26416 - Geological Mapping

Información del Plan Docente

Academic Year	2016/17
Academic center	100 - Facultad de Ciencias
Degree	296 - Degree in Geology
ECTS	9.0
Course	3
Period	First semester
Subject Type	Compulsory
Module	---

1.Basic info

1.1.Recommendations to take this course

Geological Mapping represents a basic topic of the field Geology. This subject includes learning on basic geometry of geological bodies (sedimentary or igneous rocks) and geological structures, so it is recommended to know other subjects as Stratigraphy, Structural Geology, Petrology or Geomorphology. The geological mapping is a useful tool for analysing most aspects of Geology and it needs of the development of determined observation skills in the field and the representation of such observations on a map. Other needed skills are the elaboration of geological cross-sections or block-diagrams as additional tools for map interpretation. It is recommended: (i) to attend every theoretical and practical session and to take an active participation in them; (ii) to have passed a previous, basic course on Structural Geology and Stratigraphy; (iii) knowledge of basic Spanish and English.

1.2.Activities and key dates for the course

This module consists of lectures, field work, practical laboratories, tutorial exercises, case histories and coursework exercises.

Beginning of the course: beginning of the second semester according to the academic calendar established by the Faculty of Sciences and published on its website.

Timetable: according to the schedule established by the Faculty of Sciences and published on its website.

2.Initiation

2.1.Learning outcomes that define the subject

The student, in order to pass the course, will have to show her/his competence in the following skills:

1. From a geological map: a) identify the main type of stratigraphyc contacts and tectonic structures, b) make geological cross-section ans sketches reflecting the geometry of geological structures and their relationships and d) deduce the geological history for the region.

2. From field observations, identify each body rock and contact type (stratigraphic, tectonic, magmatic,...) and the tectonic

structures and represent them on a topographyc map.

3. To use the photogeological analysis as a mapping technique.

4. To know and aply the fundamentals of geometrycal analysis for solving problems of geological mapping.

5. To use the compass for measuring the orientation of geological contacts and structures.

6. To make and interpret geological maps.

7. To develop capabilities for scientific work: to select and process critically bibliographic information in Spanish and English; to communicate efficiently scientific contents, both oral and writen (in Spanish and, at a basic level, in English); to work alone and within a group.

2.2.Introduction

Brief presentation of the course

The aim of this module is to introduce the Geological Mapping as a technique for representing and analysing the Geology of a region because it reflects the attitude, evolution, nature and structure of the materials.

3.Context and competences

3.1.Goals

The expected results of the course respond to the following general aims

1. To make accurate and precise geological maps.

2. To interpret geological maps.

3. To introduce and apply the photogeological mapping technique.

4. To introduce and apply the orthographic projection in geological mapping.

5. To undestand in the field the basic techniques in geological mapping and to develop skills for data acquisition.

3.2.Context and meaning of the subject in the degree

This course is part of a group of subjects of the *Degree in Geology* that constitute the basic training in Geology.

3.3.Competences

Acquisition of field data for geological mapping.

26416 - Geological Mapping

To use the more adequate laboratory techniques for geological mapping.

To interpret geological maps.

To do thematic maps and cross-sections.

To solve geological questions by using the ortographic projection.

3.4.Importance of learning outcomes

4.Evaluation

4.1. Assessment activities

Modality A . C ontinuous assessment

1) **Geological Report** of a region based on two journeys for fieldwork and several laboratory sessions. Geological mapping and interpretation.

2) **Report of a Field Zone.** Geological mapping and interpretation, including geological cross-sections, of a region, based on four journeys for fieldwork, several laboratory sessions and homework.

3) **Report of a mine mapping.** Geological mapping and interpretation of the interior of a mine.-

4) **Partial writen exercises.** Three parts: (a) Ortographic projectection exercises; (b) Geological mapping of a region from photogeological analysis, and (c) interpretación of a geological map (MAGNA)

5) **Final written exercise** . For those studients that had not pass the partial writen exercises, a final exercise (with the same three parts) will be carried out during the final assessment period.

Moreover the writen exercises, the assessment activities in the second convocatory would be the revision of activities 1, 2 and 3.

