Course guide
250422 - INTAIGSUBO - Interaction Between Groundwater and Civil Works

Last modified: 03/10/2023

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

Degree: MASTER'S DEGREE IN GEOTECHNICAL AND EARTHQUAKE ENGINEERING (Syllabus 2009). (Optional subject).
MASTER'S DEGREE IN CIVIL ENGINEERING (PROFESSIONAL TRACK) (Syllabus 2012). (Optional subject).
MASTER'S DEGREE IN GEOLOGICAL AND MINING ENGINEERING (Syllabus 2013). (Compulsory subject).
MASTER'S DEGREE IN GEOTECHNICAL ENGINEERING (Syllabus 2015). (Optional subject).

Academic year: 2023 **ECTS Credits:** 5.0 **Languages:** English

LECTURER

Coordinating lecturer: DANIEL FERNANDEZ GARCIA

Others: JESUS CARRERA RAMIREZ, DANIEL FERNANDEZ GARCIA

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Specific:
8200. The ability to apply knowledge of soil and rock mechanics to the study, design, construction and operation of foundations, cuts, fills, tunnels and other constructions over or through land, whatever its nature and state, and whatever the purpose of the work.
8231. The ability to plan, evaluate and regulate the use of surface water and groundwater resources.

Transversal:
8559. ENTREPRENEURSHIP AND INNOVATION: Being aware of and understanding the mechanisms on which scientific research is based, as well as the mechanisms and instruments for transferring results among socio-economic agents involved in research, development and innovation processes.
8560. SUSTAINABILITY AND SOCIAL COMMITMENT: Being aware of and understanding the complexity of the economic and social phenomena typical of a welfare society, and being able to relate social welfare to globalisation and sustainability and to use technique, technology, economics and sustainability in a balanced and compatible manner.

8561. TEAMWORK: Being able to work in an interdisciplinary team, whether as a member or as a leader, with the aim of contributing to projects pragmatically and responsibly and making commitments in view of the resources that are available.

TEACHING METHODOLOGY

The course consists of 3 hours per week of classes in the classroom. These hours are devoted to lectures where the teacher explains the concepts and theory, presents examples and exercises with greater interaction with students. The remaining weekly hours are dedicated to practice in laboratories. It uses material support in the form of detailed syllabus through campus ATENEA: content, programming and evaluation activities directed learning 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

Specialization subject in which knowledge on specific competences is intensified.

Knowledge and skills at specialization level that permit the development and application of techniques and methodologies at advanced level.

Contents of specialization at master level related to research or innovation in the field of engineering.

Impact of civil works on aquifers and groundwater in the following cases: Excavations, tunnels and linear underground works. Environmental aspects of water resources quality, emphasis on aquifer contamination. Knowledge of mathematical modeling: use of numerical models to assess the impact of civil works on aquifers.

STUDY LOAD

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

Total learning time: 125.1 h

CONTENTS

Hydrogeology and Environment

Description:
Course introduction
Basics
Darcy's law, hydraulic parameters, the flow equation,groundwater networks, particular solutions, parameter estimation.
Problem
Solving the flow equation using numerical methods. Application to hydrogeology through the program MODFLOW
Resolution numerical models through practice exercises
Review of water chemistry. Concentrations. Chemical reactions. Introduction to multivariate analysis. Hydrochemistry. Mixing.
Impactos and public works
Contents of a hydrogeological study

Specific objectives:
Course introduction
Basics
Knowledge of hydraulic aquifer
Practical application of knowledge
Learn hydrogeological modeling problems
Learn to solve practical exercises using numerical models
Study of water quality
Learning is a hydrogeological study

Full-or-part-time: 64h 48m
Theory classes: 22h
Practical classes: 5h
Self study : 37h 48m

Impact of civil works on aquifers

Description:
Theory and applications of dewatering systems
Dewatering exercises
Theory of tunnels and barrier effects. Corrective measures
Application of the theory of tunneling and barrier effect

Specific objectives:
Learn the theory and application of dewatering systems in excavations
Application of the theory of dewatering systems
Learn the theory of tunneling and barrier effect. Corrective measures
Application of the theory of tunneling and barrier effect by practical exercises

Full-or-part-time: 43h 12m
Theory classes: 9h
Practical classes: 6h
Laboratory classes: 3h
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 is evaluated by exercises (PR), a directed project work (TD) and assessment tests (EX). Evaluation tests consist on issues associated to concepts of the course, learning objectives with regard to knowledge or understanding, and a set of application exercises.

The final mark is estimated as: 0.2*PR+0.4*EX+0.4*TD

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:
- González de Vallejo, L.I. Ingeniería geológica. Madrid: Prentice Hall, 2002. ISBN 84-205-3104-9.
- Mayer, A.S.; Hassanizadeh, S.M. Soil and groundwater contamination: nonaqueous phase liquids. Washington: American Geophysical Union, 2005. ISBN 9780875903217.
- Powers, J.P.; Corwin, A.B.; Schmall, P.C.; Kaeck, W.E. Construction dewatering and groundwater control: new methods and applications. 3rd ed. Hoboken: John Wiley and Sons, 2007. ISBN 9780471479437.