Universitat Autònoma de Barcelona

2020/2021

Planet Earth

Code: 101044
ECTS Credits: 4

Degree	Type	Year	Semester
2500254 Geology	OB	1	1

The proposed teaching and assessment methodology that appear in the guide may be subject to changes as a result of the restrictions to face-to-face class attendance imposed by the health authorities.

Contact

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Use of Languages

Principal working language: catalan (cat)
Some groups entirely in English: No
Some groups entirely in Catalan: Yes
Some groups entirely in Spanish: No

Teachers

Eduard Remacha Grau
Gisela Leoz Munte

Prerequisites

Basic notions of Physics and Chemistry are recommended as well as a sufficient level of at least written comprehension of the English language.

Objectives and Contextualisation

Basic understanding of the fundamental concepts about:

- The Earth as a system and the interactions that occur between the solid Earth, Hydrosphere, Atmosphere and Biosphere.
- The origin and evolution of the Universe, the formation of the Earth and the evolution of the primitive Earth.
- The solid Earth and its internal structure.
- The time variable in Geology.
- Earth Dynamics and Tectonic Plates.
- Atmosphere and Hydrosphere.
- Interaction between atmosphere, hydrosphere and solid Earth. Climatic systems.
- The search for energy and sustainable development.
- An example of geological cycle: The C cycle.

Competences

- Display understanding of the fundamental principles of geology and the ability to identify the basic types of minerals, rocks and structures.
- Display understanding of the size of the space and time dimensions of Earth processes, on different scales.
- Recognise, depict and reconstruct tectonic structures and the processes that generate them and relate types of rocks and structures to geodynamic environments.
- Suitably transmit information, verbally, graphically and in writing, using modern information and communication technologies.

Learning Outcomes

1. Discern the basic relationships between geology and the problems of environmental change.
2. Discern the interactions between the various layers or spheres of the planet.
3. Relate the geodynamic significance of structural, petrogenetic and surface processes to the framework of plate tectonics.
4. Suitably transmit information, verbally, graphically and in writing, using modern information and communication technologies.

Content

1 - The Earth System: Origin of the Universe, the Solar System and planet Earth.

Composition and differentiation of planet Earth. 2h.

The Big Bang, formation of Galaxies, types of Galaxies, evolution, formation and types of stars, formation of the Solar System:

Earth-like planets and Jovian Planets. Processes of differentiation and primordial evolution of the Earth.

2 - The solid Earth and its internal structure. 2h.

Early evolution of the Earth and its composition, sources of information and methods of study.

Internal structure, methods of study and properties of the crust, Mantle and Core.

Hydrosphere, Atmosphere and Magnetosphere.

3 - The Time variable in Geology. 6h.

The variables space and time from a geological perspective. Relative ages. Absolute ages.

Calibration of the geologic time scale. Calibrated geological time scale. Magnitude of geological time.

Compilation of the main events in Earth History.

4 - Earth Dynamics and Tectonic Plates.

Hypothesis of continental drift. Plate Tectonic theory. Types of plate boundaries. Origin and movement of lithospheric plates. Hot spots.

5 - Atmosphere and Hydrosphere 8h.

Composition of atmosphere, solar radiation, temperature, atmospheric humidity, water cycle, continental and oceanic waters.

The Cryosphere. The energy balances. The Atmosphere: its interaction with the Hydrosphere and the solid Earth. Climatic systems.

Condensation, stability and cloud formation, precipitation, winds: Small scale systems.

General atmospheric circulation, Interactions Atmosphere-Ocean, Thermal circulation, marine and terrestrial breezes,

El Niño southern oscillation (ENSO9, other fluctuations in ocean temperatures and its relationship with climate changes.

Influence of tectonic (supercontinents, rise of the Himalayan-Tibetan orogenic system) and climate throughout geological times.

6 - The search for Energy and Sustainable Development. 2h.

The role of geologists in the front of increased demand for energy resources.

Exhaustion of fossil energy resources and change for new sustainable resources.

The problem and the consequences of climate change: the Kyoto protocol and state obligations, the storage of CO2.

Prospects for the future of geologists in front of emergence of new energy resources.

7 - An example of a geochemical cycle: The Carbon cycle. 2h.

C and life on Earth. C and climate. The C cycle: C reservoirs, flows and transfer mechanisms, terrestrial, marine and geological C cycles,

positive and negative feedback mechanisms, the current C in the atmosphere and predictions of future C contents,

actions and anthropic controls on the atmospheric C.

Methodology

Theory:

- Magistral class

Seminars:

- Seismology I. Seismic Waves. Epicenter and magnitude of earthquakes. Calibration of travel-time curves and evaluation of epicenter and magnitude of an earthquakes.
- Seismology II. Spatial and temporal distribution of seismicity on Earth. Information and databases. Seismic software. Earthquakes related to volcanic activity: the example of the El Hierro eruption. Evolution of seismicity during a major earthquake.
- Geological time I: Examples for understanding of the spatial and temporal dimension of Earth's History.
- Geologic time II: Making geological time scales using the main events of Earth's History.
- Carbon cycle on Earth: Models of the recent C cycle.
- Seminars / additional / alternative exercises: Characterization of plate boundaries using structures and volcanism, Plate Tectonics, paleogeography. Calculations of atmospheric and hydrosphere parameters.

* teachers can set the obligatory (or the optional) presentation of a dossier - exercise related to each of the seminars. This work can be evaluated in the manner determined by the teacher (assigning a grade, using this grade to refine / recalculate the final grade or other uses at teacher's criteria.

