

## 26404 - Fundamentals of Geology and Geological Mapping

### Información del Plan Docente

Academic Year	2017/18
Faculty / School	100 - Facultad de Ciencias
Degree	296 - Degree in Geology
ECTS	9.5
Year	1
Semester	First semester
Subject Type	Basic Education
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**

This is the first course in which new students get in touch with Geology. So, it is designed to make the student understand planet Earth as a dynamic system and Geology as an applied, multidisciplinary and also dynamic science. The student has to learn the basics of Geology (principles, terminology and basic concepts) and the skills to read both topographic and geological maps, to understand the information they contain and to extract sections from them. The course also includes three one-day field trips in which the student is instructed in the methodology of observation, description and data collection in the field and also in the translation of that information to a topographic map, making a geological map.

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### 5.2. Learning tasks

The activities designed to reach the objectives of the course are grouped into five learning categories:

Learning activity 1: Theoretical basis of Geology and Cartography. Developed into 50 minutes lectures (four each week).

Learning activity 2: Description and identification of minerals, rocks and fossils. Five two-hour sessions in the lab.

Learning activity 3: Reading, understanding and making of simple geological maps and sections. Seven two-hour sessions.

Learning activity 4: Introduction to field geology and geological mapping. Three one-day field trips to different areas of the Iberian Chain are scheduled into this activity.

Learning activity 5: Groupwork sessions on bibliographic search (planning of the search and introduction to bibliographic repositories, databases and search tools). These sessions include a short introductory talk and a practical activity in the computer lab.

### 5.3. Syllabus

Lessons (each one develops in one or several lectures)

- Lesson 1. Introduction to Geology.
- Lesson 2. Planet earth: location in the Solar system, shape, structure and composition. Introduction to global dynamics.
- Lesson 3. Minerals and crystals. Features of crystalline matter. Properties of the minerals: identification and classification of minerals.
- Lesson 4. Igneous rocks. Features, classification and processes that create them.
- Lesson 5. Sedimentary rocks. Features, classification and sedimentary processes.
- Lesson 6. Metamorphic rocks. Concept, factors and main types of metamorphism.
- Lesson 7. The topographic map.
- Lesson 8. Cartographic projection systems. Coordinates and orientation.
- Lesson 9. The geological map and geological sections.
- Lesson 10. Geological mapping of horizontal and dipping geological successions.
- Lesson 11. Geological mapping of folds.
- Lesson 12. Geological mapping of faults.
- Lesson 13. Plate tectonics. Development of basins and mountain ranges. Introduction to structural geology.
- Lesson 14. External processes: erosion, transport and sedimentation. Sedimentary environments and structures
- Lesson 15. Surface and subsurface waters. Geomorphological processes and landforms.
- Lesson 16. Time in geology. Absolute and relative dating methods. Biostratigraphy.
- Lesson 17. Introduction to Historical Geology. The rock record in Earth's history. Evolution of biological groups and of the fossil record.
- Lesson 18. Introduction to regional geology. Natural resources and geological heritage.

Practicals

Practicals are divided in laboratory classes and field work.

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### *Part I. Identification and description of minerals, rocks and fossils*

- Practice 1. Identification and description of minerals (I): non silicates.
- Practice 2. Identification and description of minerals (II) and rocks (I): silicates, igneous and metamorphic rocks.
- Practice 3. Identification and description of rocks (II): siliciclastic rocks
- Practice 4. Identification and description of rocks (III): carbonate rocks and other minor groups (evaporites, silicites, coals and hybrid rocks).
- Practice 5. Identification and description of fossils.

### *Part II. Reading, understanding and making geological maps*

- Practice 6. The topographic map.
- Practice 7. Topographic profiles.
- Practice 8. Geological mapping of horizontal stratigraphic sequences.
- Practice 9. Geological mapping of dipping stratigraphic sequences.
- Practice 10. Geological mapping of stratigraphic sequences with discontinuities.
- Practice 11. Geological sections of horizontal and dipping stratigraphic sequences and simple geological structures.
- Practice 12. Geological maps repositories. The MAGNA series and the GEODE digital cartography.

### *Field work*

Three all-day field trip are scheduled in this course to study:

- The Paleozoic and Triassic sequences around Montalbán (Teruel). Introduction to structure and field observation and measurements.
- The Triassic to Cretaceous sequences around Ariño (Teruel). Cartographic-scale structure.
- The Jurassic sequences around Aguilón (Zaragoza). Geological mapping of the Aguilón anticline.

Attendance to these field trips is compulsory as the results and reports are used in the practical sessions and are evaluated.

### **5.4.Course planning and calendar**

This course consists of four 50-minute lectures and one 2-hours practical session per week, during the first semester of the course, in the hours and classes scheduled by the Science Faculty.

The dates for the field trips are fixed and published in the web of the Earth Science Department (<https://cienciatierra.unizar.es/docencia/informacion-general-del-grado>) prior to the beginning of the course.

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The dates and places for the exams are fixed prior to the beginning of the course and published in the web of the Science Faculty (<https://ciencias.unizar.es/consultar-examenes>).

