Universidad de Navarra

Water treatment (F. Ciencias)

Guía docente 2025-26

PRESENTACIÓN

Breve descripción: Wellcome to the ADI webpage of Water Treatment Course. Water treatment is the process of removing pollutants from a water source, making it suitable for a specific use (domestic, industrial, river flow maintenance). The type of treatment to be applied will depend on the type and concentration of contaminants present. During the course, students will learn the origin and type of most usual contaminants found in water bodies, techniques to identify and quantify them and all the different processes applied in water treatment and purification plants.

- **Titulación**: Environmental Sciences and Double degree Biology -Environmental Sciences
- **Módulo/Materia**: Módulo II - Tecnología Ambiental. Materia II.
- **ECTS**: 6
- **Curso, semestre**: 3rd course of Environmental Sciences and 5th course of the double degree Biology-Environmental Sciences. Second semestre.
- **Carácter**: Compulsory
- **Profesorado**: Dra. Carolina Santamaría, Dr. Javier Peñas
- **Idioma**: English
- **Aula, Horario**:

RESULTADOS DE APRENDIZAJE (Competencias)

CB2	Que los estudiantes sepan aplicar sus conocimientos a su trabajo o vocación de una forma profesional y posean las competencias que suelen demostrarse por medio de la elaboración y defensa de argumentos y la resolución de problemas dentro de su área de estudio
CB3	Que los estudiantes tengan la capacidad de reunir e interpretar datos relevantes (normalmente dentro de su área de estudio) para emitir juicios que incluyan una reflexión sobre temas relevantes de índole social, científica o ética
CB4	Que los estudiantes puedan transmitir información, ideas, problemas y soluciones a un público tanto especializado como no especializado

CB5	Que los estudiantes hayan desarrollado aquellas habilidades de aprendizaje necesarias para emprender estudios posteriores con un alto grado de autonomía
CG2	Pensar de forma integrada y abordar los problemas desde diferentes perspectivas.
CG3	Tener razonamiento crítico
CG4	Trabajar en equipo.
CG5	Tener sentido de responsabilidad hacia el medio ambiente y el ecosistema
CG6	Gestionar la información
CE2	Aplicar la terminología y unidades de medida de los procesos físicos.
CE3	Describir la estructura, propiedades físico-químicas y reactividad de los elementos y compuestos implicados en los procesos biogeoquímicos.

PROGRAMA

The following topics will be cover along the course:

PART 1

1- Introduction. Water treatment definition. Introduction to water quality. Water hydrological cycle. Water management history.

2- Natural waters. Water properties. Types of water and composition. Chemical reactions in aquatic media.

3- Water pollutants. Water pollution. Pollution sources. Classification of pollutants. Water framework Directive. General pollution indicator parameters. Challenges of water pollution-emerging pollutants.

4- Water sampling and pollutants analysis techniques.

PART 2

5- Treatment of natural waters.

6- Standards for water quality and quality index. Dumping tax.

7- Drinking water treatment: natural water collection, purification plants description.

8- Wastewater treatment plants description: pre-treatment; primary; secondary; tertiary treatments.

9- Water reuse and resource recovery during wastewater treatment: towards a circular economy.

PRACTICAL CLASSES AND VISITS TO WATER TREATMENT PLANTS (1,5 ECTS)

ACTIVIDADES FORMATIVAS

1. Lectures: lectures will be given by the professors following the teaching program, using Power Point presentations, videos and the blackboard. Power Point presentations and other relevant material will be posted on ADI (30h).

2. Visits to relevant water treatment facilities: students will be taken to wastewater treatment and purification plants located around Pamplona to learn how water they consume and contaminate is treated. A report on the visit will be handled by students (12h).

3. Laboratory practices: practices related to analysis conducted in wastewater treatment and purification plants (6h).

4. Seminars: students will be asked to work in groups and present the case studies proposed by the professor (10h).

EVALUACIÓN

CONVOCATORIA ORDINARIA

PART 1:

- Reports for the practices and visits: 20%
- Reports on case studies and presentations: 40%
- Final exam: 40%

PART 2:

- Reports for the practices and visits: 25%
- Final exam: 75%

CONVOCATORIA EXTRAORDINARIA

Students who did not score a minimum of 5 points in any of the previous exams, will have to take the corresponding exam again in June.

HORARIOS DE ATENCIÓN

Universidad de Navarra

Dra. Carolina Santamaría (csanta@unav.es) (Responsible for the course)

- Despacho 0050. Edificio Investigación. Planta baja.
- Horario de tutoría: Friday from 11:00 to 12:00h.

HORARIOS DE ATENCIÓN

Dr. Javier Peñas (jpesteban@unav.es)

- Despacho 1231. Edificio Investigación. Planta primera.
- Horario de tutoría: Friday from 11:00 to 12:00h.

BIBLIOGRAFÍA

Basic bibliography:

- Environmental chemistry. Manahan, Stanley E. Ed. Boca Raton: CRC press. 9th edition (2010). Find it in the library
- Contaminación ambiental : una visión desde la química. 2ª edición. Orozco Barrenetxea, C. Ed. Thomson (2004). Find it in the Library
- Wastewater engineering: treatment and reuse. 4th edition / Metcalf & Eddy ; revised by George Tchobanoglous, Franklin L. Burton, H. David Stensel. Ed. McGraw Hill (2003). Find it in the Library

Complementary bibliography:

- Ingeniería y Ciencias Ambientales. Davis, M.L. y Masten, S.J. Ed. McGraw Hill (2004). Find it in the Library
- Dictionary of Water and Waste Management. Paul G. Smith. Co-published by IWA Publishing (2005). Find it in the Library
- Physical-Chemical Treatment of Water and Wastewater. Arcadio P. Sincero and Gregoria A. Sincero. Ed. CRC (2002). Find it in the Library
- Fangos Activos: Eliminación biológica de nutrientes. J.A Cortacans. Colegio de Ingenieros de caminos, canales y puertos (2000). Find it in the Library