

26422 - Igneous and Metamorphic Petrology

Información del Plan Docente

Academic Year	2017/18
Faculty / School	100 - Facultad de Ciencias
Degree	296 - Degree in Geology
ECTS	9.0
Year	3
Semester	Annual
Subject Type	Compulsory
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 course aims to provide students with a basic understanding of the nature and origin of igneous and metamorphic rocks, from their petrographic characteristics, both in the field and under the polarizing microscope, to their origin, distribution, and association with particular tectonic settings. The course also introduces fundamental concepts of geochemistry and mineralogy applied to igneous and metamorphic rocks. Integral practical labs will use petrographic techniques, both hand specimens and optical microscopy to identify and classify the principal igneous and metamorphic rocks based on their geometric and compositional features. It also includes two days of field trip, working on two different

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geological settings, the Quaternary volcanic field of La Garrotxa (Gerona) and the Variscan granitoids and regional and contact metamorphic rocks from the Catalonian Coastal Range around Palamós and Begur (Gerona).

5.2. Learning tasks

The course has four different learning activities:

Learning activity #1: 1-hour theory lectures (4 ECTS) to present key concepts and the theoretical fundamentals of the course.

Learning activity #2: 2-hour seminars (1 ECTS) to solve geochemistry problems and to engage the students in the study and identification of igneous and metamorphic rocks in hand specimens.

Learning activity #3: 2-hour practical sessions in the microscopy lab (3 ECTS) to study thin sections of igneous and metamorphic rocks under the polarizing microscope.

Learning activity #4: 2-day fieldtrip (1 ECTS) to show in situ important examples of igneous and metamorphic processes.

5.3. Syllabus

LECTURES

- Introduction and Methodology (9 hours)
- Origin of Igneous Rocks (4 hours)
- Magma intrusion and extrusion: field relations of plutonic and volcanic rocks (4 hours)
- Characteristics of main igneous rock types (6 hours)
- Magmatic petrotectonic associations (7 hours)
- Metamorphic rocks and metamorphism (10 hours)

PRACTICALS

- Geochemistry Seminars: 2 two-hour seminars
- Identification of igneous and metamorphic rocks in hand specimen: 6 one-hour sessions
- Identification of igneous and metamorphic rocks under the polarizing microscope: 15 two-hour sessions.
- Fieldwork: a two-day fieldtrip to NE Spain (Catalonia)

5.4. Course planning and calendar

The course has 9 ECTS (225 hours of student work). It starts at the beginning of the academic year in September and ends in May. There is an examination period in February (for the topics covered during the first semester) and another in June (for the topics covered in the second semester). Later in June takes place the final examination for those students that have failed in the February exams or in the early June exams, or both.

The 225 hours of student work are divided into the following items:

- 40 h of theory lectures (Learning activity #1)
- 10 h of seminars (Learning activity #2)
- 30 h of lab sessions (Learning activity #3)
- 10 h of field work (Learning activity #4)
- 130 h of personal student work
- 5 h of exams

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Theory lectures are taught in 1h sessions twice a week (Monday and Tuesday from 11 to 12AM). Practicals (geochemistry seminars, rock identification in hand sample, and microscopy lab) are taught in 2h sessions in small groups (15 students or less) on Wednesdays afternoon. The 2-day fieldtrip is usually arranged for the first or second week of May.

More information on the functioning of the course will be uploaded in due time to its Moodle Page:
<https://moodle2.unizar.es/add/>

5.5. Bibliography and recommended resources

- BB** Barker, A.J.. Introduction to metamorphic textures and microstructures / A.J. Barker . - 2nd ed. Cheltenham : Stanley Thornes, 1998
- BB** Bucher, K., Grapes, R.. Petrogenesis of metamorphic rocks. 8th ed. Springer Verlag. 2011
- [Obs. docente: Manual clásico de petrogénesis de rocas metamórficas, ya en su octava edición. Como novedad de esta última edición destacan las secciones PT y TX para visulaizar de manera muy simple la evolución prograda de los diferentes tipos composicionales de rocas.]*
- BB** Encyclopedia of volcanoes / editor-in-chief Haraldur Sigurdsson ; associate editors Bruce F. Houghton ... [et al.] ; foreword by Robert D. Ballard. San Diego [etc] : Academic Press, cop. 2000.
- BB** Gill, Robin. Chemical fundamentals of geology / Robin Gill . - 2nd ed. London [etc.] : Chapman & Hall, 1996
- BB** Gill, Robin. Igneous rocks and processes : a practical guide / Robin Gill . Oxford : Wiley-Blackwell, 2010
- BB** Igneous rocks : a classification and glossary of terms : recommendations of the International Union of Geological Sciences, Subcomission on the Systematics of Igneous Rocks / edited by R. W. Le Maitre; A. Streckeisen... [et al] . - 2nd ed. Cambrigde : Cambridge University Press, 2004

