Universitat Autònoma de Barcelona

2019/2020

Igneous Petrology

Code: 101055
ECTS Credits: 6

Degree	Type	Year	Semester
2500254 Geology	OB	3	1

Contact

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Use of Languages

Principal working language: spanish (spa)
Some groups entirely in English: No
Some groups entirely in Catalan: No
Some groups entirely in Spanish: Yes

Other comments on languages

It can be used in the classroom and to answer the exam questions if it is necessary

Prerequisites

It is advised to have passed the following subjects of the
1st year: Fundamentals of Geology, Earth Planet and Chemistry of the Earth, and
Mineralogy of the 2nd year.

Objectives and Contextualisation

Igneous Petrology is a fundamental subject of Geology, key to understand how the Earth Planet works inside and generates magmas and igneous rocks. Knowlege of Mineralogy is essential to describe these rocks, which are also very related to metamorphic and sedimentary ones, all of them Earth materials studied in the 3rd year. Also, high temperature geochemistry (3rd year subject) is particularly useful to understand igneous processes.

The subject is divided into lectures and practical works.

the aims to be achieved by students from lectures are:

- Skills in using with criteria the different classifications of igneous rocks and in correlating the different types of classifications.
- To use adequate geochemical diagrams to classify igneous series
- To relate the different types of basalts to their mineral and chemical compositions; to identify their typical outcrop structures and volcano types; to assess the basaltic magma genesis and crystallization based on geochemical compositions and the geodynamic setting of their outcrops.
- To discuss magmatic differentiation processes from a parental basaltic melt using simple phase diagrams.
- To relate the different types of gabbros and dolerites to their mineral and geochemical compositions; to identify internal structures and types of outcrops; to discuss their genesis and magmatic crystallization based on geochemical data and the geological setting of these rocks.
- To relate the ultramafic and ultrabasic rocks to their mineral compositions and to identify their internal structures, type of outcrops and other related rocks.

- To relate andesites, dacites and rhyolites to their mineral and geochemical compositions, types of outcrops and volcanoes; to discuss their genesis and magmatic crystallization based on geochemical data and their geodynamic settings.
- To relate the different types of granitoids with their mineral, geochemical compositions and outcrops at different scales. To discuss the different mechanism of intrusion of granitic magmas, their genesis and crystallization based on geochemical data and their geodynamic settings.
- To compare the heterogeneous composition of igneous alkaline rocks and smaller volume of their present outcrops with respect to other igneous series.

Detail aims to achieve from practical works are:
- Field work to watch and describe the contacts between the different types of igneous rocks (plutonic, volcanic and subvolcanic) and their country rocks (either sedimentary, metamorphic or igneous), along with the relationships between their structures in order to infer the relative chronology of intrusion.
- To describe and identify igneous rocks at the outcrop scale and in hand specimen.
- To get skills in identifying minerals and textures of igneous rocks under the petrographic microscope.
- To describe and classify different types of igneous rocks under the microscope, based on their mineral mode and textures using the IUGS normative classification

Competences

- Draw up and interpret geological maps and other means of depicting geological information (columns, correlation frames, geological cross-sections, etc.)
- Identify and characterise minerals and rocks through instrumental techniques, determine their formation environments and know their industrial applications.
- Learn and apply the knowledge acquired, and use it to solve problems.
- Process, interpret and present laboratory data using qualitative and quantitative techniques, and suitable computer programmes.
- Show an interest in quality and incorporate it into practice.
- Suitably transmit information, verbally, graphically and in writing, using modern information and communication technologies.
- Synthesise and analyse information critically.
- Work independently.

Learning Outcomes

1. Learn and apply the knowledge acquired, and use it to solve problems.
2. Present arguments based on phase diagrams.
3. Recognise the principal types of rocks in hand specimen and using a petrographic microscope.
4. Relate each type of rock to its genesis and the temporal dimension.
5. Relate field observations of minerals and rocks to laboratory observations and to genetic theory, based on the textures.
6. Show an interest in quality and incorporate it into practice.
7. Suitably transmit information, verbally, graphically and in writing, using modern information and communication technologies.
8. Synthesise and analyse information critically.
9. Work independently.

Content

Lectures

Chapter 1- Magmas and igneous rocks.

Chapter 2- Basalts and related rocks.

Chapter 3- Magmatic differentiation.

Chapter 4- Gabbroid rocks.

Chapter 5- Ultramafic and ultrabasic rocks.

Chapter 6- Andesites, dacites and rhyolites.

Chapter 7- Granitic rocks.

