295506 - TMSQ - Environmental Technologies and Sustainability

Coordinating unit: 295 - EEBE - Barcelona East School of Engineering
Teaching unit: 713 - E0 - Department of Chemical Engineering
Academic year: 2019
Degree: BACHELOR'S DEGREE IN CHEMICAL ENGINEERING (Syllabus 2009). (Teaching unit Compulsory)
ECTS credits: 6
Teaching languages: Catalan

Teaching staff

Coordinator: IGNASI CASAS PONS
Others: Primer quadrimestre:
        IGNASI CASAS PONS - M11, M12
        CESAR ALBERTO VALDERRAMA ANGEL - M11, M12

Opening hours

Timetable: Es dirà a classe i a ATENEA

Prior skills

Requirements

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 an 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.

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<tr>
<th>Study load</th>
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<tbody>
<tr>
<td><strong>Total learning time</strong>: 150h</td>
<td>52h 30m</td>
<td>35.00%</td>
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<tr>
<td>Hours large group:</td>
<td>0h</td>
<td>0.00%</td>
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<tr>
<td>Hours medium group:</td>
<td>7h 30m</td>
<td>5.00%</td>
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<tr>
<td>Hours small group:</td>
<td>90h</td>
<td>60.00%</td>
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<td>Self study:</td>
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## Content

| Tema 1 INTRODUCTION | **Learning time:** 6h  
|                     | Theory classes: 6h |

| Tema 2 Water contamination. Prevention and treatments. | **Learning time:** 17h  
|                                                      | Theory classes: 17h |
| 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. |

| Tema 3 Atmospheric contamination. Prevention and treatments. | **Learning time:** 14h  
|                                                          | Theory classes: 14h |
| 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. |

| Tema 4 Soil and groundwater contamination | **Learning time:** 8h  
|                                          | Theory classes: 8h |
| 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. |
The final course grade will be calculated according to the following formula, taking into account that the final exam includes the whole course content:

\[
\text{FINAL NOTE : NF} = 0.1 \times \text{NP} + 0.3 \times \text{NEP} + 0.6\% \times \text{NEF}
\]

where:
- NP : practice note
- NEP : note of the partial tests
- NEF : Final exam

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

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 (https://eebe.upc.edu/ca/estudis/normatives-academiques/documents/eebe-normativa-avaluacio-i-permanencia-18-19-aprovat-je-2018-06-13.pdf)

### Qualification system

<table>
<thead>
<tr>
<th>Tema 5 Accidental environmental impact</th>
<th>Learning time: 9h</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Description:</strong></td>
<td>Theory classes: 9h</td>
</tr>
<tr>
<td>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).</td>
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<tr>
<th>Tema 6 Wastes: minimization and treatment</th>
<th>Learning time: 6h</th>
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</thead>
<tbody>
<tr>
<td><strong>Description:</strong></td>
<td>Theory classes: 6h</td>
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### Regulations for carrying out activities

In both partial and final exams the teaching material of the course can be used (theory and problems books).
295506 - TMSQ - Environmental Technologies and Sustainability

Bibliography

Basic:


Josep Arnaldos et al. Transparències de Teoria. Reprografia EEBE,
Josep Arnaldos et al. Llibre de problemes i pràctiques. Reprografia EEBE,

Others resources: