Universidad de Navarra

Fundamentals of environmental engineering (F. Ciencias)

Guía docente 2026-27

PRESENTACIÓN

- **Breve descripción**: The subject Fundamentals of Environmental Engineering provides students with the basic tools to understand the technologies which are being used to minimize environmental impacts. It is included in Module III: Environmental Technology of Curriculum structure.
- **Titulación**: Bachelor in Environmental Sciences
- **Módulo/Materia**: Module III
- **ECTS**: 6
- **Curso, semestre**: 1st year Bachelor in Environmental Sciences and 3rd year Double Bachelor in Biology -Environmental Sciences. Second semester.
- **Carácter**: Compulsory.
- **Profesorado**: Dra. Itziar Vélaz Rivas (itzvelaz@unav.es) and Dr. Yasser Morera Gómez (ymorera@unav.es).
- **Profesor responsable de la asignatura**: Dr. Yasser Morera Gómez (ymorera@unav.es)
- **Idioma**: English (3 ECTS)/Spanish (3 ECTS)
- **Aula**: 35
- **Horario**: 3 h/week

RESULTADOS DE APRENDIZAJE (Competencias)

COMPETENCES OF THE SUBJECT IN THE DEGREE

The contents of the materials that make up the module III will equip students with the skills related to environmental technology, with the aim of training professionals engaged in activities with a strong technical foundation for the improvement of the environment and treatment techniques and control of pollution of air, soil, solid waste and water treatment systems (Memory for the application of Title, 2013)

Specific skills

• CE2 Apply terminology and units of measurement of physical processes.

• CE40 Perform material balances and applying energy to all kinds of processes and facilities.

General and basic skills

• CG2 Think integrated manner and approach problems from different perspectives.

• CG3 Having critical thinking.

• CG6 Manage information.

• CB1 Students have demonstrated knowledge and understanding in a field of study that part of the basis of general secondary education, and is typically at a level which, although it is supported by advanced textbooks, includes some aspects involving knowledge of the forefront of this field of study

• CB2 Students can apply their knowledge to their work or vocation in a professional manner and have competences typically demonstrated through sustaining arguments and solving problems within this field of study

• CB3 Students have the ability to gather and interpret relevant data (usually within this field of study) to inform judgments that include reflection on relevant social, scientific or ethical

COMPETENCES OF THE SUBJECT

With regard to knowledge:

- Set up and solve material balances under different conditions: steady, dynamic, with and without chemical reaction.

- Set up and solve energy balances in different systems: stationary, with and without chemical reaction.

- Provide basic engineering skills to solve environmental problems.

- Provide an overview of the most used in environmental engineering processes, to avoid the impact caused by human activities.

- Determine the extent of application of technologies to different environmental problems.

Skills and Attitudes:

- Encourage participation in seminars related to environmental engineering from the workgroup.

- Promoting the use of information sources on issues related to the subject.

Students should (according to the evaluation):

- Attend and actively participate in both theoretical and practical sessions.

- Resolve the issues and problems that take place in class.

- Attend to lab and outing sessions.

- Conduct a final written exam to assess knowledge acquisition.

PROGRAMA

- **UNIT 1:** Fundamentals of Environmental Engineering

Definition and objectives of Environmental Engineering. General concepts of Environmental Engineering. Transport Phenomena.

- **UNIT 2:** Unit Operations in Environmental Engineering

Definition and classification of unit operations. Frequent Unit Operations in Environmental Engineering.

- **UNIT 3:** Material balances

Principle of conservation of matter. General material balance. Exercises.

- **UNIT 4:** Energy balances

Principle of conservation of energy. General energy balance. Exercises.

- **CROSS UNIT:** Applications of Environmental Engineering

Water, air, soil and waste treatment.

ACTIVIDADES FORMATIVAS

- **Lessons (40 hours):** At the end of each block, in ADI the necessary documentation will be provided to follow the course. RECOMMENDATION: Students should be able to answer questions during the course.
- **Laboratory sessions (12 hours):** Practical activities to check the main acquired knowledge in the lectures
- **Outing activities (12 hours):** During the course there will be at least 2 outings to visit industries where the concepts and tools studied in class are applied.
- **Tutoring (10 hours):** By appointment (ymorera@unav.es; itzvelaz@unav.es). RECOMMENDATION: each student should assist to 2 sessions at least.
- **Tests (6 hours):** two tests will be done. Mid-term exam and Final exam.
- **Personal work (104 hours).**

EVALUACIÓN

CONVOCATORIA ORDINARIA

- Test: **70 %.** If the student passed the midterm exam (UNIT 1 and 2) with 5 or more, it will not be necessary to attend the final call (May or June) for these parts.
- Laboratory sessions: **30 %.** Report 60%; individual performance in the laboratory 40%

To pass the course:

- As a minimum of 5 (over 10)

To do the average mark:

- As a minimum of 5 (over 10)
- Test (5 in each part: part UNIT 1-2 and part UNIT 3-4)
- Laboratory sessions (compulsory to attend the sessions and submit the report)
- Outing activities (compulsory to attend the sessions)

CONVOCATORIA EXTRAORDINARIA

- Similar to the ordinary call. But in this case, if the student passed one of the parts (UNIT 1 and 2 or UNIT 3 and UNIT 4) in the final call (May) with 5 or more, it will not be necessary to attend the extraordinary call (June) for this part.

