

## 28759 - Sanitary Engineering

### Syllabus Information

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**Academic Year:** 2019/20

**Subject:** 28759 - Sanitary Engineering

**Faculty / School:** 175 -

**Degree:** 423 - Bachelor's Degree in Civil Engineering

**ECTS:** 6.0

**Year:** 4

**Semester:** Second semester

**Subject Type:** Optional

**Module:** ---

## 1.General information

### 1.1.Aims of the course

The subject and its expected results respond to the following approaches and objectives:

- Show the basic concepts of analysis of environmental factors and their interrelation among them.
- Show the concepts that allow the analysis of the interactions between the activity of the human being and the environment.
- Show tools for identification, assessment, mitigation of environmental impacts.
- Show the general principles of the tools available for good environmental management.
- Introduce the existing basic environmental regulations (European, state and regional).

### 1.2.Context and importance of this course in the degree

The Environment is a constant concern of our society. The environmental factors, the interrelation between them, the interactions of the human species with their environment are the object of studies and analysis.

One of the major interactions that occur between the human being and his environment is linked to the activity of Civil Engineering. This course is primarily aimed at training engineers trained to identify the environmental aspects and impacts of the industry, in order to minimize them, prevent them and solve them. For this, it begins by describing and studying the links between the company and the Environment. All the vectors of pollution and environmental technology are studied below for each one of them. Finally, basic knowledge of environmental management is given (Environmental regulations, Environmental Management Systems, Environmental Impact Assessment) so that the student knows the most useful and effective environmental tools for the industry.

Each subject will develop practical work and exercises, so that students work both in class and independently and serve as a subject for discussion in practical classes, with the main goal of giving them an active role in their learning process, having as a central and fundamental point of reference when evaluating them, the importance of reflection, analysis and interpretation of the results obtained by participating in the spirit of Bologna.

The subject of Environmental Engineering, is part of the degree in Civil Engineering taught by EUPLA, framed within the group of subjects that make up the module called specific training: hydrology and which belongs to the subject of Environmental Engineering. It is a subject of third course located in the second semester and compulsory (OB), with a teaching load of 6 ECTS credits for the training course of Hydrology. (Explain also that it can be taken as optional in another / other courses).

The need of the subject within the curriculum of the present degree is more than justified because being a subject with a strong transversal character influences the approach of the rest of the subjects taught, adding the environmental variable.

### 1.3.Recommendations to take this course

The development of the subject of Environmental Engineering requires putting into play knowledge and strategies from subjects related to:

- Social Sciences.
- Natural Sciences

This subject is part of the basic training to be completed within this Degree and does not have any regulatory prerequisite nor does it require specific additional knowledge.

Therefore, the above is understood from a formal point of view, although it is necessary to be clear that an adequate training base is needed in the disciplines previously indicated

## 2.Learning goals

### 2.1.Competences

### 2.2.Learning goals

### 2.3.Importance of learning goals

## 3.Assessment (1st and 2nd call)

### 3.1.Assessment tasks (description of tasks, marking system and assessment criteria)

## 4.Methodology, learning tasks, syllabus and resources

### 4.1.Methodological overview

Strong interaction between the teacher/student. This interaction is brought into being through a division of work and responsibilities between the students and the teacher. Nevertheless, it must be taken into account that, to a certain degree, students can set their learning pace based on their own needs and availability, following the guidelines set by the teacher.

The current subject is conceived as a stand-alone combination of contents, yet organized into three fundamental and complementary forms, which are: the theoretical concepts of each teaching unit, the solving of problems or resolution of questions and laboratory work, at the same time supported by other activities.

The organization of teaching will be carried out using the following steps:

**Theory Classes:** Theoretical activities carried out mainly through exposition by the teacher, where the theoretical supports of the subject are displayed, highlighting the fundamental, structuring them in topics and or sections, interrelating them.

**Practical Classes:** The teacher resolves practical problems or cases for demonstrative purposes. This type of teaching complements the theory shown in the lectures with practical aspects.

**Laboratory Workshop:** The lecture group is divided up into various groups, according to the number of registered students, but never with more than 20 students, in order to make up smaller sized groups.

**Individual Tutorials:** Those carried out giving individual, personalized attention with a teacher from the department. Said tutorials may be in person or online.

### 4.2.Learning tasks

Involves the active participation of the student, in a way that the results achieved in the learning process are developed, not taking away from those already set out, the activities are the following:

? **Face-to-face generic activities:**

? **Theory Classes:** The theoretical concepts of the subject are explained and illustrative examples are developed as support to the theory when necessary.

? **Practical Classes:** Problems and practical cases are carried out, complementary to the theoretical concepts studied.

? **Laboratory Workshop:** This work is tutored by a teacher, in groups of no more than 20 students.

? **Generic non-class activities:**

? Study and understanding of the theory taught in the lectures.

? Understanding and assimilation of the problems and practical cases solved in the practical classes.

? Preparation of seminars, solutions to proposed problems, etc.

? Preparation of laboratory workshops, preparation of summaries and reports.

? Preparation of the written tests for continuous assessment and final exams.

The subject has 6 ECTS credits, which represents 150 hours of student work in the subject during the trimester, in other words, 10 hours per week for 15 weeks of class.

A summary of a weekly timetable guide can be seen in the following table. These figures are obtained from the subject file in the Accreditation Report of the degree, taking into account the level of experimentation considered for the said subject is moderate.

### 4.3.Syllabus

- Topic 1. Water. Properties, physico-chemical characteristics
- Topic 2. The water cycle and its interaction with the environment
- Topic 3. Regulations
- Topic 4. Water Microbiology
- Topic 5. Introduction to debug systems
- Topic 6. Activated sludge. Water line. pretreatment
- Topic 7. Activated sludge. Water line. Primary treatment
- Topic 8. Activated sludge. Water line. Secondary treatment
- Topic 9. Activated sludge. Water line. tertiary treatment
- Topic 10. Activated sludge.
- Topic 11. biological filters, trickling filters, biodiscs
- Topic 12. Green Filters
- Topic 13. Water Purification
- Topic 14. Reuse treated water

Each topic discussed in the previous section, carries associated practical exercises on real cases of application in several companies: engineering, industry and the free exercise of the profession. During this course practical activities consist of the following will take place:

1. Determination of various physico-chemical parameters of water.
2. Determination of BOD
3. Technical visits to EDAR and ETAP

### 4.4.Course planning and calendar

The planning orientation shown below

? **Week 1, 2 and 3:** Topic 1.

? **Week 4:** Topic 2.

? **Week 5:** Topic 3.

? **Week 6:** Topic 4.

? **Week 7:** Topic 5.

? **Week 8:** Topic 6.

? **Week 9:** Topic 7.

? **Week 10:** Topic 8.

? **Week 11:** Topic 9.

? **Week 12:** Topic 10.

? **Week 13:** Topic 11.

? **Week 14 and 15:** Topic 12.

#### MATERIAL RESOURCES

Material	Format
Topic theory notes Topic problems	Paper/repository
Topic theory notes Topic presentations Topic problems Related links	Digital/Moodle E-Mail
Educational software	Web page

The timetables and dates of the final exams will be those published officially at:

<https://eupla.unizar.es/asuntos-academicos/calendario-y-horarios>

<https://eupla.unizar.es/asuntos-academicos/examenes>

### 4.5.Bibliography and recommended resources

