Degree competences to which the subject contributes

Specific:
13340. Apply scientific concepts to environmental problems and their correlation with technological concepts.
13347. Dimension unconventional systems and advanced treatment and raise their mass balance and energy.

Teaching methodology

The course consists of 2 hours per week of teaching in which the teacher presents the basic concepts and topics of the subject, shows examples and solves exercises.

Some classes will be dedicated to solve practical problems with greater interaction with the students. The objective of these practical exercises is to consolidate the general and specific learning objectives.

Support material is provided using the virtual campus ATENEA.

Learning objectives of the subject

CE01 - Apply scientific concepts to environmental problems and their correlation with technological concepts.
CE08-Dimension unconventional systems and advanced treatment and raise their mass balance and energy.

Explore scientific concepts and technical principles of quality management of the receiving means, atmosphere, water and soil, and applied to problem solving.
Explore scientific concepts and technical principles of management and treatment of gaseous emissions, water supply, sewage and waste and remediation techniques for groundwater and contaminated soils.
Sized systems for the treatment of major pollutants vectors in specific sectors of activity.
Interprets rules, identifies goals, assesses technical alternatives proposed unconventional solutions and priority actions.

Water resources. Protection and management of resources.
Criteria and standards.
Legislation and regulations.
The urban water cycle supply: collection, purification, regulation, supply network.

Familiarizing students with the scientific basis and technical principles of the water supply. Special attention is paid on treatment processes aimed at improving water quality.

<table>
<thead>
<tr>
<th>Study load</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Total learning time:</strong> 125h</td>
<td>Theory classes: 15h</td>
<td>12.00%</td>
</tr>
<tr>
<td></td>
<td>Practical classes: 10h</td>
<td>8.00%</td>
</tr>
<tr>
<td></td>
<td>Laboratory classes: 10h</td>
<td>8.00%</td>
</tr>
<tr>
<td></td>
<td>Guided activities: 10h</td>
<td>8.00%</td>
</tr>
<tr>
<td></td>
<td>Self study: 80h</td>
<td>64.00%</td>
</tr>
</tbody>
</table>
## Content

<table>
<thead>
<tr>
<th>Topic</th>
<th>Learning time</th>
<th>Description</th>
<th>Specific objectives</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Introduction on water quality, treatment and supply</strong></td>
<td>2h 24m</td>
<td>Water quality parameters. National and European legislation and regulations on the water cycle.</td>
<td>To know the basics about drinking water quality, management and treatment.</td>
</tr>
<tr>
<td><strong>Water demand</strong></td>
<td>2h 24m</td>
<td>Water supply: basic concepts. Water use. Water balance. Estimation of water demand.</td>
<td>To understand concepts related to water demand estimation</td>
</tr>
<tr>
<td><strong>Coagulation-flocculation</strong></td>
<td>9h 36m</td>
<td>Coagulation-flocculation: basic principles, reagents, reactors used and energy intake. Polyelectrolytes. Jar test. Design of coagulation-flocculation systems</td>
<td>To understand concepts related to the process of coagulation-flocculation. To develop the ability to identify and solve problems related to coagulation and flocculation system design</td>
</tr>
</tbody>
</table>
### Gravity separation

**Description:**

**Specific objectives:**
To understand concepts related to gravity separation.
To develop capacity to identify, formulate and solve problems related to the design of a gravity separation system.

**Learning time:** 4h 48m
- Theory classes: 1h
- Practical classes: 1h
- Self study: 2h 48m

### Filtration

**Description:**

**Specific objectives:**
To understand concepts related to filtration.
To develop capacities to identify, formulate and solve problems for the calculation of pressure drop in filtration systems.

**Learning time:** 4h 48m
- Theory classes: 1h
- Practical classes: 1h
- Self study: 2h 48m

### Adsorption. Activated carbon filters

**Description:**

**Specific objectives:**
To understand concepts related to activated carbon filtration.
To develop capacity to identify, formulate and solve problems for filter design and calculation of adsorption isotherms.

**Learning time:** 4h 48m
- Theory classes: 1h
- Practical classes: 1h
- Self study: 2h 48m
### Disinfection

**Description:**

**Specific objectives:**
To understand concepts related to water disinfection. To develop capacities to identify, formulate and solve problems for calculating the concentration / dose of disinfectant or contact time.

**Learning time:** 9h 36m
- Theory classes: 2h
- Practical classes: 2h
- Self study: 5h 36m

### Sludge treatment and management

**Description:**
Basic principles. Origin and composition of sludge generated in drinking water treatment plants. Pre-treatment, thickening and dewatering.

**Specific objectives:**
To understand concepts related to sludge treatment and management.

**Learning time:** 2h 24m
- Theory classes: 1h
- Self study: 1h 24m

### Softening

**Description:**

**Specific objectives:**
To understand concepts related to water softening. To develop capacity to identify, formulate and solve problems for calculating soda and lime needs.

**Learning time:** 4h 48m
- Theory classes: 1h
- Practical classes: 1h
- Self study: 2h 48m
Desalination

**Description:**

**Specific objectives:**
To understand concepts related to water desalination. To develop the skills to identify guidelines for the proper management of brackish water in a desalination plant.

---

Catchment and pre-treatment

**Description:**

**Specific objectives:**
To understand concepts related to water catchments and pre-treatment in a drinking water treatment plant.

---

Water distribution networks

**Description:**

**Specific objectives:**
To understand concepts related to water supply management and distribution networks.

---

Design of a drinking water treatment plant

**Description:**
Design of a drinking water treatment plant.

**Specific objectives:**
To understand concepts related to the design of drinking water treatment plants.
The mark of the course is obtained from the continuous assessment. Continuous assessment consist in several activities, both individually and in group carried out during the year (both in and out of the classroom).

Evaluation tests include two exams with both theoretical and practical questions (40% + 60% of final mark) about concepts associated with the learning objectives of the course.

Qualification system

Evaluation

<table>
<thead>
<tr>
<th>Learning time: 14h 23m</th>
</tr>
</thead>
<tbody>
<tr>
<td>Laboratory classes: 6h</td>
</tr>
<tr>
<td>Self study : 8h 23m</td>
</tr>
</tbody>
</table>

Filed trip

<table>
<thead>
<tr>
<th>Learning time: 9h 36m</th>
</tr>
</thead>
<tbody>
<tr>
<td>Laboratory classes: 4h</td>
</tr>
<tr>
<td>Self study : 5h 36m</td>
</tr>
</tbody>
</table>

Regulations for carrying out activities

If student do not perform an evaluation activity in the scheduled period the mark will be zero.

Bibliography

Basic:

Complementary: