

Course guide

2500226 - GEA0226 - Decontamination of Soils and Aquifers

Last modified: 01/10/2023

Unit in charge: Barcelona School of Civil Engineering
Teaching unit: 751 - DECA - Department of Civil and Environmental Engineering.

Degree: BACHELOR'S DEGREE IN ENVIRONMENTAL ENGINEERING (Syllabus 2020). (Compulsory subject).

Academic year: 2023 **ECTS Credits:** 6.0 **Languages:** Catalan

LECTURER

Coordinating lecturer: DANIEL FERNANDEZ GARCIA

Others: MARCOS CARNICERO DEL RIO, DANIEL FERNANDEZ GARCIA

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Specific:

- 14451. Apply the fundamental concepts of statistics and randomness of physical, social and economic phenomena, as well as uncertainty and decision-making techniques.
- 14457. Identify the fundamentals of structure theory, sustainable procedures for construction and dismantling of buildings and civil works; and describe the technology bases of the materials used in construction.
- 14460. Design and project treatment systems for purification and purification of water resources, and establish the basis for the management of waste generated, describe and assess desalination and reuse processes.
- 14461. Analyze, design, simulate and optimize processes and systems with environmental relevance, both natural and artificial, and their resolution techniques, as well as recognize techniques for analysis and evaluation of climate change.
- 14462. Design and project processes for the treatment of contaminated soils and aquifers.
- 14463. Prepare, implement, coordinate and evaluate urban and industrial solid waste management plans and resource recovery.
- 14464. Apply measures to prevent and control air quality, quantify noise pollution and its corrective measures and quantify odor emissions and corrective measures.

Generical:

- 14440. Identify, formulate and solve problems related to environmental engineering.
- 14441. Apply the functions of consulting, analysis, design, calculation, project, construction, maintenance, conservation and exploitation of any action in the territory in the field of environmental engineering.
- 14442. To use in any action in the territory proven methods and accredited technologies, in order to achieve the greatest efficiency respect for the environment and the protection of the safety and health of workers and users.
- 14443. Apply the necessary legislation during the professional practice of environmental engineering.
- 14444. Apply business management techniques and labor legislation.

TEACHING METHODOLOGY

The course consists of 2.3 hours per week of classroom activity (large size group) and 1.2 hours weekly with half the students (medium size group).

The 2.3 hours in the large size groups are devoted to theoretical lectures, in which the teacher presents the basic concepts and topics of the subject, shows examples and solves exercises.

The 1.2 hours in the medium size groups 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

This course will allow studying the sources of underground contamination and their characteristics. The types of pollutants and sources of contamination will be presented and the bases for the transport of pollutants in a porous medium (soils and aquifers) will be established. The mass transfer processes involved and important chemical reactions will be presented. Contaminated sites and risk models for human health and ecosystems will be assessed, to end by analyzing possible decontamination techniques by analyzing case studies.

1. Understand the sources of subsoil contamination and their properties, as well as the concepts of reactive transport, chemical specialization and nappes (non-aqueous phase liquids).
2. Characterize and assess contaminated sites and know the risk models for human health and ecosystems and the techniques of decontamination.

Soil and Aquifer Decontamination. This course will allow studying the sources of underground contamination and their characteristics. The Contaminated sites and risk models for human health and ecosystems, to finish by analyzing possible decontamination techniques by analyzing case studies.

STUDY LOAD

Type	Hours	Percentage
Self study	90,0	60.00
Hours small group	15,0	10.00
Hours medium group	15,0	10.00
Hours large group	30,0	20.00

Total learning time: 150 h

CONTENTS

Introduction

Description:

Introduction

Full-or-part-time: 4h 48m

Theory classes: 2h

Self study : 2h 48m

Transport of pollutants in saturated media

Description:

Transport of pollutants in saturated pores

Transport in heterogeneous porous media and double porosity systems

Problems

Full-or-part-time: 24h

Theory classes: 8h

Practical classes: 2h

Self study : 14h

Transformation, sorption and attenuation of pollutants

Description:

Transformation, sorption and attenuation

Problems

Workshops

Full-or-part-time: 33h 36m

Theory classes: 8h

Practical classes: 2h

Laboratory classes: 4h

Self study : 19h 36m

Evaluation

Full-or-part-time: 14h 23m

Laboratory classes: 6h

Self study : 8h 23m

Multiphase flow and transport

Description:

Flow and transport in the vadose zone

Multiphase flow and transport

Problems

Full-or-part-time: 24h

Theory classes: 8h

Practical classes: 2h

Self study : 14h



Characterization and remediation

Description:

Characterization of contaminated sites
Remediation of contaminated aquifers and soils
Risk analysis
Problems
Workshops

Full-or-part-time: 43h 12m

Theory classes: 12h
Practical classes: 4h
Laboratory classes: 2h
Self study : 25h 12m

GRADING SYSTEM

The mark of the course is obtained from the ratings of continuous assessment and their corresponding laboratories and/or classroom computers.

Continuous assessment consist in several activities, both individually and in group, of additive and training characteristics, carried out during the year (both in and out of the classroom).

The teachings of the laboratory grade is the average in such activities.

Classes given by Maarten Saaltink will be in Spanish

The evaluation tests consist of a part with questions about concepts associated with the learning objectives of the course with regard to knowledge or understanding, and a part with a set of application exercises.

The qualification of the subject is the weighted average between the practices and exercises to realize (PR), a directed work (TD) and two examinations (EX1 and EX2).

The final grade is estimated as:

$$NF = 0.1 * PR + 0.1 * TD + 0.4 * EX1 + 0.4 * EX2$$

Students who have not passed (NF)

Students who have already passed it or with a NF

EXAMINATION RULES.

Fraudulent performance of an assessment act will lead to a numerical grade of zero for the entire subject without the possibility of re-assessment. During the exams, the use of mobile phones and/or computers is not allowed.

BIBLIOGRAPHY

Basic:

- Fetter, C.W.; Boving, T.; Kremer, D. Contaminant hydrogeology. Long Grove, Illinois: Waveland Press, 2018. ISBN 1478632798.

Complementary:

- Zheng, Chunmiao; Bennett, Gordon D. Applied contaminant transport modeling : theory and practice. New York [etc.]: Van Nostrand Reinhold, cop. 1995. ISBN 0442013485.

- Bear, J., Cheng, A.H.D. Modeling groundwater flow and contaminant transport. Dordrecht [etc.]: Springer, 2010. ISBN 9781402066818.