Modality B. G lobal test of evaluation

(modality of evaluation for the students who did no attend the subject, or students who, still being it done, wish to take refuge in their right to a global evaluation)

1) **Global written exercise** . similar to those previously described.

2) An **adittional test** , including the geological mapping of a region from field data.

4.2. Assessment criteria

For passing the course, the student must:

26416 - Geological Mapping

- Obtain a grade equal or higher thant 5 points in either each of the three partial writen exercises, or the two parts of the global test.

- Obtain a grade e qual or higher thant 5 points in either each of the activities 1, 2 y 3 de la evaluación presencial. They would be compensated if only one activity is equal or higher than 4.5 points.

Evaluation of modality A

1) Geological repport . . . . 14 % (factor 0.14)

2) Report of a Field Zone . . . . . 35 % (factor 0.35)

3) Report of a mine mapping . . . . . 6 % (factor 0.06)

4) Partial/Final writen exercises . . . . 45 % (factor 0.45)

Evaluation of modality B

1) Global written exercise . . . . . 45 % (factor 0.45)

2) Additional test . . . . . 55 % (factor 0.55)

5.Activities and resources

5.1.General methodological presentation

The programme of the course is not the target, but a framework for developing personal work of students. In this way, time devoted to theoretical lectures will be reduced to a minimum, in benefit of collective discussion on practical exercises and case studies. Laboratory sessions will be mainly devoted to analysis of the most common techniques for geological mapping construction and interpretation. Fieldwork will focus on the recognition of geological contacts and geological structures, collection of detailed observations and orientation measurements on them. The obtained data will be represented on the student's notebook by means of tectonic schemes and cross-sections and used for the geological mapping of the region. Tutorials will be considered another academic activity where the student will be free to: (i) ask any doubt related with the subject; (ii) receive orientation about information sources; (iii) ask for guidelines about personal work and report elaboration.

5.2.Learning activities

Actividty 1 . Learning of conceptual bases of geological mapping.

Metodology: **Theoretycal Classes** (1 ECTS; 10 h)

Activity 2 . Practical exercises using orthographic projection in geological mapping.

Metodology: **Practical sessions** (1 ECTS; 10 h).

Activity 3 . Photogeological interpretation.

Metodology: **Practical sessions with photograph stereopairs** (1.3 ECTS; 13 h).

Activity 4 . Realization of geological maps and cross-sections.

Metodology: **Practical sessions** (1.5 ECTS; 15 h).

Activity 5 . Acquisition of geological data and mapping in field in different regions.
Metodology: **Fieldwork** (3 ECTS, 7 journeys).

Activity 6 . Interpretation of geological maps.

Metodology: **Practical sessions** (1.2 ECTS; 12 h).

5.3.Program

I. CONTENTS

1. Representation of tectonic structures.

2. Elements in geological mapping.

3. Orthographic projection. Fundamentals and applications.

4. The Geological history. Interpretation of geological maps.

II. PROGRAM OF PRACTICAL SESSIONS

1. Photogeology 1. The Pico del Águila region.
2. Map and cross-section 1.
3. Geological map 1. Muniesa map.
4. Photogeology 2.
5. Photogeology 3. Field Zone.
6. Photogeology 4.
7. Map and cross-section 2. Field Zone.
8. Geological map 2.
9. Geological map 3. Series of cross-sections and structural contour map.
10. Geological map 4. With igneous rocks.
11. Geological map 5.
12. Orthographic projection 1 (2 sesiones).
13. Orthographic projection 2. 3 point problems.
14. Orthographic projection 3. Thickness of stratigraphical series.
15. Orthographic projection 4. Faults and slip components.

16. Geological map 6. Geological mapping in mine interiors.

III. PROGRAM OF FIELDWORK

Journey 1. Aladrén

Journey 2. Aladrén

Journeys 3, 4, 5 and 6. Field Zone.

Journey 7. Mine interior.

5.4.Planning and scheduling

- 10 h of theoretical classes (≈ 1 h/week).

- 50 h of practical sessions in laboratory (≈ 5 h/week).

