

60435 - The Earth: processes and interactions at large scales

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

2. Initiation

2.1. Learning outcomes that define the subject

2.2. Introduction

3. Context and competences

3.1. Goals

3.2. Context and meaning of the subject in the degree

3.3. Competences

3.4. Importance of learning outcomes

4. Evaluation

5. Activities and resources

5.1. General methodological presentation

This course aims 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 activities

Learnig activities

Learning activity #1: 2.4 ECTS of lectures, to present the key concepts and the theoretical basis of the course

Learning activity #2: 1,8 ECTS of practical sessions, using dedicates software or general applications for the resolution of specific problems

Learning activity #3: 0.8 ECTS of seminars, to discuss on topics previosuly selected by the course teachers.

5.3.Program

Unit 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.

Unit 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.

Unit 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.

Practical sessions

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

5.4.Planning and scheduling

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 theory 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: 75

Hour of Lectures/Seminars: 24

Hours of Practicals/Problem Classes: 26

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Days of Fieldwork: 0

Assessment details

Written Exam: 30% (three written exams, one at the end of each thematic unit; 10% each)

Coursework: 70% (Practical session reports, 50%; Seminars, 20%)

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.