

Course guide

310605 - 310605 - Geomorphology

Last modified: 09/05/2025

Unit in charge: Barcelona School of Building Construction
Teaching unit: 751 - DECA - Department of Civil and Environmental Engineering.

Degree: BACHELOR'S DEGREE IN GEOINFORMATION AND GEOMATICS ENGINEERING (Syllabus 2016).
(Compulsory subject).

Academic year: 2025 **ECTS Credits:** 6.0 **Languages:** Catalan

LECTURER

Coordinating lecturer: Palau Berastegui, Rosa-Maria

Others:

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Specific:

E3. (ENG) Comprendre i analitzar els problemes de implantació en el terreny de les infraestructures, construccions i edificacions projectades des de l'enginyeria en topografia, analitzar els mateixos i procedir a la seva implantació.

E6. (ENG) Reunir i interpretar informació del terreny i tota aquella relacionada geogràficament i econòmicament amb ell.

E8. (ENG) Planificació, projecte, direcció, execució i gestió de processos de mesura, sistemes d'informació, explotació d'imatges, posicionament i navegació; modelització, representació i visualització de la informació territorial en, sota i sobre la superfície terrestre.

Transversal:

G4. EFFICIENT ORAL AND WRITTEN COMMUNICATION - Level 1. Planning oral communication, answering questions properly and writing straightforward texts that are spelt correctly and are grammatically coherent.

G5. TEAMWORK - Level 1. Working in a team and making positive contributions once the aims and group and individual responsibilities have been defined. Reaching joint decisions on the strategy to be followed.

G6. EFFECTIVE USE OF INFORMATION RESOURCES - Level 1. Identifying information needs. Using collections, premises and services that are available for designing and executing simple searches that are suited to the topic.

TEACHING METHODOLOGY

The subject is organized in four classroom hours per week, consisting of theory sessions, lab sessions and workshops. The theory sessions (26 h) also enclose short workshops for discussion of questionnaires and workshops of exploration of real cases to illustrate the theoretical concepts.

Some specific and longer workshop sessions (6 h) serve as a synthesis and review of the theory just before each partial exam and also to explain its solution.

The subject has a strong practical component. The labs (Activities 1, 2 and 3; 23 h) are aimed at the direct application of the acquired theoretical knowledge, more precisely at developing the skills of identifying basic landforms, their evolution over time and their cartographic representation.

LEARNING OBJECTIVES OF THE SUBJECT

Upon passing the course, the student will be able to:

- Identify the landscape forms
- Understand the processes leading to these forms
- Interpret simple geomorphological maps (schemes)
- Represent basic landforms on a contour levels map
- Analyze the setoff for an efficient selection of topographic points
- Search and select information in an efficient way (basic level).
- Synthesize information and communicate results in public (basic level).
- Work in group (basic level).

STUDY LOAD

Type	Hours	Percentage
Hours large group	24,0	16.00
Hours medium group	36,0	24.00
Self study	90,0	60.00

Total learning time: 150 h

CONTENTS

I. INTRODUCTION TO THE EXTERNAL GEODYNAMICS

Description:

Presentation of the subject. (15 min)

Unit 1. The earth's surface and its dynamics. (1.75 h)

General features of the land surface of the Moon, Mars and Earth. Large units of land landform: large morphotectonic units of the continents and submerged areas. Continental margins. External geodynamic processes. Interaction of the outer layers of the Earth. Elementary geomorphological processes and agents. Products of external geodynamics. Energy sources of external geodynamics.

Unit 2. Basic landform representation. (1 hour)

Elements of a map. Contour maps, slope maps. Topographic profiles. Elementary landforms and its representation by contour levels.

Unit 3. Types of landforms and their conditioning factors. (1 hour)

Landform conditioning factors. Geomorphological and sedimentary environments. The morpho-sedimentary system. Landform types. Introduction to geological and geomorphological maps.

Specific objectives:

Knowledge of the large units of relief on the earth's surface.

Synthetic vision of the different geological processes that operate on our planet.

Knowledge of topographic contour maps and the realization of topographic profiles.

Knowledge of the classification of landforms based on their conditioning factors.