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- BB** La volcanología actual / [Vicente Araña...(et al.)] ; Joan Martí, Vicente Araña, [coordinadores] Madrid : Consejo Superior de Investigaciones Científicas, 1993
- BB** Mackenzie, W.S.. Atlas de petrografía : minerales formadores de rocas en lámina delgada / W. S. Mackenzie, C. Guilford ; versión española, Marceliano Lago San José y Enrique Arranz Yagüe Barcelona [etc.] : Masson, cop. 1996
- BB** Mackenzie, W.S.. Atlas de rocas ígneas y sus texturas / W.S. Mackenzie, C.H. Donaldson, C. Guilford ; versión española de Marceliano Lago San José y Enrique Arranz Yagüe Barcelona [etc.] : Masson, cop. 1996[e(Hong-Kong)]
- BB** Mackenzie, W.S.. Atlas en color de rocas y minerales en lámina delgada / W.S. Mackenzie, A.E. Adams ; versión española, Marceliano Lago San José y Enrique Arranz Yagüe Barcelona [etc.] : Masson, 1997
- BB** Metamorphic rocks : a classification and glossary of terms : recommendations of the International Union of Geological Sciences Subcommittee on the Systematics of Metamorphic Rocks / editors D. Fettes and J. Desmons ; contributing authors P. Árkai ... [et al.]. . - 1st published Cambridge [etc.] : Cambridge University Press, 2007
- BB** Nédélec, A., Bouchez J-L.. Granites: petrology, structure, geological setting, and metallogeny. Oxford University Press. 2015
- [Obs. docente: Conciso manual sobre todos los aspectos relevantes de las rocas graníticas: petrología, geoquímica, ambientes de formación y metalogenia.]*
- BB** Raymond, Loren A.. Petrology : the study of igneous, sedimentary, metamorphic rocks. Vol. 2, Sedimentary petrology / Loren A. Raymond Dubuque, IA : Wm.C.

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Brown, cop. 1995

- BB** Sigurdsson (editor). The Encyclopedia of Volcanoes. 2nd. Ed. Academic Press. 2015
- [Obs. docente: Una completa y actualizada visión de los fenómenos volcánicos, desde la formación y el ascenso de los magmas hasta los riesgos y los aspectos culturales. Imprescindible.]*
- BB** Vernon, R. H.. Principles of metamorphic petrology / R.H. Vernon, G.L. Clarke . - [1st ed.] New York [etc.] : Cambridge University Press, 2008
- BB** Winter, John D.. An introduction to igneous and metamorphic petrology / John D. Winter. Upper Saddle River (New Jersey) : Prentice Hall , cop. 2001.
- BB** Yardley, Bruce W.D.. An introduction to metamorphic petrology / Bruce W.D. Yardley . - [1st ed., repr.] Harlow, Essex : Longman Scientific & Technical, 1993
- BB** Yardley, Bruce W.D.. Atlas de rocas metamórficas y sus texturas / B.W.D. Yardley, W.S. Mackenzie, C. Guilford ; versión española, Marceliano Lago San José y Enrique Arranz Yagüe Barcelona : Masson, 1997
- BC** Bard, J.P.. Microtexturas de rocas magmáticas y metamórficas / por J.P. Bard ; versión castellana de Marceliano Lago San José. - [1a. ed. española] Barcelona : Masson, 1985
- BC** Best, Myron G.. Igneous and metamorphic petrology / Myron G. Best . - 2nd ed. Malden : Blackwell, cop. 2003
- BC** Blenkinsop, Tom. Deformation microstructures and mechanisms in minerals and rocks / by Tom Blenkinsop Dordrecht : Kluwer Academic Publishers, cop. 2000

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- BC** Hall, Anthony. Igneous petrology / Anthony Hall . - 1st ed., 3rd imp., [2nd] repr. Burnt Mill, Harlow [etc.] : Longman Scientific & Technical [etc.], 1993
- BC** McBirney, Alexander R.. Igneous Petrology / Alexander R. McBirney . - 3rd. ed. Boston : Jones and Bartlett , cop. 2007
- BC** Nesse, William D.. Introduction to optical mineralogy / William D. Nesse . - 2nd ed. New York : Oxford University Press, 1991
- BC** Passchier, C.W.. Microtectonics / Cees W. Passchier, Rudolph A.J. Trouw . - 2nd, rev. and enl. ed. Berlin [etc.] : Springer, cop. 2005
- BC** Vernon, R.H. . A practical guide to Rock Microstructure. - 2004. Cambridge Univ. Press