Course guide
2500019 - GECTECNAMB - Environmental Technology

Unit in charge: Barcelona School of Civil Engineering
Teaching unit: 751 - DECA - Department of Civil and Environmental Engineering.
Degree: BACHELOR’S DEGREE IN CIVIL ENGINEERING (Syllabus 2020). (Compulsory subject).
Academic year: 2022 ECTS Credits: 6.0 Languages: Catalan, English

LECTURER

Coordinating lecturer: JOAN GARCIA SERRANO, JAUME PUIGAGUT JUAREZ
Others: CLARA CORBELLA VIDAL, JOAN GARCIA SERRANO, JAUME PUIGAGUT JUAREZ

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Specific:
14408. Ability to apply study methodologies and environmental impact assessments. (Common module to the Civil branch)
14417. Knowledge and understanding of the supply and sanitation systems, as well as their sizing, construction and conservation. (Specific technology module: Civil Construction)
14419. Knowledge and understanding of the functioning of ecosystems and environmental factors. (Specific technology module: Hydrology)
14420. Knowledge of urban services projects related to water distribution and sanitation. (Specific technology module: Hydrology)
14421. Knowledge and understanding of the supply and sanitation systems, as well as their sizing, construction and conservation. (Specific technology module: Hydrology)

General:
14380. Scientific-technical training for the exercise of the profession of Technical Engineer of Public Works and knowledge of the functions of advice, analysis, design, calculation, project, construction, maintenance, conservation and exploitation.
14383. Ability to project, inspect and direct works, in their field.

TEACHING METHODOLOGY

The course consists of 3 hours per week of lectures in the classroom, outlining the basics of the subject, presenting examples and solving exercises.

Support material is provided through the Virtual Campus ATENEA.

There is a compulsory technical visit.
LEARNING OBJECTIVES OF THE SUBJECT


1 Ability to conduct a water quality analysis study including chemical and biological factors.
2 Ability to analyze the cycle of a sewage treatment plant.
3 Ability to analyze the cycle of a water purification plant.


Knowledge and understanding of the main treatment systems of drinkable water, wastewater and municipal solid waste.

STUDY LOAD

<table>
<thead>
<tr>
<th>Type</th>
<th>Hours</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hours large group</td>
<td>30,0</td>
<td>20.00</td>
</tr>
<tr>
<td>Self study</td>
<td>84,0</td>
<td>56.00</td>
</tr>
<tr>
<td>Hours medium group</td>
<td>30,0</td>
<td>20.00</td>
</tr>
<tr>
<td>Guided activities</td>
<td>6,0</td>
<td>4.00</td>
</tr>
</tbody>
</table>

Total learning time: 150 h

CONTENTS

**Presentation**

Description:
Presentation of the course

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

**Description:**
Urban water circuit  
Sampling and preservation of samples  
Mass emission rate  
Inhabitant equivalent

**Specific objectives:**
To describe the urban water circuit  
To explain the process of sampling and preservation of samples  
To define the concepts of mass emission rate and inhabitant equivalent

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

---

**2. Water characterization**

**Description:**
Composition of water  
Physico-chemical water quality  
Microbiological water quality

**Specific objectives:**
To describe the typical composition of different water sources  
To define the main physico-chemical and microbiological water quality parameters

**Full-or-part-time:** 7h 11m  
Theory classes: 3h  
Self study: 4h 11m
3. Drinkable water treatment

Description:
- Standards for water supply
- Distribution networks
- Objectives of drinkable water treatment processes
- Coagulation and flocculation

Applying the theory of reactors in the coagulation-flocculation
Exercises on coagulation-flocculation
Sedimentation
Granular media filtration
Adsorption
Exercises on coagulation-flocculation, sedimentation and filtration

Specific objectives:
- To list water supply quality standards
- To describe the distribution networks
- To explain the processes of coagulation and flocculation
- To apply the theory of reactors in the coagulation-flocculation
- To solve exercises on coagulation-flocculation
- To describe the process of sedimentation
- To compare the filtration in slow and fast granular media filters
- To explain the role of active carbon adsorption
- To solve exercises on the processes of coagulation-flocculation, sedimentation and filtration

Full-or-part-time: 28h 47m
- Theory classes: 3h
- Practical classes: 4h
- Laboratory classes: 5h
- Self study: 16h 47m

