

## 25224 - Water pollution

### Información del Plan Docente

|                 |  |
|-----------------|--|
| Academic Year   | 2016/17                                |
| Academic center | 201 - Escuela Politécnica Superior     |
| Degree          | 277 - Degree in Environmental Sciences |
| ECTS            | 6.0                                    |
| Course          | 3                                      |
| Period          | First Four-month period                |
| Subject Type    | Compulsory                             |
| Module          | ---                                    |

### 1. Basic info

#### 1.1. Recommendations to take this course

#### 1.2. Activities and key dates for the course

### 2. Initiation

#### 2.1. Learning outcomes that define the subject

#### 2.2. Introduction

### 3. Context and competences

#### 3.1. Goals

#### 3.2. Context and meaning of the subject in the degree

#### 3.3. Competences

#### 3.4. Importance of learning outcomes

### 4. Evaluation

### 5. Activities and resources

#### 5.1. General methodological presentation

The learning process that is designed for this subject is based on the following:

The course is theoretical and practical. The learning process that is designed for this subject is based on immersion student in environmental pollution, so that allows to acquire the habits and skills necessary for planning and development of a strategy to control water pollution from a technical point of view.

#### 5.2. Learning activities

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The program that is offered in order to achieve the expected results includes the following activities ...

Theory classes: 30 hours

The course is organized into two thematic blocks:

B1. Introduction to quality and water pollution.

B2. Water treatment technologies.

Practical sessions of laboratory and Integral Practical Work: 20 hours

SEMINARS (5 hours)

VISITS TO WATER TREATMENT FACILITIES (5 hours)

NO STUDENT CLASSROOM WORK (86 hours)

### 5.3.Program

#### THEORY

In class theory (30 hours)

#### B1. INTRODUCTION TO THE QUALITY AND POLLUTION OF WATER

1. General concepts about the quality and pollution of water.
2. Water pollutants. Types of pollutants. Origin and effects of the pollutants. Main polluting sectors.
3. Characterizing the pollution present in sewage and natural water. Physicochemical parameters and biological indicators.
4. Preventative measures applicable for pollution control. Best techniques available (Mejores técnicas disponibles (MTDs))
5. Evolution of pollutants in the receiving environment
6. Basic legislation regarding water. Quality standards.

#### B2.- WATER TREATMENT TECHNOLOGY

1. General concept about water treatment technologies. Classification of treatments.
2. Water treatment installations: treatment, purification, regeneration.
3. Homogeneization chambers
4. Techniques for the elimination of thick solids, sedimentable solids and fats. Roughing down and removal of sand and grease.



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|                            |          |          |          |          |          |          |          |          |          |          |   |
|----------------------------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|---|
| Classroom activity         |          |          |          |          |          |          |          |          |          |          |   |
| <b>Theory</b>              | 2        | 2        |          | 2        | 2        | 1        | 2        | 2        | 2        | 2        | 2 |
| <b>Lab sessions</b>        |          | 3        |          | 3        |          | 3        |          | 3        |          | 3        |   |
| <b>Simulation sessions</b> |          |          |          |          | 2        |          |          |          |          |          |   |
| <b>Seminars</b>            |          |          |          |          |          |          | 2        |          | 3        |          |   |
| <b>Visits</b>              |          |          |          |          |          |          |          |          |          |          |   |
| <b>Evaluation</b>          |          |          |          |          |          |          |          |          |          |          |   |
| Non classroom activity     |          |          |          |          |          |          |          |          |          |          |   |
| <b>Individual work</b>     | 4        | 3        | 5        | 3        | 3        | 3        | 3        | 3        | 2        | 2        |   |
| <b>Collective work</b>     |          |          | 2        | 1        | 2        | 1        | 2        | 1        | 1        | 1        |   |
| <b>TOTAL</b>               | <b>6</b> | <b>8</b> | <b>7</b> | <b>9</b> | <b>9</b> | <b>8</b> | <b>9</b> | <b>9</b> | <b>8</b> | <b>8</b> |   |

| Activity/Week              | 13       | 14       | 15        | 16       | 17       | 18        | 19       | 20 | 21 | Total      |
|----------------------------|----------|----------|-----------|----------|----------|-----------|----------|----|----|------------|
| Classroom activity         |          |          |           |          |          |           |          |    |    | 59         |
| <b>Theory</b>              | 2        | 2        |           |          | 2        |           |          |    |    | <b>25</b>  |
| <b>Lab sessions</b>        |          |          |           |          |          |           |          |    |    | <b>15</b>  |
| <b>Simulation sessions</b> | 3        |          |           |          |          |           |          |    |    | <b>5</b>   |
| <b>Seminars</b>            |          |          |           |          |          |           |          |    |    | <b>5</b>   |
| <b>Visits</b>              | 5        |          |           |          |          |           |          |    |    | <b>5</b>   |
| <b>Evaluación</b>          |          |          |           |          |          | 4         |          |    |    | <b>4</b>   |
| Non classroom activity     |          |          |           |          |          |           |          |    |    | 91         |
| <b>Individual work</b>     | 2        | 9        | 9         | 9        | 8        | 4         |          |    |    | <b>77</b>  |
| <b>Collective work</b>     | 2        |          |           |          |          |           |          |    |    | <b>14</b>  |
| <b>TOTAL</b>               | <b>7</b> | <b>9</b> | <b>11</b> | <b>9</b> | <b>9</b> | <b>10</b> | <b>8</b> |    |    | <b>150</b> |

### 5.5. Bibliography and recommended resources

BB

Calidad y tratamiento del agua : manual de suministros de agua comunitaria / American Water Works Association Madrid [etc.] : McGraw Hill, D.L. 2002

BB

Ingeniería de aguas residuales : tratamiento, vertido y reutilización / Metcalf and Eddy ; revisado por George Tchobanoglous, Franklin L. Burton ; traducción y revisión técnica, Juan de Dios Trillo Montsoriu, Ian Trillo Fox ; prólogo de

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- Angel Cajigas . - 3a. ed., [reimpr.] Madrid [etc.] : McGraw-Hill, D.L. 2000
- BB** Nemerow, Nelson Leonard. Tratamiento de vertidos industriales y peligrosos / Nelson Leonard Nemerow, Avijit Dasgupta Madrid : Diaz de Santos, D.L. 1998
- BB** Standard methods for the examination of water and wastewater . - 21st ed Washington : American Public Health Association : American Water Works Association : Water Environment Federation, 2005