60435 - The Earth: processes and interactions at large scales

Información del Plan Docente

Academic Year	2017/18
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.Introduction

1.2.Recommendations to take this course

1.3.Context and importance of this course in the degree

1.4.Activities and key dates

2.Learning goals

2.1.Learning goals

2.2.Importance of learning goals

3.Aims of the course and competences

3.1.Aims of the course

3.2.Competences

4.Assessment (1st and 2nd call)

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

5.Methodology, learning tasks, syllabus and resources

5.1.Methodological overview

The aim of this course is to provide a planet-wide perspective on the energy and matter flows in the Earth. These global flows have a large impact on the Earth surface, thus affecting life in a fundamental way by conditioning the value of most environmental variables (atmosphere composition, surface temperature, presence or absence of a liquid hydrosphere, ocean chemistry, climate, etc.). They are also the drivers of geological processes in the crust and the mantle underneath. From this point of view, it can be said that global energy and matter flows are the first order "predictors" of the type and characteristics of terrestrial superficial environments.

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5.2.Learning tasks

The course includes the following learning activities:

- Activity 1 - Lectures (2.4 ECTS) to present the key concepts and the theoretical basis of the course.
- Activity 2 - Practice sessions (1.8 ECTS) are dedicated to software or general appplications for the solving of specific problems.
- Activity 3 - Seminars (0.8 ECTS) to discuss about some topics previosuly selected by the course teachers.

5.3.Syllabus

The course will address the following topics:

Topic 1. Earth's global energy budget (8 hours)

- Principles of heat transfer; thermal properties of solids and liquids; heat flow and geotherm; sources and sinks of thermal energy; Earth's thermal history and current thermal budget; thermal anomalies; geothermics and geothermal exploration.

Topic 2. Chemical geodynamics and global geochemical cycles (8 hours)

- Basics of cycles, reservoirs, stationary states and residence times; the water cycle and its role in Earth's dynamics; global bio-geochemical cycles of carbon, sulphur and nitrogen.

Topic 3. External effects of Earth's internal large-scale processes (8 hours)

- Magmatism, metamorphism and their effect on atmosphere, hydrosphere and biosphere; mountain building and its interaction with climate; consequences of changes in the distribution of land masses; applied geothermics; distribution of key chemical elements in the Earth's surface; natural and anthropogenic geochemical anomalies.

Practice sessions

- There are 9 two-hour practice sessions and 4 two-hour seminars on topics covered during the lectures.

5.4.Course planning and calendar

The course (Earth - processes and interactions at large scales), of 5 ECTS, is taught during the second semester in four-hour sessions, one per week (Monday, 09-13h). Each sesion comprises a theoretical part and a practical part whose duration depends on the topic.

In detail, the 125 hours of student work are divided as follows:

- Total Number of Hours of Student Work (autonomous work): 75
- Hours of Lectures/Seminars: 24
- Hours of Practice/Problem Sessions: 26
- Days of Fieldwork: 0

Assessment details

- Written Exam: 30% (three written exams, one at the end of each topic; 10% each)
- Coursework: 70% (Practice session reports, 50%; Seminars, 20%)

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Moodle Page: https://moodle2.unizar.es/add/

5.5.Bibliography and recommended resources

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

Jaupart, C. Heat generation and transport in the Earth. Cambridge University Press. 2010.

Stober, I. Geothermal Energy: From Theoretical Models to Exploration and Development. Springer. 2013.

Treatise on geochemistry. Volumes 2, 3, 5, 7; executive editors H.D. Holland and K.K. Turekian Amsterdam: Elsevier, 2005.

Turcotte, D.L. Geodynamics / Donald Turcotte, G. Schubert, Cambridge: Cambridge University Press, 2002, Second edition.