



Course guide

250MEA001 - 250MEA001 - Pollutants in the Natural Environment

Last modified: 25/06/2024

Unit in charge: Barcelona School of Civil Engineering
Teaching unit: 751 - DECA - Department of Civil and Environmental Engineering.
Degree: MASTER'S DEGREE IN ENVIRONMENTAL ENGINEERING (Syllabus 2024). (Compulsory subject).
Academic year: 2024 **ECTS Credits:** 5.0 **Languages:** Spanish

LECTURER

Coordinating lecturer: MAARTEN WILLEM SAALTINK
Others: MARCOS CARNICERO DEL RIO, DANIEL FERNANDEZ GARCIA, ALBERT FOLCH SANCHO, PAULA FELICIDAD RODRIGUEZ ESCALES, FRANCISCO JAVIER SANCHEZ VILA

TEACHING METHODOLOGY

The course consists of 3 hours per week of classroom activity.

The 2 hours are devoted to theoretical lectures, in which the teacher presents the basic concepts and topics of the subject, shows examples and solves exercises.

The 0,8 hours is devoted to solving practical problems with greater interaction with the students. The objective of these practical exercises is to consolidate the general and specific learning objectives.

The rest of weekly hours devoted to laboratory practice.

Support material in the form of a detailed teaching plan is provided using the virtual campus ATENEA: content, program of learning and assessment activities conducted and literature.

Although most of the sessions will be given in the language indicated, sessions supported by other occasional guest experts may be held in other languages.

LEARNING OBJECTIVES OF THE SUBJECT

STUDY LOAD

Type	Hours	Percentage
Hours large group	25,5	20.38
Hours medium group	9,8	7.83
Self study	80,0	63.95
Hours small group	9,8	7.83

Total learning time: 125.1 h

CONTENTS

Mass balances and transport processes

Description:

Mass balance in completely mixed systems. Analytical solutions for ODEs. Transport processes: advection, diffusion, dispersion and turbulence, buoyancy and convection, sedimentation. Distributed mass balance and analytical solutions for ODEs.

Full-or-part-time: 25h 02m

Theory classes: 5h 06m

Practical classes: 1h 58m

Laboratory classes: 1h 58m

Self study : 16h

Review of biogeochemical reactions

Description:

Equilibrium/kinetics. Water/gas reactions, adsorption, precipitation/dissolution. Metabolisms (photosynthesis, heterotrophic, lithotrophic) and redox sequence.

Full-or-part-time: 12h 31m

Theory classes: 2h 33m

Practical classes: 0h 59m

Laboratory classes: 0h 59m

Self study : 8h

Atmosphere

Description:

Pressure, temperature and wind profiles. Atmospheric stability. Layers (troposphere, stratosphere, ...). Plume calculation. Photochemical reactions. Aerosols and particles. Acid rain.

Full-or-part-time: 12h 31m

Theory classes: 2h 33m

Practical classes: 0h 59m

Laboratory classes: 0h 59m

Self study : 8h

Surface water

Description:

Dispersion and transport in rivers, exchange with the atmosphere and reoxygenation, Streeter-Phelps equation. Thermocline and stratification in lakes. Eutrophication of lakes.

Full-or-part-time: 12h 31m

Theory classes: 2h 33m

Practical classes: 0h 59m

Laboratory classes: 0h 59m

Self study : 8h



Groundwater

Description:

Groundwater flow, Darcy's law and water equation. Advection and dispersion equation with retardation and decay. Plume calculation. Matrix diffusion. Redox sequence in groundwater.

Full-or-part-time: 25h 02m

Theory classes: 5h 06m

Practical classes: 1h 58m

Laboratory classes: 1h 58m

Self study : 16h

Unsaturated zone

Description:

Evapotranspiration, infiltration, recharge. Capillarity and retention curve. Water balance models. Darcy-Buckingham law and Richards equation.

LINAS (Non-Aqueous Liquids).

Full-or-part-time: 25h 02m

Theory classes: 5h 06m

Practical classes: 1h 58m

Laboratory classes: 1h 58m

Self study : 16h

Waste and landfills

Description:

Urban waste landfills. Mining waste and acid mine drainage. Nuclear waste storage.

Full-or-part-time: 12h 31m

Theory classes: 2h 33m

Practical classes: 0h 59m

Laboratory classes: 0h 59m

Self study : 8h

GRADING SYSTEM

The rating will be obtained from continuous assessment of qualifications. Continuous assessment consists of doing various activities, both individual and group character and additive training, conducted during the year (in the classroom and outside of it). The rating is the average of the activities of this type, obtained through exercises (PR), a directed work (TD) and an examination (EX). The final mark is estimated as: $0.3 * PR + 0.3 * TD + 0.4 * EX$

EXAMINATION RULES.

Failure to perform a laboratory or continuous assessment activity in the scheduled period will result in a mark of zero in that activity.



BIBLIOGRAPHY

Basic:

- Vallero, D.. Fundamentals of Air Pollution [on line]. 5th ed. Elsevier, 2014 [Consultation: 06/11/2024]. Available on: <https://www-sciencedirect-com.recursos.biblioteca.upc.edu/book/9780124017337/fundamentals-of-air-pollution>. ISBN 9780124017337.
- Fetter, C.W.; Boving, T.; Kreamer, D. Contaminant hydrogeology. Long Grove, Illinois: Waveland Press, 2018. ISBN 1478632798.
- Ji, Z.-G.. Hydrodynamics and water quality: modeling rivers, lakes, and estuaries. John Wiley & Sons, 2008. ISBN 9780470135433.
- Schnoor, J.L. Environmental modeling: fate and transport of pollutants in water, air, and soil. Hoboken, NJ: John Wiley & Sons, 1996.