Chapter 8- Alkaline rocks.

Field works

One day excursion to watch igneous rocks of the Catalan Coastal Range.

Laboratory works (Petrography)

1. Minerals, textures and description of igneous rocks.

2. Associations of basic and ultrabasic rocks.

2a) Volcanic rocks (basalts and related rocks).

2b) Plutonic and subvolcanic rocks (gabbros, dolerites and ultrabasic rocks).

3. Associations of intermediate and acid rocks.

3a) Volcanic rocks (andesites, dacites and rhyolites).

3b) Subvolcanic rocks (microgranitoids).

3c) Plutonic rocks (granitoids).

Methodology

To achieve the competences in this subject, the student must attend the lectures, the field excursion and the practical works in the microscope laboratory.

Notes taken during the lectures must be extended with further reading of the recommended references and doing related exercises complementary of the theoretical chapters. These exercises will be corrected and discussed during the lectures. Moreover, some issues from the theoretical chapters must be further developed by the students, either alone or working in groups. They will be supervised and discussed by the teacher during the tutorials in the classroom. Other purposes of tutorials are to discuss and clarify students' doubts about theoretical and/or practical issues.

Field work data must be further completed by the student, after the field excursion, using adequate references .

Audiovisual media will be used during the lectures, with illustrations that will be provided to the students either in photocopies or via Virtual Campus. For the microscope practical works, audiovisual media and specific documents will be used and provided to the students in the same way. Documents for the field excursion include maps and instructions for doing the job and will be also available from the Virtual Campus.

Activities

Title	Hours	ECTS	Learning Outcomes
Type: Directed			

Field work	7.5	0.3	1, 6, 3, 5, 9
Lectures	24	0.96	8, 6, 2, 4, 5
Practical work in the laboratory	20	0.8	1, 6, 3, 5
Type: Supervised			
Tutorials in the office	14	0.56	1, 2, 4
Type: Autonomous			
To answer questions, to solve exercises and to prepare oral presentations	40	1.6	1, 2, 4, 7
To study the subject	35	1.4	8, 1, 6, 2, 3, 4, 5, 9

Assessment

For assessing the students about the competences of this subject, the following items will be taken into account:

1- Attendance to lectures and practical works: attendance to lectures and practical works higher or equal to 75% will account for 5% of the global qualification. Skipping lectures or practical works more than 25%, without a reason, will be punished with 10% discount on the final qualification.

2- Attendance to the field excursion and passing an exam on it will count 10% of the final qualification. If an student does not go to the field excursion, he/she will lose 60% of this item qualification. The field work exam will not have a second-chance opportunity.

3- During th course, regular working on doing description of samples, either in hand specimen or under the microcrospe, and solving exercises will count 5% of the final qualification. To solve exercices could be done individually or in group. This item will not be re-assessed.

4- Passing either two partial exams on both lecture chapters and practical works on petrography or a second-chance final exam of the whole subject will count 80%, distributed into 50% for the exam on lectures and 30% on the skills achieved in the microscope laboratory. For passing each partial exam a minimum of 4 points is required between the lecture part and the laboratory part. However, qualifications on the lecture part and on the laboratory part will not compensate each other, if the former is <2 of a total 5 and the latter is <1 of a total 3. Students getting <3 points of total 8 in one or both partial exams, must take the second-chance final global exam. To take this second-chance exam, the student must have previously taken the two partial exams.

To be successful, the student must get a minimum of 5 points considering items from 1 to 4.

Students who pass the two partial exams, but want to improve their qualification can also take the second-chance exam.

If the continuous assessing of the student is>35%, he/she cannot apply for the "Not have been taken" qualification

Assessment Activities

Title	Weighting	Hours	ECTS	Learning Outcomes
To complete data from the field work and exam on the field work	10% of the global qualification	1	0.04	6, 4, 5, 7, 9

To control the attendance to lectures and practical works in the laboratory (75% minimum)	5% of the global qualification	0	0	6
Tutorials in the classroom or in the laboratory; control of the regular work done during the course, discussion on topics	5% of the global qualification	1.5	0.06	8, 1, 6, 2, 3, 4, 5, 7, 9
Two partial exams of lecture chapters and/or one second-chance global exam	50% of the global qualification	4	0.16	8, 1, 6, 2, 4, 5, 7, 9
Two partial exams of practical works in the laboratory and/or a second-chance global exam	30%	3	0.12	8, 1, 6, 3, 7, 9

Bibliography

Lectures

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Practical works in the microscope laboratory

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