Additional -important- information:

-Students must not copy in the exam. This can lead to lose the opportunity of examining.

-Students must not use smart calculators or smart phones/watch's in the exam. This can lead to lose the opportunity of examining.

-If a student has passed the laboratory sessions, this mark will be kept one academic course. In this way, the student must pass the test during the following academic course if he/she wishes to pass the subject in that academic course.

- If the initial plan on this teaching guide changes due to external causes the students will be informed properly.

ALUMNOS CON NECESIDADES ESPECIALES/STUDENTS WITH SPECIAL EDUCATIONAL NEEDS: los estudiantes con necesidades educativas especiales deberán ponerse previamente en contacto con la Coordinación de Estudios de la Facultad de Ciencias para obtener la autorización correspondiente a las adaptaciones (por ejemplo, disponer de más tiempo en los exámenes). Dicha autorización deberá ser enviada por el alumno al profesor. Se recomienda realizar esta gestión al comienzo del cuatrimestre. / Students with special educational needs must contact the Studies Coordination Office of the Faculty of Science in advance to obtain the corresponding authorization for accommodations (for example, having additional time during exams). This authorization must then be sent by the student to the professor. It is recommended that this procedure be completed at the beginning of the semester.

ATENCIÓN/ATTENTION: Se recuerda que cualquier intento de fraude, copia, plagio u otro comportamiento irregular supone una infracción grave, tal y como está contemplado en el título IV "Normas de disciplina académica de los estudiantes" dentro del Sistema de normas sobre la convivencia en la Universidad de Navarra. / It is reminded that any attempt at fraud, cheating, plagiarism, or other irregular behavior constitutes a Grave Misconduct, as established in Title IV, *'Academic Discipline Regulations for Students'*, within the *System of Rules on Coexistence at the University of Navarra*.

HORARIOS DE ATENCIÓN

If after attending the lessons and working, at home, on the contents presented in the classroom, the student has any questions, a tutoring can be requested by email.

It is recommended that students attend at least two sessions in personalized tutoring during the course (they can be online).

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- Office 1-050. First Floor. Research building. Department of Chemistry_School of Sciences.

BIBLIOGRAFÍA

Recommended reading: Locate them in Library

- Franklin J. Agardy, Nelson Leonard Nemerow (2005). Environmental solutions [Recurso electrónico]. Elsevier.Localízalo en la Biblioteca
- Metcalf & Eddy, Inc. (2003) Wastewater Engineering: Treatment and Reuse, 4d ed., McGraw-Hill, New York. Localízalo en la Biblioteca
- Perry, R.H. y Green, D. (2019). Perry's Chemical Engineer's Handbook, 9ª ed., Ed. McGraw-Hill. Localízalo en la Biblioteca
- Ruth F. Weiner and Robin A. Matthews (2003). Environmental Engineering (Fourth Edition) ISBN: 978-0-7506-7294-8 [Recurso electrónico]. Elsevier. Localízalo en la Biblioteca
- Warren l. McCabe, Julian C. Smith, Peter Harriott (2007). Operaciones unitarias en ingeniería química, McGraw-Hill. Séptima edición. ISBN 9789701061749. IMPORTANT FOR UNIT 2. Localízalo en la Biblioteca

Complementary reading:

- Antonio Pérez Gisbert (2010). Ingeniería del medio ambiente. ISBN 9788484548010. [Recurso electrónico]. Editorial club Universitario. Localízalo en la Biblioteca

- Izquierdo, José Felipe; Costa López, José; Martínez de la Ossa, Enrique; Rodríguez, José; Izquierdo, María (2011). Introducción a la Ingeniería Química: Problemas resueltos de Balances de Materia y Energía. ISBN: 9788429179132. Editorial Reverte. Localízalo en la Biblioteca
- Mackenzie Davis, David Cornwell (2013). Introduction to Environmental Engineering. McGraw-Hill. ISBN: 9780071326247. IMPORTANT FOR UNIT 3, UNIT 4 AND UNIT 5. Localízalo en la Biblioteca
- Harrison, R.M., Chester, Roy, Slater, David (1996). Pollution: Causes, Effects and Control. Royal Society of Chemistry. Localízalo en la Biblioteca
- Bisesi, Michael; and Koren, Herman, (2002). Pollutant Interactions in Air, Water, and Soil.