Related activities:

Lab PC1. Introduction to landform recognition on contour level maps. (1 hour)

Related competencies :

CT6. (ENG) Reunir i interpretar informació del terreny i tota aquella relacionada geogràficament i econòmicament amb ell.

Full-or-part-time: 13h

Theory classes: 4h

Practical classes: 1h

Self study : 8h

II. LITHOLOGY AND STRUCTURAL GEOMORPHOLOGY

Description:

Unit 4. Geologic materials. (3 h)

Mineral, rock and surface formation concepts. Petrogenetic minerals. Sedimentary, igneous and metamorphic rocks: deposit geometry, texture, mineralogy and classification. Distribution of rocks in the lithosphere.

Unit 5. Geological structures. (1 hour)

Geological contacts and discontinuities in rock formations. Fractures: joints and faults. Folds.

Unit 6. Structural landscapes. (1 hour)

Passive and active structural control. Landscapes with inherited geological structure: tabular landscapes, monoclinical landscapes, residual landscapes, landscapes in folded areas.

Unit 7. Weathering. (2 h)

Effects of exposure of rocks on the Earth's surface. Mechanical weathering and chemical weathering. Weathering strength. Weathering products. Influence of climate.

Unit 8. Lithological landforms. (2 h)

General characteristics. Granite landscapes. Karst landforms. Landforms in clay formations (badlands).

Specific objectives:

Knowledge of the main characteristics of rocks and their formation processes.

Knowledge of geologic structures.

Knowledge of weathering processes, the resulting geological materials and associated environmental and engineering problems.

Knowledge of the main lithological and structural landforms.

Related activities:

Labs on landscape identification and their cartographic representation. (6 h)

Review workshop (previous 1st theory part) (1.5 h).

Resolution workshop for the first partial theory exam (0.5 h)

Related competencies :

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Full-or-part-time: 51h

Theory classes: 9h

Practical classes: 8h

Guided activities: 3h

Self study : 31h

III. DYNAMIC AND TECTONIC GEOMORPHOLOGY

Description:

Unit 9. Slope process and forms. (2 h)

Hydrological cycle of the slopes. Surface erosion. Slope movements (typology, morphology, velocity and activity)

Unit 10. Glacial geomorphology. (1 hour)

Definition and types of glaciers. Glaciations. Glacier movement. Erosion and erosional landforms. Sedimentation and depositional landforms. The last ice age in the Pyrenees.

Unit 11. River geomorphology. (2 h)

Erosion dynamics - river sedimentation. Morphology of the riverbed. Morphology of the river valleys. Base level and balance profile. Transition from slopes to flood plains: alluvial fans and glacis.

Unit 12. Coastal geomorphology. (2 h)

Coastal processes. Erosional coasts. Depositional coasts. Emerged and submerged coasts: changes in the coastline over time.

Unit 13. Tectonic and volcanic landforms. (2 h)

Faults and landscape: landforms generated by active faults, mountain fronts, failed blocks (horsts and grabens). Volcanism and landscape: types of eruptions and volcanic products, typology of volcanoes, volcanic collapses, movement on slopes of active volcanoes.

Topic 14. Horizontal and vertical movements of the earth's surface. (2 h)

Movement of the continents. Distribution of earthquakes and active volcanoes. Ocean basin formation. Subduction. Plate tectonics. Isostasy principle. Mountain range formation. Levelling of mountain ranges. Epeirogenic movements.

Unit 15. Local displacements of the ground surface and its control (2 h).

Synthesis of geological and geomorphological processes causing displacement of the ground surface. Types of displacement. Introduction to conventional techniques and modern displacement control techniques.

Specific objectives:

Knowledge of the main dynamic geomorphological processes (colluvial, fluvial, glacial and coastal)

Knowledge of the landforms resulting from erosion and sedimentation.

Knowledge of active tectonic and volcanic processes and the resulting landforms.

Knowledge of the horizontal movements of the Earth's lithosphere. Notions of Plate tectonics, understanding the spatial distribution of tectonic, volcanic and seismic activity on a global scale.

Knowledge and understanding of the formation and destruction of mountain ranges, and of other vertical movements on a regional scale.