4. Water disinfection

Description:
- Importance of disinfection
- Chlorination
- Disinfection with ozone
- Disinfection with UV

Applying the theory reactors to water disinfection
Exercises on water disinfection

Specific objectives:
- To compare the main methods of water disinfection
- To describe the process of breakpoint chlorination
- Applying the theory of the disinfection reactors
- Solving exercises in water disinfection

Full-or-part-time: 21h 36m
- Theory classes: 2h
- Practical classes: 2h
- Laboratory classes: 5h
- Self study: 12h 36m
5. Desalination of water

**Description:**
- Filtration membranes
- Reverse Osmosis
- Desalination plants

**Specific objectives:**
- To define the process of reverse osmosis
- To describe the treatment line of a desalination plant

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

---

**Evaluation**

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

---

6. Wastewater treatment

**Description:**
- Regulation of wastewater
- Sanitation networks
- Theory of wastewater treatment
- Pretreatment
- Outfalls
- Primary treatment
- Secondary treatment
- Tertiary treatment
- Outfalls
- Kinetics of microbial growth
- Application of microbial kinetics in a CSTR with and without recirculation
- Exercises on activated sludge systems

**Specific objectives:**
- To list the wastewater regulations
- To describe the processes used on wastewater pretreatment, primary treatment, secondary treatment and tertiary treatment
- To apply a microbial kinetics in a CSTR with and without recirculation
- To solve exercises on activated sludge systems

**Full-or-part-time:** 28h 47m
- Theory classes: 5h
- Practical classes: 2h
- Laboratory classes: 5h
- Self study: 16h 47m
7. Sludge treatment

**Description:**
- Characteristics of sludge
- Thickening
- Dewatering
- Anaerobic Digestion
- Final Destination of sludge
- Exercises of sludge treatment systems

**Specific objectives:**
- To define the main characteristics of sludge
- To describe the process of thickening, dewatering and anaerobic digestion of sludge
- To solve exercises on sludge treatment systems

**Full-or-part-time:** 7h 11m
- Theory classes: 2h
- Practical classes: 1h
- Self study: 4h 11m

---

**Technical Visit**

**Description:**
- Technical visit to a water or solid waste treatment plant

**Specific objectives:**
- To describe water and municipal solid waste treatment processes

**Full-or-part-time:** 7h 11m
- Laboratory classes: 3h
- Self study: 4h 11m

---

8. Municipal solid waste management and treatment

**Description:**
- Composting
- Anaerobic digestion
- Incineration
- Landfills
- Exercises on municipal solid waste treatment

**Specific objectives:**
- To describe municipal solid waste composting, anaerobic digestion and incineration
- To compare the processes of composting and anaerobic digestion
- To describe the life cycle of landfills
- To solve exercises on municipal solid waste treatment
- To describe the process of incineration of municipal solid waste
- To describe the life cycle of landfills

**Full-or-part-time:** 19h 12m
- Theory classes: 6h
- Practical classes: 2h
- Self study: 11h 12m
GRADING SYSTEM

The grade for the course is obtained from continuous assessment activities and exams.

Continuous assessment includes activities such as exercises and a technical visit (30% of the grade for the course).

Exams consist of theoretical questions with exercises. There are two exams (35% of the grade for the course each).

Criteria for re-evaluation qualification and eligibility: Students that failed the ordinary evaluation and have regularly attended all evaluation tests will have the opportunity of carrying out a re-evaluation test during the period specified in the academic calendar. Students who have already passed the test or were qualified as non-attending will not be admitted to the re-evaluation test. The maximum mark for the re-evaluation exam will be five over ten (5.0). The non-attendance of a student to the re-evaluation test, in the date specified will not grant access to further re-evaluation tests. Students unable to attend any of the continuous assessment tests due to certifiable force majeure will be ensured extraordinary evaluation periods.

These tests must be authorized by the corresponding Head of Studies, at the request of the professor responsible for the course, and will be carried out within the corresponding academic period.

EXAMINATION RULES.

Failure to perform a continuous assessment activity in the scheduled period will result in a mark of zero in that activity.

To have access to the re-evaluation the minimum mark is 4.

BIBLIOGRAPHY

Basic:

Complementary: