Course guides
250666 - AIGABAST - Water of Provision

Unit in charge: Barcelona School of Civil Engineering
Teaching unit: 751 - DECA - Department of Civil and Environmental Engineering.
Degree: MASTER'S DEGREE IN ENVIRONMENTAL ENGINEERING (Syllabus 2014). (Optional subject).
Academic year: 2020 ECTS Credits: 5.0 Languages: Catalan, Spanish

LECTURER
Coordinating lecturer: JOAN GARCIA SERRANO
Others: IVET FERRER MARTI, JOAN GARCIA SERRANO, MARIA SOLÉ BUNDÓ

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.
## STUDY LOAD

<table>
<thead>
<tr>
<th>Type</th>
<th>Hours</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Guided activities</td>
<td>10,0</td>
<td>8.00</td>
</tr>
<tr>
<td>Hours large group</td>
<td>15,0</td>
<td>12.00</td>
</tr>
<tr>
<td>Hours medium group</td>
<td>10,0</td>
<td>8.00</td>
</tr>
<tr>
<td>Hours small group</td>
<td>10,0</td>
<td>8.00</td>
</tr>
<tr>
<td>Self study</td>
<td>80,0</td>
<td>64.00</td>
</tr>
</tbody>
</table>

**Total learning time:** 125 h

## CONTENTS

### Introduction on water quality, treatment and supply

**Description:**
Water quality parameters. National and European legislation and regulations on the water cycle.

**Specific objectives:**
To know the basics about drinking water quality, management and treatment.

**Full-or-part-time:** 2h 24m
- Theory classes: 1h
- Self study: 1h 24m

### Water demand

**Description:**

**Specific objectives:**
To understand concepts related to water demand estimation

**Full-or-part-time:** 2h 24m
- Theory classes: 1h
- Self study: 1h 24m

### Coagulation-flocculation

**Description:**
Coagulation-flocculation: basic principles, reagents, reactors used and energy intake. Polyelectrolytes. Jar test. Design of coagulation-flocculation systems

**Specific objectives:**
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

**Full-or-part-time:** 9h 36m
- Theory classes: 2h
- Practical classes: 2h
- Self study: 5h 36m
Gravity separation

Description:
Design of sedimentation basins

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.

Full-or-part-time: 4h 48m
Theory classes: 1h
Practical classes: 1h
Self study: 2h 48m

Filtration

Description:
Filter design and calculation of pressure drop.

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.

Full-or-part-time: 4h 48m
Theory classes: 1h
Practical classes: 1h
Self study: 2h 48m

Adsorption. Activated carbon filters

Description:
Design of activated carbon filters. Adsorption isotherms

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.

Full-or-part-time: 4h 48m
Theory classes: 1h
Practical classes: 1h
Self study: 2h 48m
Disinfection

Description:
UV disinfection: advantages and technical requirements. Kinetics of UV disinfection.
Ozone disinfection: advantages and technical requirements.
Exercises on kinetic model for chlorine disinfection.

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.

Full-or-part-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.

Full-or-part-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.

Full-or-part-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.

**Full-or-part-time:** 4h 48m  
Theory classes: 1h  
Practical classes: 1h  
Self study: 2h 48m

### Catchment and pre-treatment

**Description:**

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

**Full-or-part-time:** 2h 24m  
Theory classes: 1h  
Self study: 1h 24m

### Water distribution networks

**Description:**

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

**Full-or-part-time:** 2h 24m  
Theory classes: 1h  
Self study: 1h 24m

### 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.

**Full-or-part-time:** 4h 48m  
Practical classes: 2h  
Self study: 2h 48m
**Evaluation**

**Full-or-part-time:** 14h 23m  
Laboratory classes: 6h  
Self study : 8h 23m

**Filed trip**

**Full-or-part-time:** 9h 36m  
Laboratory classes: 4h  
Self study : 5h 36m

**GRADING SYSTEM**

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.

**EXAMINATION RULES.**

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

**BIBLIOGRAPHY**

**Basic:**

**Complementary:**