Universidad del País Vasco Euskal Herriko Unibertsitatea

COURSE GUIDE 2025/26

Faculty 363 - Faculty of Engineering - Bilbao **Cycle** .

Degree GMECAN30 - Bachelor`s Degree in Mechanical Engineering **Year** Fourth year

COURSE

26611 - Environmental Technologies **Credits, ECTS:** 6

COURSE DESCRIPTION

OVERVIEW

Environmental Technologies is a 6 ECTS undergraduate core module of 4th year (first semester). This module belongs to the Industrial Area modules group, common to all undergraduate BSc Courses: BSc in Electrical Engineering, BSc in Automatic and Industrial Electronical Engineering; BSc in Mechanical Engineering.

The aim of the Environmental Technology module is to introduce Industrial Engineering students to the study of environmental issues, so that they can address the challenges encountered throughout their engineering career.

This module undertakes the technologies for water, air and waste treatment. In addition, the goals of sustainable development and IPPC legislation, certain aspects of noise pollution and similarities and differences among Environmental management systems (EMS) will also be covered.

Based on previous scientific-technical knowledge acquired through core modules such as Foundation Chemistry of first year and Science of Materials and Thermal Engineering of second year, the causes for environmental perturbations are studied. These perturbations are mainly due mainly to industrial processes, power generation and transport. The current state of technology in wastewater, air, solid waste and soil management is undertaken, and their effect on health and the environment. All of these units will be studied in reference to the European Union legal framework that regulates the quality standards of the environmental perturbations.

COMPETENCIES/LEARNING RESULTS FOR THE SUBJECT

SKILLS

C4.- Ability to resolve problems through initiative, decision-making, creativity, critical reasoning and convey knowledge, skills and abilities in the field of Industrial Engineering.

C6 - Ability to apply mandatory specifications, regulations and standards

C7 - Ability to analyse and assess the social and environmental impact of the technical solutions

C8 - Ability to apply quality principles and methods

C11 - Knowledge, understanding and ability to apply the required legislation within the technical industrial engineering practice.

CRI10 - Basic knowledge and application of environmental technologies and sustainability

C12 - To adopt a responsible attitude, an organised approach to work and a willingness to learn considering the challenge posed by the need for lifelong training.

C13 - To apply the specific strategies of scientific methodology: analyse the situation and its issues both qualitatively and quantitatively. Propose hypotheses and solutions using the specific models of Industrial Engineering.

C14 - To work efficiently in a team integrating capabilities and knowledge for adopting decisions within the field of Industrial Engineering

LEARNING OUTCOMES:

Students should be able to:

- Analyse and assess the social and environmental impact of the technical solutions to the challenges posed by technological development, applying sustainability criteria.

- Know, understand and apply the law, specifications and mandatory rules and regulations within the technical industrial engineering practice, being fully aware of their professional responsibilities as engineers and applying the principles and

methods of quality, safety and business economic framework

Module content coordination is required since some of the topics are also included in the module "Environmental Management Systems ISO14001" from 4th year. More specifically, content relating to Environmental Management Systems ISO14001 that is covered in–depth and the topic about Sound that is related to Security and Hygiene Systems at workplace.

Theoretical and Practical Contents

SYLLABUS:

Unit 1. Introduction to environmental pollution. What is meant by the term Environment? What is meant by the term pollution? UN sustainable development goals. Normative and Legislation on Environment. IPPC and application instruments.

Unit 2. Air pollution. The atmosphere. Types of pollutants. Primary and secondary pollutants. Effects of pollution. Macroecological aspects: Acid rain, greenhouse effect and ozone´s layer. Normative framework. Emission limit values and air quality. Atmospheric stability. Atmospheric air pollutant dispersion from chimneys (Gaussian dispersion model). Particle and gas emission control technologies.

Unit 3. Noise pollution. Characterization: physical properties of sound. Measurement, propagation and noise control. Applicable legislation.

Unit 4. Water pollution. Physical and chemical properties of water. Source, classification and characterization of pollutants. Pollution indicators. Effects produced by discharge (of untreated wastewater). Natural water treatments: description of a DWTP (drinking water treatment plant) and treatments for industrial water. Wastewater treatments: WWTP (wastewater treatment plant). Industrial wastewater treatment (IWWT). Reuse of treated wastewater. Water quality criteria. Normative framework.

Unit 5. Solid waste and soil. Sources, classification and characterization of wastes. Urban solid waste (UW) and its management. Urban solid waste valorisation. Hazardous solid wastes (RP): sources and classification. Hazardous solid waste identification system. Hazardous waste treatment systems. Waste disposal: landfills. Normative framework. Soil pollution and remediation.

Unit 6. Environmental management. Environmental management systems. EMAS regulation. Differences between ISO 14001 and EMAS.

