

Academic Year/course: 2021/22

## 66224 - Water Quality and Treatment

### Syllabus Information

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**Academic Year:** 2021/22

**Subject:** 66224 - Water Quality and Treatment

**Faculty / School:** 110 - Escuela de Ingeniería y Arquitectura

**Degree:** 531 - Master's in Chemical Engineering

**ECTS:** 6.0

**Year:** 2 and 1

**Semester:** Second semester

**Subject Type:** Optional

**Module:**

### 1. General information

### 2. Learning goals

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

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

#### 4.1. Methodological overview

The methodology followed in this course is oriented towards achievement of the learning objectives. It includes both theory and practice and it is based on the immersion of the student in the topic of water pollution control, so he/she can gain the knowledge and skills necessary in order to face projects and, in general, any work activities, including environmental considerations in both management and technical tasks.

Classroom materials will be available via Moodle. These include a repository of the lecture notes used in class, the course syllabus, as well as other course-specific learning materials (<http://moodle2.unizar.es/add/>)

#### 4.2. Learning tasks

The course includes the following learning tasks:

- Lectures (TP1): 35 hours.
- Practice sessions (TP2): 15 hours. Exercises and case studies will be done in order to complement the theory sessions.
- Practice sessions (TP3): 7 hours. Laboratory and/or Personal computer sessions.
- Field work (TP4): 3 hours. One session.
- Guided case studies (TP6): 14 hours. Guidance, monitoring and evaluation of guided assignments.
- Assessment (TP8): 10 hours.
- Autonomous work and study (TP7): 52 hours.
- Tutorials: 14 hours.

#### 4.3. Syllabus

The course will address the following topics:

##### **SECTION 1. WATER POLLUTION CONTROL LEGISLATION (B1)**

- 1.1. Water legislation
- 1.2. River basin organizations and competent authority in water management. Water catchment regulation and waste discharge authorization.

## SECTION 2. NATURAL WATER STATUS (B2)

- 2.1. Groundwater. Natural composition. Quality criteria and chemical status. Control Networks.
- 2.2. Surface water. Natural composition of rivers, lakes, transitional, and coastal waters. Quality criteria, chemical, and ecological status. Control Networks.
- 2.3. Protected Areas. Quality required of waters used for the abstraction of drinking water, bathing waters, freshwaters needing protection or improvement in order to support fish life. Nutrient-sensitive areas. Control Networks.
- 2.4. Pressure and impact assessment: Pollution Risk Quantification.

## SECTION 3. USE OF WATER: QUALITY AND TREATMENT (B3)

- 3.1. Water for human consumption. Quality criteria and treatment facilities. Design and Operation of Drinking Water Treatment Plants. Waste management.
- 3.2. Water used in industrial activities. Quality criteria and treatment facilities.
- 3.3. Water used in agricultural, forestry and aquaculture. Quality criteria and treatment technologies.
- 3.4. Water used in recreational activities. Quality criteria and treatment technologies.
- 3.5. Water used for ambiental purposes. Quality criteria and treatment technologies.

## SECTION 4. WASTEWATER CONTROL AND TREATMENT (B4)

- 4.1. Effluent Guidelines for direct and indirect wastewaters. Pollution Fees and Taxes.
- 4.2. Urban and biodegradable industrial wastewaters. Wastewater Treatment Plants (WWTP) type 1, type 2, type 3. Reclamation of treated effluents. Waste management in WWTP. Design and Operation of WWTPs for small, medium and large agglomerations. Control of waste water discharging into receiving waters which are considered sensitive areas: nutrient removal processes.
- 4.3. Industrial wastewater containing hazardous substances. Treatment technologies in specific studied cases.

## PRACTICE SESSIONS (TP3 AND TP4).

Session 1: Trainnig practise for surface water ecological status assesment (P1)

Session 2: Training practice for water treatment I (P2)

Session 3: Training practise for water treatment II (P3)

## 4.4. Course planning and calendar

### Provisional course planning

WEEK	THEORY, EXERCISES AND TTs DELIVERY (TP1, TP2 and TP6)				Training Practice Sessions (TP3 & TP4)
	h1	h2	h3	h4	
1	Course Presentation	B1	B1	B1	
2	B1	B1	B1	TT1	
3	B1	B2	B2	TT2	
4	B2	B2	B2	TT3	
5	B2	B2	B2	TT4	
6	B2	B2	B2	B2	
7	B3	B3	B3	TT5	
8	B3	B3	B3	TT6	P1
9	B3	B3	B3	B3	

10	<b>B3</b>	<b>B3</b>	<b>B3</b>	<b>B3</b>	
11	<b>B3</b>	<b>B4</b>	<b>B4</b>	<b>TT7</b>	
12	<b>B4</b>	<b>B4</b>	<b>B4</b>	<b>B4</b>	<b>P2</b>
13	<b>B4</b>	<b>B4</b>	<b>B4</b>		<b>P3</b>
14	<b>B4</b>	<b>B4</b>	<b>B4</b>		
15	<b>B4</b>	<b>B4</b>	<b>B4</b>	<b>TT8</b>	
Next	<b>EXAM (TP8)</b>				

#### 4.5. Bibliography and recommended resources

[http://biblos.unizar.es/br/br\\_citas.php?codigo=66224&year=2019](http://biblos.unizar.es/br/br_citas.php?codigo=66224&year=2019)