Llibre de problemes i pràctiques. Reprografia EEBE,

RESOURCES

Other resources: