UAB
Universitat Autònoma de Barcelona

Planet Earth

2026/2027

Code: 101044
Credits: 4

Degree programme	Type	Course
Geology	OB	1

Contact lecturer

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Teaching staff

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Group languages

You can consult this information at the end of the document.

Prerequisites

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

Objectives

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 early Earth.
- The solid Earth and its internal structure.
- The Time variable in Geology.
- Earth Dynamics and Plate Tectonics.
- Atmosphere and Hydrosphere.
- Interaction between Atmosphere, Hydrosphere and solid Earth.
- Climatic systems and climatic change.
- The C cycle
- The search for material and energy resources and sustainable development.

Learning outcomes

- CM01 (Plan the set of techniques required to solve problems related to plate tectonics, large-scale sedimentation, and climate change.) Plan the set of techniques required to solve problems related to plate tectonics, large-scale sedimentation, and climate change.
- KM01 (Explain the field of knowledge and the main objectives of study of the different disciplines encompassed by geology.) Explain the field of knowledge and the main objectives of study of the different disciplines encompassed by geology.
- KM02 (Describe the endogenous and exogenous processes capable of modifying the physical geography of the planet and the distribution of geological materials in the Earth's crust, including the interpretation of the geochemical and petrological record.) Describe the endogenous and exogenous processes capable of modifying the physical geography of the planet and the distribution of geological materials in the Earth's crust, including the interpretation of the geochemical and petrological record.
- KM03 (Differentiate the different inner layers of the Earth, its atmosphere and the hydrosphere.) Differentiate the different inner layers of the Earth, its atmosphere and the hydrosphere.
- KM04 (Estimate the temporal order of magnitude of the different geological processes.) Estimate the temporal order of magnitude of the different geological processes.
- SM01 (Apply the basic principles of geology (sedimentation, metamorphism, magmatism, deformation, and erosion) to reconstruct the chain of events of a place based on a deep geological section.) Apply the basic principles of geology (sedimentation, metamorphism, magmatism, deformation, and erosion) to reconstruct the chain of events of a place based on a deep geological section.

Contents

1. The Earth System: Origin of the Universe, the Solar System and the Planet Earth (2 h)

The Big Bang, formation of galaxies, types of galaxies, formation, evolution and types of stars, formation of the Solar System: terrestrial and Jovian planets. Processes of differentiation and early evolution of the Earth.

2. The Solid Earth and Its Internal Structure (2 h)

Early evolution of the Earth and its composition. Sources of information and methods of study. Internal structure, study methods and properties of the Earth's crust, mantle and core. The hydrosphere, atmosphere and magnetosphere.

3. Time as a Variable in Geology (6 h)

The variables of space and time from a geological perspective. Relative ages. Absolute ages. Calibration of the geological time scale. Calibrated geological time scale. Magnitude of geological time. Overview of the major events in Earth's history.

4. Earth Dynamics and Plate Tectonics (6 h)

Continental drift. Evidence for plate tectonics. Types of plate boundaries. Origin and movement of tectonic plates. Hotspots.

5. The Atmosphere and Hydrosphere (6 h)

Composition of the atmosphere. Solar radiation. Temperatures. Atmospheric humidity. The water cycle. Continental and oceanic waters. The cryosphere. Energy balance. The atmosphere and its interaction with the hydrosphere and the solid Earth. Climate systems. Condensation, atmospheric stability and cloud formation. Precipitation. Winds: small-scale systems. General atmospheric circulation. Atmosphere-ocean interactions. Thermal circulation. Sea and land breezes. El Niño and the Southern Oscillation. Other fluctuations in ocean temperatures and spatial climate variability. Glaciations.

6. Climate and Climate Change (2 h)

Climate controls. Köppen-Geiger climate classification. Main mechanisms of climate change.

7. An Example of a Geochemical Cycle Essential for Life on Earth: The Carbon Cycle (2 h)

Carbon and life on Earth. Carbon and climate. The carbon cycle: carbon reservoirs, fluxes and transfer mechanisms; terrestrial, marine and geological carbon cycles; positive and negative feedback mechanisms; present atmospheric carbon and future projections; anthropogenic actions and controls affecting atmospheric carbon.

8. Natural Resources (2 h)

Metallic ores. Energy resources (coal and petroleum). Water resources. Industrial rocks and minerals (aggregates, dimension stones, clays, binders and industrial minerals). Importance of natural resources. The role of geologists in resource exploration and exploitation.

Learning activities and methodology

Title	Hours	ECTS	Learning outcomes
Autonomous work	58	2.32	
Theory	28	1.12	
Seminars	6	0.24	

Theory:

- Magistral classes

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.
- El Niño (ENSO).
- Carbon cycle on Earth: Models of the recent C cycle.
- Additional Seminars / alternative exercises: Characterization of plate boundaries using structures and volcanism, Plate Tectonics, paleogeography. Calculations of atmospheric and hydrosphere parameters.

* Teachers can stablish the compulsory or 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 self criteria.

Annotation: within the schedule set by the centre or degree programme, 15 minutes of one class will be reserved for students to evaluate their lecturers and their courses or modules through questionnaires.

Assessment

Continuous assessment activities

Title	Weight	Hours	ECTS	Learning outcomes
1st Exam (Themes 1-3 + seminars)	40% of total EC grade	3	0.12	KM02, KM03, KM04, SM01
Final Exam	The same as each previous	2	0.08	CM01, KM01, KM02, KM03, KM04,

	exams			SM01
Assignements on Seminars	20% of total EC grade	0	0	CM01, KM01, KM02, KM03, KM04, SM01
2n Exam (Themes 4 - 8)	40% of total EC grade	3	0.12	CM01, KM01, KM02

-CONTINOUS ASSESMENT (CA):

- Two midterm examinations (theory and seminars), graded out of 10.

First midterm: theory + seminars = 40% of the final grade.

Second midterm: theory + seminars = 40% of the final grade.

Students who sit either midterm are not eligible for a "Not Assessed" grade, since each midterm accounts for more than 35% of the continuous assessment.

- Assignments, reports, and exercises account for 20% of the final grade.

Submission may be mandatory or optional depending on the instructor.

Failure to submit three mandatory assignments by the deadline results in the loss of this component (20%).

Assignments are not recoverable after the deadline.

CA Grade = (First Midterm × 0.4) + (Second Midterm × 0.4) + (Assignments × 0.2)

To pass:

- CA grade $\geq$ 5.0.
- Each midterm grade must be **>** 3.0.

If either midterm grade is $\leq$ 3.0, the CA grade cannot be calculated and the student must take the corresponding recovery examination.

Final Recovery Examination

The Recovery exam consists of:

1. Recovery of the first midterm.
2. Recovery of the second midterm.

Assignments and seminar reports cannot be retaken.

If the recovery mark is lower than the original midterm mark, the arithmetic mean of the two marks will be used.

If either component remains below 3.0 after the recovery, the final result will be Fail.

Final Grade = (First Midterm × 0.4) + (Second Midterm × 0.4) + (Assignments × 0.2)

Special case: If,

- Final grade $\geq$ 4.8;
- Mandatory assignments have been submitted correctly (no more than two missing);
- Assignment grade $\geq$ 5;

the final mark may be increased to 5.0, allowing the student to pass the course.

-SINGLE ASSESMENT:

- Final comprehensive examination covering all theoretical and seminar content.
- All required seminar assignments/reports must be submitted along with the exam.

Calculation of final grade:

- Final Grade = (Exam × 0.8) + (Assignments × 0.2). A minimum grade of 5.0 is required to pass.

Single-Assessment Recovery

- A new comprehensive final exam covering all course content will be administered.
- Assignments on seminars are not recoverable; the grade previously obtained for this component will be retained.

Calculation of the recovery grade:

Final Grade=(Recovery Exam Grade × 0.8)+(Assignments × 0.2).A minimum grade of 5.0 is required to pass.

OTHER CONSIDERATIONS:

1. any type of academic irregularity (copying, misuse of AI, etc.) results in a grade of 0 in the affected activity.
2. In the event that several irregularities are verified in the evaluation acts of the same subject, the final grade of the subject will be 0.
3. Activities with irregularities will not be recoverable.

-Use of Artificial Intelligence:

It is only allowed for:

1. Bibliographic or information search tasks
2. Proofreading
3. Translations
4. Other uses explicitly authorized by the teacher.

In addition, the student must:

1. Identify the parts that have been generated with AI.
2. Specify the tools used.
3. Include a critical reflection on how these have influenced the process and the final result of the activity.

Lack of transparency in the use of AI in any evaluable activity will be considered a lack of academic honesty and will result in the activity being rated with 0 and not being able to be recovered.

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/

Software

Google Earth

Excel

Course groups and languages

The information provided is provisional until November 30. After this date, you will be able to consult the language of each group through this link. To access the information, you will need to enter the course CODE

Type of teaching	Group	Language	Semester	Shift
(TE) Theory	1	Catalan	first semester	morning-mixed
(SEM) Seminars	1	Catalan	first semester	morning-mixed
(SEM) Seminars	2	Catalan	first semester	morning-mixed
(SEM) Seminars	3	Catalan	first semester	morning-mixed