### 5.5. Bibliography and recommended resources

- BB** Hamblin, William Kenneth. Earth's dynamic systems / W. Kenneth Hamblin, Eric H. Christiansen . - 8th. ed. Upper Saddle River, (New Jersey) : Prentice Hall, 1998
- BB** Martínez-Álvarez, J.A.. Cartografía geológica / J.A. Martínez-Álvarez Madrid : Paraninfo, 1989
- BB** Press, Frank. Understanding earth / Frank Press, Raymond Siever . - 2nd ed., 2nd printing New York : W.H. Freeman, 1998
- BB** Ramón-Lluch, Rafael. Introducción a la cartografía geológica / R. Ramón-Lluch, L.M. Martínez-Torres, A. Apraiz . - [4a ed. rev. y amp.] Bilbao : Servicio Editorial de la Universidad del País Vasco|g(Argitarapen Zerbitzua Euskal Herriko Unibertsitatea) 2001
- BB** Skinner, Brian J.. The blue planet : an introduction to earth system science / Brian J. Skinner, Stephen C. Porter, Daniel B. Botkin . - 2nd ed. New York [etc.] : John Wiley & Sons, 1999
- BB** Tarbuck, Edward J. : Ciencias de la tierra : una introducción a la geología física / Edward J. Tarbuck, Frederick K. Lutgens ; ilustrado por, Dennis Tasa ; revisión técnica, Dolores García del Amo. . - 10 ed. Madrid : Pearson, D.L. 2013.
- BC** Bennison, G. M.. An introduction to geological structures and maps / G. M. Bennison and K. A. Moseley . - 7th ed. London : Hodder Education, cop. 2003

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- BC** Bolton, T.. Geological maps : their solution and interpretation / T. Bolton ; illustrations by P. Proudlove . 1st ed., 2nd repr. Cambridge : University Press, 1995
- BC** Boulter, Clive A.. Four dimensional analysis of geological maps : techniques of interpretation / Clive A. Boulter ; illustrated by Josie Wilkinson Chichester [etc.] : John Wiley & Sons, cop. 1989
- BC** Carrillo Vigil, Leonor. Geología / Leonor Carrillo Vigil, Luis García-Amorena Sánchez, Josep Gisbert Aguilar ; Mariano García Gregorio, coordinador Valencia : Ecir, 2001
- BC** Elementos de cartografía/ Arthur H. Robinson...[et al.]; [traducción por Rosa Ma Ferrer] . - ed. española/ revisada por Josep M. Rabella i Vives, Josep M. Panareda i Clopés Barcelona : Omega, D.L. 1987
- BC** Foucault, Alain. Diccionario de geología / por Alain Foucault y Jean- François Raoult ; versión castellana de la 2a. ed. francesa por M. Lago, A. Pocoví, J. Tena . - 1a. ed. Barcelona : Masson, 1985
- BC** Groshong, Richard H.. 3-D structural geology : a practical guide to surface and subsurface map interpretation / Richard H. Groshong, Jr.. Berlin [etc.] : Springer, cop. 1999
- BC** Joly, Fernand. La cartografía / Fernand Joly ; [traducción de Julio Morencos Tévar] . - [2a. ed.] Barcelona : Ariel, 1982
- BC** Lisle, Richard J.. Geological structures and maps : a practical guide / by Richard J. Lisle . - [1st ed.] Oxford [etc.] : Pergamon Press, 1988
- BC** López Vergara, María Luisa. Manual de fotogeología / M.L. López Vergara . - 3a ed. rev. y aum. Madrid : Servicio de Publicaciones del Centro de Investigaciones Energeticas,

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Medioambientales y Tecnológicas, 1988

BC MALTMAN, A. Geological maps. An Introduction. - 1990 Open University Press

BC Martínez-Álvarez, J.A. Mapas geológicos: explicación e interpretación/ J.A. Martínez-Alvarez . - 3a ed. act. Madrid : Paraninfo, 1985

BC Martínez-Alvarez, J.A.. Geología cartográfica : ejercicios sobre interpretación de mapas geológicos / J.A. Martínez Alvarez Madrid : Paraninfo, 1981

BC Martínez-Torres, Luis Miguel. Planos acotados aplicados a geología : [problemas resueltos] / L.M. Martínez-Torres, R. Ramón-Lluch, L. Eguiluz Bilbao : Servicio Editorial de la Universidad del País Vasco, 1993

BC Roberts, John L.. Introduction to geological maps and structures / John L. Roberts . - [1st ed.] Oxford [etc.] : Pergamon Press, 1982

BC RÖMER, H. S. DE. Fotogeología aplicada.. - 1969 Ed. Universitaria de Buenos Aires

BC Skinner, Brian J.. The dynamic earth : an introduction to physical geology / Brian J. Skinner, Stephen C. Porter . - 3rd ed. New York [etc.] : John Wiley & Sons, 1995

### LISTADO DE URLs:

Recursos y ejercicios de Cartografía Geológica de la UNED -  
[<http://ocw.innova.uned.es/cartografia/>]

Tectónica de placas -  
[<http://pubs.usgs.gov/gip/dynamic/dynamic.html>]



**Universidad**  
Zaragoza

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