The most important topics are Air Pollution, Water Pollution and Solid Waste and Soil.
There are no experimental practicals but computer-based tools will be used to look up and discuss reports, network data and other information related to the topic, as well as to perform calculations applying computer programs.

TEACHING METHODS

TEACHING METHODS:

The following modes of teaching will be used: lectures, computer practicals and seminars. These teaching methods could be complemented by field trips to companies related to the topics studied or through attending technical conferences organised by key institutions in the field of Environment (IHOBE, for instance) , the University itself, etc.

Skills C6-C13 will be developed through lectures (usually comprising very large groups of students). During lectures, teachers will present the main contents of the module, including examples, problem solving as part of a team or independently, watching and discussing educational videos, searching for legislation or visiting web pages, etc.

Teachers can suggest individual assignments on scientific articles, institutional reports, normative, links to specific information, etc, related with module topics. Then, the prepared written essays or short presentations in the classroom will be assessed by teachers.

Every skill is developed during seminars and computer practicals, including Skills C14 and C4 (that refers to communication of knowledge, procedures, results, etc.) applying a more active learning strategy/method. Problems and exercises will be first worked independently, and then solved in a participative manner. The teacher will provide feedback. These sets of problems and exercises allow students to work the contents and also to check their progress (self-assessment). Teachers, will provide, by lecturing or through tutorials, the tools to improve their learning process.

Attendance at Seminars and Computer practicals will be monitored and a minimum attendance of 80% will be required for satisfactory completion of continuous assessment.

Teacher guided scientific technical activities will be suggested. Students will work as members of a team to search for and discuss information on the questions requested, prepare written reports and oral presentations, etc. Students know the assessment criteria established previously.

Therefore, the emphasis is placed on encouraging the independent guided learning, understood as a combination of individual and teamwork.

If the health situation avoids the development of any teaching or evaluation activity, a non-presential alternative will be used and the students will be promptly informed

TYPES OF TEACHING

Types of teaching	M	S	GA	GL	GO	GCL	TA	TI	GCA
Hours of face-to-face teaching	45	7			8				
Horas de Actividad No Presencial del Alumno/a	67,5	10,5			12				

Legend:

M: Lecture-based | S: Seminar | GA: Applied classroom-based groups
GL: Applied laboratory-based groups | GO: Applied computer-based groups | GCL: Applied clinical-based groups
TA: Workshop | TI: Industrial workshop | GCA: Applied fieldwork groups

Evaluation methods

- Continuous evaluation
- End-of-course evaluation

Evaluation tools and percentages of final mark

- Written test, open questions 80%
- Individual and team assignments (problem solving, essays, oral presentations, report analysis, legislation search, etc.): 20%

ORDINARY EXAMINATION PERIOD: GUIDELINES AND OPTING OUT

ORDINARY SITTING. GUIDELINES AND COMPLETION REQUIREMENTS.

CONTINOUS ASSESSMENT:

- First term exam held halfway through the semester: it is a written exam that will consist of short answer questions, extended response questions and problems: 31%

If a student passes this written exam, then the mark will be carried forward to the reassessment exam in the extraordinary examination period (included). Students that fail the first term exam will have to resit for first term material in the January exam.

- Exam held during the official period of January exams: it is a written exam that will consist of short answer questions, extended response questions and problems:

a) In the case of students that got a pass for the first term exam held halfway through the semester: they will take the written exam of the second term of the subject: 49%

b) In the case of students that did not pass the first term exam held halfway through the semester: they will take the written exam of the whole subject: 80%

- Teachers suggested tasks (coursework): teamwork assignments, oral presentations, reports on technical workshops, field trips to companies, etc.: 20%

The overall grade will be obtained by the sum of the marks obtained previously but it is necessary to pass the exam held during the official period of January exams. If it is not passed, the assigned mark will be the one obtained in that exam.

FINAL ASSESSMENT:

Students following article 8.3 of the Regulation Guidelines on Assessment of students in the UPV/EHU will be able to sit

for a final exam.

"Regardless of the assessment mode followed, students have the right to be assessed by a final exam. In that case, students should submit a written form of withdrawal from the continuous assessment mode to the teacher responsible of the module within the first 9 weeks of the semester start date (for 1-semester modules) and within 18 weeks of the course start date (for full academic year modules), according to the academic calendar of the corresponding faculty/school"

The final exam is a written exam held during the official exam period in January and it consists of short answer questions, extended response questions and problems: 100%.

Failure to attend the written examination of the ordinary sitting will not count as an assessment attempt and it will be marked as "No attendance".

If the health situation avoids the development of any teaching or evaluation activity, a non-presential alternative will be used and the students will be promptly informed.

EXTRAORDINARY EXAMINATION PERIOD: GUIDELINES AND OPTING OUT

RESIT EXAMINATION. GUIDELINES AND COMPLETION REQUIREMENTS

Students that fail to pass the module in the ordinary sitting, irrespective of the assessment method followed, will be able to resit for a final exam. It is a written exam held in June and consists of short answer questions, extended response questions and problems: 100%.