Activities

Title	Hours	ECTS	Learning Outcomes
Type: Directed			

Seminars	6	0.24	2, 1, 3, 4
Theory	28	1.12	2, 1, 3, 4
Type: Autonomous			
Autonomous work	58	2.32	2, 1, 3, 4

Assessment

Continuous evaluation (CE):

2 exams (which will include the contents of the theory as well as those of seminars). Each test will score about 10 pt.

1st exam: Theory subjects 1 to 4 + Seminars of Seismicity, Geological Time *. test questions of the theory topics 1st part (will be communicated) ± test questions about the associated seminars ± short questions about the theory or seminars) = 40% total CE

2nd exam: Theory subjects 5 to 8 + Seminars on the C cycle, El Niño (ENSO), *. test questions of the theory topics 2nd part (will be communicated) ± test questions about the associated seminars ±short answer questions about the theory or seminars) = 40% total CE

Work / Dossiers on the seminars carried out or other exercises proposed by the professors. You must submit all items that professors stablish as compulsory. Grading will be: Very Good-10, Good-7, Normal-5, Incorrect-3, Very incorrect or not submitted-0. The average grade is then calculated, and its weight will be 0.2. If there are two dossiers or papers not submitted, this part of the grading (20%) will be lost. The dossiers or works must be delivered on the due dates. The non-submission on due dates implies a non-submitted mark and will not be recoverable in any case after the date fixed for submission, which in any case will be prior to the date of the second exam.

Continuous evaluation mark (CE mark) = grade on 1st theory exam x 0.4 + grade on 2n theory exam x 0.4 + grade on Dossiers / works x 0.2

To pass the subject by continuous evaluation the CE grade must be equal or greater than 5 and the grade of each exam will have to be greater than 3. Grades less than 3 in an exam prevent to calculate the CE grade and the student must do the corresponding part again on the final exam.

Final Exam:

The final exam will consist of two parts:

1: Recovery of the first exam (theoryand seminars)

2: Recovery of the second exam (theory and seminars).

In the event that a grade lower than that obtained in the corresponding partial one is obtained; the arithmetic mean of the two grades will be made and this will become the final grade in this part (theory).

If, in any of the two theory exams the grade remains below 3, the final grade will be failing. In this last case if the grade average is greater than 5 the numerical grade will be reduced to 4.9 and it will be also failing).

Students with a grade of fail or non presented to any of the exams must present to these parts of the final exam and do not have to notify the teacher.

Students who wish to improve the grades of one or two parts in the final exam must notify in advance what is / are those parts (that is, first exam, second exam or both). The teacher will implement a list with a registration deadline for this final exam. If the teacher does not receive an alert from the student within the stipulated limit, the student can not present to final exam and will lose the right to improve the grades of the exam/s.

FINAL GRADE:

The formula for calculating the final grade will also be:

Final mark = (Grade Test theory + 1st partial Seminars X 0.4) + (Grade Test theory + 2nd part Seminars x 0.4) + Note works/dossiers x 0.2

If the final grade is 4.8 and you have submitted the work/exercise/compulsory dossiers (or optional substitutes, if appropriate) (not more than two unsubmitted) and if the qualification of these works/exercises is 5 you can increase the grade to 5 and approve the subject. In no case may the subject be exceeded with notes < 4.8 or (5 > Note 4.8) with two compulsory works/exercises/dossiers not presented.

Assessment Activities

Title	Weighting	Hours	ECTS	Learning Outcomes
1st Exam (Themes 1-4 + seminars)	40% of total EC grade	3	0.12	2, 1, 3, 4
2n Exam (Themes 5 - 8)	40% of total EC grade	3	0.12	2, 1
Final Exam	The same as each previous exams	2	0.08	2, 1, 3, 4

Bibliography

An Introduction to Our Dynamic Planet. Nick Rogers. Cambridge University Press ISBN: 9780521494243, 2007-2008.

Planet Earth : Cosmology, Geology, and the Evolution of Life and Environment. Cesare Emiliani, Cambridge University Press ISBN: 9780521409490, 1992-1997.

Ciencias de la Tierra: Una introducción a la geología física. Tarbuck, Edward J., Madrid [etc.] : Prentice Hall, cop. 2000. Capítulo 2: Tectónica de placas: el desarrollo de una revolución científica. 33-75.

Meteorology Today: an introduction to weather, climate, and the environment. Ahrens, C. Donald, Pacific Grove, CA : Thomson/Brooks/Cole, cop. 2007.

Geografía física. Strahler, Arthur Newell, Barcelona : Omega, cop. 1989.

Geologia Física, Strahler, Arthur. Editorial Omega, Barcelona. ISBN: 84-282-0770-4. 1992, 629 pag.

Origen e Historia de la Tierra. Francisco Anguita Virella, Editorial Rueda, Madrid. ISBN: 8472070522 ISBN-13: 9788472070523, 1ª ed. edición (09/1988), 445 pags.

Understanding the Earth. Grotzinger, J. and Jordan, T., 2010. 6th. Ed. W. H. Freeman & Co., NY.

Earth and Life. The Dynamic Earth. S269 DE Science: a secon level course. S269 Course Team. The Open University. 1997.

The Blue Planet. An Introduction to Earth Sistem Science. Brian J. Skinner, Stephen C. Porter and Daniel B. Botkin., 1999. 2nd. Ed. John Wiley & Sons, Inc.

During the semester we will provide links to e-learning resources to complement particular aspects. Some of the more used ones are:

US Geological Survey: https://www.usgs.gov/

NASA: https://www.nasa.gov/

JET PROPULSION LAB (NASA):https://www.jpl.nasa.gov/

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION: https://www.noaa.gov/

METEOROLOGY AT UNIVERSITY OF ILLINOIS AT URBANA CHAMPAIGN:
https://atmos.illinois.edu/courses/atmos100/