

60440 - Underground geological repositories

Información del Plan Docente

Academic Year	2016/17
Academic center	100 - Facultad de Ciencias
Degree	541 - Master's in Geology: Techniques and Applications
ECTS	5.0
Course	1
Period	Second semester
Subject Type	Optional
Module	---

1. Basic info

1.1. Recommendations to take this course

1.2. Activities and key dates for the course

The classes will start at the beginning of the second semester following the calendar of the Sciences Faculty.

2. Initiation

2.1. Learning outcomes that define the subject

Students should:

- know the different geological environments suitable as storage and/or disposal media;
- recognise the different properties that condition the suitability of a geological environment as a storage media;
- learn the different techniques for exploration, characterisation and assessment of the geological storage systems;
- be able to decide when a rock formation is suitable as a storage media, based on its tectonic, petrophysical, geochemical and hydrogeological properties;
- learn the methodologies for the monitoring and assessment of the geological disposal systems and their effects on the environment; and
- learn to use multidisciplinary information from different sources and to integrate and summarise that in a comprehensive report and oral presentation.

2.2. Introduction

The study of the geological storage and disposal integrates different issues associated to most of the geological disciplines (Petrology, Stratigraphy, Tectonics, Geochemistry, Hydrogeology, etc.) and with a clear focus on 1) the problem of wastes management and 2) the use and exploitation of geological resources. The understanding of a wide set of theoretical principles and the knowledge of the use of many different methodologies is necessary in order to be able to deal with this type of problems. Therefore, the course is focused on the study of the general geological aspects of the different storage media in general and on the particular and specific issues related to the different materials to be stored or disposed, with special emphasis on the radioactive wastes, the CO₂ and the gas.

3. Context and competences

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3.1.Goals

To understand the main theoretical principles related to the geological storage and disposal and the specific characters and methodologies applied to the different materials and concepts.

3.2.Context and meaning of the subject in the degree

3.3.Competences

Students should:

- know the different geological environments suitable as storage and/or disposal media;
- recognise the different properties that condition the suitability of a geological environment as a storage media;
- learn the different techniques for exploration, characterisation and assessment of the geological storage systems;
- be able to decide when a rock formation is suitable as a storage media, based on its tectonic, petrophysical, geochemical and hydrogeological properties;
- learn the methodologies for the monitoring and assessment of the geological disposal systems and their effects on the environment; and
- learn to use multidisciplinary information from different sources and to integrate and summarise that in a comprehensive report and oral presentation.

3.4.Importance of learning outcomes

4.Evaluation

Written Exam: 30% (at the end of some thematic units)

Coursework: 70% (Practical session reports, 30%; Seminars, including the personal presentation and debate, 40%)

5.Activities and resources

5.1.General methodological presentation

The methodology that will be applied has been prepared to provide the students with the necessary link between the theoretical knowledge and its practical use in the resolution of actual problems in different types of geological storage.

The student will develop competences to be able to treat different issues related to the characterisation, monitoring and assessment of different geological storage systems.

The learning process will follow three complementary actions (next section).

5.2.Learning activities

Activity 1: Master Classes (1.5 ECTS). To develop the concepts and theoretical basis of the course.

Activity 2: Practical Sessions (2 ECTS). Management and assessment of real or theoretical-practical cases about the different types of storage systems described in the course.

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Activity 3: Seminars (1,5 ECTS). Debates, discussions and presentations on the alternatives, problems and the present and past issues related to the geological storage.

The duration of the sessions will be 4 hours and will combine Activity 1 with Activity 2 or 3 depending on the programme.

5.3.Program

Lectures

Unit 1. Introduction. Geological storage and disposal, concept and types.

Unit 2. Radioactive waste disposal.

Unit 3. Geological storage of gas and CO₂.

Unit 4. Geothermics.

Unit 5. Effects, risks and consequences of the geological disposals.

Practical sessions

There are several practical sessions and seminars on the topics covered during the lectures that will be given in parallel to them. The practical sessions will consist of solving practical cases related to the exploration and assessment of suitable geological areas for different underground repositories in Spain and in other European countries. Additionally, some examples of geothermic usage in local areas and the assessment of the environmental effects of some underground facilities, will be analysed by using some conventional and specific calculation programs. The seminars will include the discussion and debate on different subjects related to the worldwide socio-political, economic and scientific context, responses and positions with respect to the geological storage and disposal. Every student will have to prepare an oral presentation about one of the subjects proposed by the teachers at the beginning of the course.

5.4.Planning and scheduling

Total Number of Hours of Student Work: 75

Hour of Lectures/Seminars: 30

Hours of Practicals/Problem Classes: 20

Days of Fieldwork: 0

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5.5. Bibliography and recommended resources

Course materials will consist of lecture notes, lecture Powerpoint presentations and practical class handouts. Recommended texts are:

Advances in the Geological Storage of Carbon Dioxide. Springer, Netherlands. Lombardi et al. (2006).

Principles and standards for the disposal of long-lived radioactive wastes. Waste Management Series, Volume 3, Pergamon, Elsevier. Chapman, N. and McCombie, Ch. (2003).

Geological disposal of carbon dioxide and radioactive wastes: a comparative Assessment. Springer. Toth (2011).

Geological repository systems for safe disposal of spent nuclear fuels and radioactive waste. Woodhead Publishing Limited. Ahn and Apted (2010).