- 7 journeys of fieldwork (3 ECTS):

The close relationship between theoretical and practical classes have conditioned that they have included within the same shedule, in two sessions of three hours by week according to the following groups:

Group 1: Tuesday (15-18 h) and Thursday (16-19 h).

Group 2: Wednesday (15-18 h) and Thursday (9-12 h).

5.5.Bibliography and recomended resources

BB	Babín Vich, Rosa Blanca. Problemas de Geología Estructural : resolución mediante proyección ortográfica / Rosa Blanca Babín Vich Madrid : Facultad de Ciencias Geológicas, 2004
BB	Barnes, John W.. Basic geological mapping / John W. Barnes . - 3rd ed. reprint.
BB	Basic methods of structural geology. Part I, Elementary techniques / by Stephen Marshak, Gautam Mitra. Part II, Special topics. Englewood Cliffs, New Jersey : Prentice Hall, cop. 1988

26416 - Geological Mapping

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BB	Bennison, G. M.. An introduction to geological structures and maps / G. M. Bennison and K. A. Moseley . - 7th ed. London : Hodder Education, cop. 2003
BB	Blyth, F.G.H.. Geological maps and their interpretation. 2nd Cambridge University Press, 1976
BB	Bolton, T.. Geological maps : their solution and interpretation / T. Bolton ; illustrations by P. Proudlove . - 1st ed., 2nd repr. Cambridge : University Press, 1995
BB	Davis, George Herbert. Structural geology of rocks and regions / George H. Davis, Stephen J. Reynolds . - 2nd ed. New York [etc.]: John Wiley & Sons, cop. 1996
BB	Fernández Martínez, Esperanza M.. Del papel a la montaña : iniciación a las prácticas de cartografía geológica / Esperanza M. Fernández Martínez, Antonio López Alcántara León : Universidad de León, 2004
BB	Foucault, Alain. Coupes et cartes géologiques / par Alain Foucault et Jean -François Raoult ; préface de M. M. Durand Delga . - 2e éd. [rev. et] augm., [reimp.] Paris : S.E.D.E.S. : Doin, D.L. 1984
BB	Gómez Ortiz, David. Introducción a la geología práctica / David Gómez Ortiz , Tomás Martín Crespo , Silvia Martín Velázquez Madrid : Editorial Universitaria Ramón Areces , D. L. 2004
BB	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

26416 - Geological Mapping

BB	Introduction to mineral exploration / edited by Anthony M. Evans ; with contributions from William L. Barrett ... [et al.] . - [1st published] Oxford [etc.] : Blackwell Science, 1995
BB	Lisle, Richard J.. Geological structures and maps : a practical guide / by Richard J. Lisle . - [1st ed.] Oxford [etc.] : Pergamon Press, 1988
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BB	Maltman, A.. Geological maps. An introduction. Open University Press, 1990
BB	Martínez-Álvarez, J. A.. Cartografía geológica / J. A. Martínez-Álvarez Madrid : Paraninfo, 1989
BB	Martínez-Álvarez, J. A.. Mapas geológicos: explicación e interpretación/ J. A. Martínez-Álvarez . - 3a ed. act. Madrid : Paraninfo, 1985
BB	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 Pais Vasco, 1993
BB	Mattauer, Maurice. Las deformaciones de los materiales de la corteza terrestre / Maurice Mattauer ; [traducido por Mateo Gutiérrez Elorza y Jesús Aguado Sánchez] . - [2a ed.] Barcelona : Omega, D.L. 1989
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26416 - Geological Mapping

	structures / K.R. McClay . - 1st ed., reprinted Chichester [etc.] : John Wiley and Sons, 1992
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BB	Ramsay, John G.. Plegamiento y fracturación de las rocas / John G. Ramsay ; versión española Fernando Bastida Ibáñez, Ignacio Gil Ibarguchi . - [1a ed.] Madrid : Hermann Blume, 1977
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26416 - Geological Mapping

LISTADO DE URLs:

Guía tridimensional interactiva de prácticas - [http://ocw.innova.uned.es/cartografia/]

Stephen J. Reynolds: Arizona Geology - [http://reynolds.asu.edu/]