Knowledge and understanding of the processes that generate ground displacement and introduction to observation techniques.

Related activities:

1) Labs:

a) Landform photointerpretation of setoff shapes(10 h)

b) Recognition of the evolution of landforms (6 h)

2) Workshops:

a) Theory review workshop (Topics 9 to 15) (2.5 h)

b) Workshop for resolution of the final theory exam (0.5 h)

3) Practical work on a real case (supervised self-activity)

Related competencies :

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06 URI N1. EFFECTIVE USE OF INFORMATION RESOURCES - Level 1. Identifying information needs. Using collections, premises and services that are available for designing and executing simple searches that are suited to the topic.

04 COE N1. EFFICIENT ORAL AND WRITTEN COMMUNICATION - Level 1. Planning oral communication, answering questions properly and writing straightforward texts that are spelt correctly and are grammatically coherent.

05 TEQ N1. TEAMWORK - Level 1. Working in a team and making positive contributions once the aims and group and individual responsibilities have been defined. Reaching joint decisions on the strategy to be followed.

Full-or-part-time: 86h

Theory classes: 13h

Practical classes: 18h

Guided activities: 4h

Self study : 51h

GRADING SYSTEM

The evaluation has the following components:

- 1) Theory exams (value: 50%): two theory partials, each weighing 25% in the course grade.
- 2) A practical exam (weight: 25%)
- 3) Report of a practical study case, which involves a delivery of a document and an oral presentation (25%) (Activity 4, in group).

At the end of the course, an optional re-evaluation exam will be held for students with a final average grade between 3.5 and 4.9. This exam will cover the content of the theory exams and the practical exam. Students requiring the re-evaluation exam to pass the course can achieve a maximum final grade of five (5.0).

Participation and class work will be valued in the final grade.

EXAMINATION RULES.

The overall grade of "not presented" will be applied in cases of non-delivery of an exam or the report of the practical work (either, the deliverable report or the oral presentation).

BIBLIOGRAPHY

Basic:

- Gutiérrez Elorza, Mateo. Geomorfología. Madrid: Prentice Hall, 2008. ISBN 9788483223895.
- Tarbuck, E. D. ; Lutgens, F. K. Ciencias de la Tierra: una introducción a la geología física. 8a ed. Madrid: Prentice Hall, 2005. ISBN 8420544000.
- Summerfield, Michael A. Global Geomorphology. Essex: Longman, 1991. ISBN 9780582301566.

Complementary:

- Strahler, Arthur Newell. Geología física. Barcelona: Omega, 1992. ISBN 8428207704.
- Anguita Virella, F.; Moreno Serrano, F. Procesos geológicos externos y geología ambiental. Madrid: Rueda, 1993. ISBN 8472070700.
- Ritter, Dale F. ; Kochel, R. Craig ; Miller Jerry R. Process geomorphology. 5th ed. Long Grove, Ill: Waveland Press, 2011. ISBN 9781577666691.
- Gutiérrez Elorza, M. [et al.]. Geomorfología de España. Madrid: Rueda, 1994. ISBN 8472070751.
- Martínez de Pisón, E. [et al.]. Atlas de geomorfología. Madrid: Alianza, 1986. ISBN 8420662054.
- Pedraza Gilsanz, J. [et al.]. Geomorfología : principios, métodos y aplicaciones. Madrid: Rueda, 1996. ISBN 8472070875.
- García Fernández, J. Geomorfología estructural. Barcelona: Ariel, 2006. ISBN 8434434813.
- Easterbrook, D.J, Kovanen , D.J.. Interpretation of Landforms from Topographic Maps and Air Photographs: A Laboratory Manual.. Upper Saddle River: Prentice Hall, 1999. ISBN 9780139760020.

RESOURCES

Hyperlink:

- http://higherred.mcgraw-hill.com/sites/0072402466/student_view0/ />. Physical Geology 9 ed
- <https://visibleearth.nasa.gov/>. Visible Earth: a catalog of NASA images and animations of our home planet.
- http://www.earthonlinemedia.com/ebooks/tpe_3e/contents.html. The Physical Environment e-book