Students that followed the continuous assessment in the ordinary sitting could choose, when sitting for the exam, whether they want to carry forward the marks of the coursework or not. If the coursework is carried forward, the resit mark will be based on 80% examination. If coursework is not carried forward, the resit mark will be based on 100% examination.

Failure to attend the resit written examination will not count as an assessment attempt and it will be marked as "No attendance".

If the health situation avoids the development of any teaching or evaluation activity, a non-presential alternative will be used and the students will be promptly informed.

MANDATORY MATERIALS

COMPULSORY MATERIALS

Materials provided by teachers.

Questions and problems to promote self-knowledge and self-assessment of students.

BIBLIOGRAPHY

Basic bibliography

BIBLIOGRAPHY. ESSENTIAL TEXTBOOKS

1. Baird C. y Cann M. Environmental Chemistry. Ed. W. H. Freeman, 2012.
2. Lanas P.M. Conocimiento, evaluación y control del ruido. San Sebastián: APA (Asociación para la Prevención de Accidentes), 2000.
3. Masters G.M., Ela W. P. Introduction to environmental engineering and science. Madrid: Pearson-Prentice Hall, 1998.
4. Orozco Carmen, González Mª Nieves. Problemas resueltos de contaminación ambiental. Madrid: Thomson-Paraninfo, 2003.
5. Orozco Carmen, Pérez A. Contaminación ambiental. Madrid: Thomson-Paraninfo, 2008
6. Mateos Sánchez, Esperanza. Contaminación atmosférica. Bilbao: Servicios de Publicaciones EUITI, 2004.
7. Mateos Sánchez, Esperanza. Contaminación del agua. Bilbao: Servicios de Publicaciones EUITI, 2004.
8. Mateos Sánchez, Esperanza. Los residuos y su gestión. Estudio de impacto ambiental. Bilbao: Servicios de Publicaciones EUITI, 2004

Detailed bibliography

1. Colomer Mendoza F. J. Tratamiento y gestión de residuos sólidos. Valencia: Universidad Politécnica de Valencia, 2007.
2. Elías X. (editor). Reciclaje de residuos industriales. Residuos sólidos urbanos y fangos de depuradora. Madrid: Díaz de Santos, 2ª Edición, 2009.

3. Ferrando M., Granero J. Gestión y minimización de residuos. Madrid: FC editorial, 2011.
4. Gómez Orea D. Recuperación de espacios degradados. Mundi-Prensa Libros, 2007.
5. Muñoz Andrés V., Martín Nevskala D. Bases de la ingeniería ambiental. Madrid: UNED Ciencias Ambientales, 2007.
6. Osorio F., Torres Rojo J.C., Sánchez Bas M. Tratamiento de aguas para la eliminación de microorganismos y agentes contaminantes. Madrid: Díaz de Santos, 2010.
7. Rodríguez Jiménez J.J., Irabien Gulías A. Gestión sostenible de los residuos peligrosos. Madrid: Síntesis, 2013.
8. Spiro T.G. y Stigliani W.M. Química ambiental. Madrid: Pearson, 2007.

Journals

REVISTAS (EUITI-Bilbao)

• Ingeniería Química
• Residuos
• Ingeniería del Agua
• Tecnología del Agua
• Energía

Web sites of interest

INTERNET RESOURCES

Environmental information:
https://www.euskadi.eus/difusion-de-la-informacion-ambiental/web01-a2inginf/es/

Departamento de Miedo Ambiente, Planificación Territorial y Vivienda del Gobierno Vasco: http://www.euskadi.eus/web01-a1inguru/es/

Consulta red de estaciones de control de la calidad del aire de GV: http://www.ingurumena.ejgv.euskadi.eus/r49-aa17a/es/aa17aCalidadAireWar/datohistorico?locale=es

Publicaciones de IHOBE: https://www.ihobe.eus/publicaciones

Ministerio para la Transición Ecológica y el Reto Demográfico: https://www.miteco.gob.es/es/

Informes de la European Environment Agency (EEA): https://www.eea.europa.eu//publications/air-quality-in-europe-2019

Informe Calidad Aire España 2017: https://www.miteco.gob.es/es/calidad-y-evaluacion-ambiental/temas/atmosfera-y-calidad-del-aire/informeevaluacioncalidadaireespana2017_tcm30-481655.pdf

Perfil Ambiental de España de 2015 (informe basado en indicadores):
https://www.miteco.gob.es/es/calidad-y-evaluacion-ambiental/publicaciones/perfil_ambiental_2015.aspx

Informe Calidad del Aire en España 2015 Ecologistas en Acción:
https://www.ecologistasenaccion.org/IMG/pdf/informe-calidad-aire-2015.pdf

OBSERVATIONS