

60440 - Underground geological repositories

Syllabus Information

Academic Year: 2019/20

Subject: 60440 - Underground geological repositories

Faculty / School: 100 - Facultad de Ciencias

Degree: 541 - Master's in Geology: Techniques and Applications

ECTS: 5.0

Year: 1

Semester: Second semester

Subject Type: Optional

Module: ---

1.General information

1.1.Aims of the course

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

1.2.Context and importance of this course in the degree

This course offers an advanced formation in several interdisciplinary geological issues, focused on the study of some resource management of the antropogenically generated wastes. That is why it is specially interesting for students with research and

As it is an interdisciplinary course, the students will be able to apply specific aspects from their master's thesis to the development first term, mainly those related to the knowledge of instrumental techniques and data management and evaluation.

2.1.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.

2.2.Learning goals

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.

2.3.Importance of learning goals

Some of these goals are:

1. To understand the basis of the geological storage as an alternative for the wastes management.
2. To study and understand the different types of geological storage.
3. To evaluate their effects in the environment and their evolution with time.

This course will help the student develop the ability to analyse, critically assess and, in summary, to take decisions based on reasonable facts.

3.Assessment (1st and 2nd call)

3.1.Assessment tasks (description of tasks, marking system and assessment criteria)

The student will have to show that has reached the learning outcomes through the following evaluation activities:

Continuous Assessment:

- **Activity 1** will be assessed through individual questionnaires with theoretical-practical content of each course unit (maximum one per thematic unit). This activity is worth 45% of the final grade.

- **Activity 2** will be assessed through the evaluation of the reports from the lab sessions. This activity is worth 10% of the final grade.

- **Activity 3** will be assessed through two individual or small-group essays presented by the students on topics related to the two main units of the course. The active participation on the debates will also be taken into account. This activity is worth 45% of the final grade.

Each questionnaire/exercise or presentation will be graded on a scale from 0 to 10. Each item will be passed with a grade equal or greater than 5. The final/global grade will be calculated applying the corresponding weights for each activity provided every activity has a grade greater than 4.

Final Assessment

The student that decides to take only the final exam, or the student that has not passed the continuous assessment, will have to pass a final assessment consisting of several theoretical-practical questions about the units treated during the course. The exam will be graded from 0 to 10 and it will be considered passed with a qualification of 5.

Off-site students Exams

The off-site students will be evaluated with the same final/global assessment indicated in the previous section.

4.Methodology, learning tasks, syllabus and resources

4.1.Methodological overview

The methodology followed in this course provides 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. Students will develop competences to deal with different issues related to the characterisation, monitoring and assessment of different geological storage systems.

A wide range of teaching and learning tasks are implemented, such as lectures, practice sessions and seminars.

4.2.Learning tasks

The course includes the following learning tasks:

- **Activity 1 - Lectures** (1.5 ECTS). Development of the concepts and theoretical basis of the course.
- **Activity 2 - Practice Sessions** (2 ECTS). Management and assessment of real and/or theoretical-practical cases about the different types of storage systems described in the course.
- **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 of 4 hours and will combine Lectures with Practice sessions or Seminars, depending on the syllabus.

4.3.Syllabus

The course will address the following topics:

Lectures

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

Topic 2. Radioactive waste disposal.

Topic 3. Geological storage of gas and CO₂.

Topic 4. Geothermics.

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

Practice sessions

There are several practice sessions and seminars on the topics covered during the lectures that will be given in parallel to them.

- The practice sessions will involve solving practical cases related to the exploration and assessment of suitable geological areas for different underground repositories in Spain and other European countries. Additionally, some examples of geothermic use 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 of different topics related to the worldwide socio-political, economic and scientific context, responses and positions with respect to the geological storage and disposal. Every student will prepare an oral presentation about one of the topics proposed by the lecturers at the beginning of the course.

4.4.Course planning and calendar

The course includes the following learning tasks:

- Hours of autonomous work: 75
- Hour of Lectures/Seminars: 30
- Hours of Practice/Problem Classes: 20
- Days of Fieldwork: 0

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

4.5.Bibliography and recommended resources

http://biblos.unizar.es/br/br_citas.php?codigo=60440&year=2019