

DIM-SAP-346 Environmental Engineering and Sustainability

SEMESTER: Fall / Spring
CREDITS: 6 ECTS (4.8 Theory + 1.2 Lab work)
LANGUAGE: English
DEGREES: SAPIENS program

Course overview

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.

Prerequisites

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

Course contents

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:

There will be four 2-hour sessions in the second lecture week.

- P1.** Raw Water Analysis.
- P2.** Chlorination procedure and Jar Test.
- P3.** Soil and MSW analysis
- P4.** DISPER 4.0 Simulation of air pollution
- P5.** Air pollution measurement of CH₄, Ozone,

Textbook

- 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.

Grading

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 %)

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.