Last update: 04-11-2015

250422 - INTAIGSUBO - Interaction Between Groundwater and Civil Works

Coordinating unit: 250 - ETSECCPB - Barcelona School of Civil Engineering

Teaching unit: 751 - DECA - Department of Civil and Environmental Engineering

Academic year: 2015

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

ECTS credits: 5 Teaching languages: Spanish, English

Teaching staff

Coordinator: DANIEL FERNANDEZ GARCIA

Others: DANIEL FERNANDEZ GARCIA

Opening hours

Timetable: Office D2-004, by appointment

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.

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.

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

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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

Total learning time: 125h	Theory classes:	19h 30m	15.60%
	Practical classes:	9h 45m	7.80%
	Laboratory classes:	9h 45m	7.80%
	Guided activities:	6h	4.80%
	Self study:	80h	64.00%

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Content

Hydrogeology and Environment

Learning time: 57h 35m

Theory classes: 19h
Practical classes: 5h
Self study : 33h 35m

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

Impact of civil works on aquifers

Learning time: 36h

Theory classes: 6h
Practical classes: 6h
Laboratory classes: 3h
Self study : 21h

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

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Qualification 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

Regulations for carrying out activities

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.

Alex S. Mayer and S. Majid Hassanizadeh. Soil and groundwater contamination. American Geophysical Union. Washington, USA: AGU, 2005. ISBN 0170-9600.

J Patrick Powers, Arthur B Corwin, Paul C Schmall, Walter E Kaeck. Construction dewatering and groundwater control. New Jersey: John Wiley and Sons, Inc, 2007. ISBN 978-0-471-47943-7.