COMILLAS
UNIVERSIDAD PONTIFICIA
ICAI ICADE CIHS

GUÍA DOCENTE
2025 - 2026

FICHA TÉCNICA DE LA ASIGNATURA

Datos de la asignatura

Nombre completo	Environmental Engineering & Sustainability
Código	DIM-SAP-346
Cuatrimestre	Semestral
Créditos	6,0 ECTS
Carácter	Optativa
Departamento / Área	Departamento de Ingeniería Mecánica
Responsable	Maria del Mar Cledera Castro

Datos del profesorado

Profesor

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Profesores de laboratorio

Profesor

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Profesor

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DATOS ESPECÍFICOS DE LA ASIGNATURA

Contextualización de la asignatura

Prerrequisitos

Having passed a first year of bachelor's degree in engineering

Competencias - Objetivos

BLOQUES TEMÁTICOS Y CONTENIDOS

Contenidos – Bloques Temáticos

This course is an introduction to environmental engineering and sustainable development. It includes environmental quality standards, sources, characteristics, transport, and effects of water pollutants, where we will study biological, chemical, and physical processes in water and the design of water purification (WPP) and wastewater treatment plants (WWTP). It also includes the study of the structure and composition of the atmosphere and effects of air pollutants, greenhouse gases, climate change and the equipment needed to clean the air in industries such as thermoelectric power plants, cement plants, etc..... We will study solid waste management and disposal. Finally, we will study concepts such as carbon footprint, life cycle assessment and introduce Sustainability.

Theory

1. Sustainability: Introduction and basic concepts. The challenges of sustainability.
Measurement of sustainability. Indicators of sustainability. Examples of commonly used indicators. Instruments for sustainability. General criteria. Sustainability rules and policies. Environmental impact assessment. Life Cycle Analysis. Evaluation of social capital. Sustainability policies.
2. Basic concepts in ecology. Trophic networks. Mass and energy balances in the ecosystem. Ecotoxicology. Industrial ecology.
3. Air Pollution: parts of the atmosphere, pollution measurement and control, greenhouse gases, carbon footprint, carbon capture and storage.
4. Water Pollution: hydrology and hydrogeology, quality, purification (WPP) and wastewater treatment plants (WWTP).
5. Soil Pollution: Soil features and pollution. Natural resources management. Solid waste management.

Laboratory:

P1. Raw Water Analysis.

P2. Waste Water Analysis.

P3. Soil and MSW analysis.

P4. DISPER 4.0 Simulation of air pollution.

P5. Air pollution measurement of CH4, Ozone, ...

METODOLOGÍA DOCENTE

Aspectos metodológicos generales de la asignatura

EVALUACIÓN Y CRITERIOS DE CALIFICACIÓN

The following conditions must be accomplished to pass the course:
A minimum overall grade of at least 5 over 10.
A minimum grade in the final exam of 4 over 10.

The overall grade is obtained as follows:

- Final exam (30%)

- Other assignments (30%).
- Lab (20%)
- Participation in class exercises and debates (20%)

The grade of the extraordinary exam is obtained as follows:

- Extraordinary exam (80%)
- Continuous evaluation (20 %)

Allowed use of AI

The use of Artificial Intelligence is permitted exclusively for the completion of the PROJECT. Therefore, Level 2 of the Evaluation Scale by Perkins et al. (2024) establishes: 'AI may be used for pre-task activities such as brainstorming, outlining, and initial research. This level focuses on using AI for planning, synthesis, and idea generation, but assessments should emphasise the ability to develop and refine these ideas independently.' That is, the student may use AI for planning, developing ideas, and conducting research, but both the Report and the Final Presentation must demonstrate how these ideas have been developed and refined.

BIBLIOGRAFÍA Y RECURSOS

Bibliografía Básica

- Davis, M. L., & Masten, S. J. (2004). Principles of environmental engineering and science. McGraw-Hill.
- Henry, J. G., & Heinke, G. W. (1996). Environmental science and engineering. 2nd Edition. Prentice Hall.
- Mulder, K. (ed) (2006). Sustainable development for engineers. Greenleaf Publishing.
- Rogers, P.P., K.F. Jalal, J.A. Boyd (2007). Introduction to sustainable development. Earthscan Publications.