Universitat Autònoma de Barcelona

2023/2024

Geology of Petroleum

Code: 101052
ECTS Credits: 4

Degree	Type	Year	Semester
2500254 Geology	OT	3	2
2500254 Geology	OT	4	2

Contact

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Teaching groups languages

You can check it through this link. To consult the language you will need to enter the CODE of the subject.
Please note that this information is provisional until 30 November 2023.

Teachers

Gumersinda Galan Garcia

Prerequisites

The subject, largely involves integration of basic knowledge on geology, mainly stratigraphy, sedimentology and tectonics; but also interpretation of geological mapping, geochemistry and geochronology, as well as stratigraphic and structural interpretation of seismic reflection data and interpretation and correlation of well log (logs). It is highly recommended the student having already passed the subjects where the mentioned disciplines are dealt with.

The acquisition of knowledge on petroleum geology is much more effective and easier if the student has already completed the basin analysis subject, or is studying it in parallel within the same period of time.

Objectives and Contextualisation

The objective of this subject is to provide the most basic concepts of petroleum geology, essentially oriented to the hydrocarbon exploration and basic characterization mainly of conventional reservoirs, and less those nonconventional.

Starting with the analysis of the historical and socio-economic aspects, as well as the projection to the future within the energetic transition time and the final global "decarbonization", the subject follows with a detailed analysis of the essential elements forming a petroleum system, and geological characterization of reservoirs.

Competences

Geology

- Display knowledge of the applications and limitations of geophysical methods for learning about the Earth.
- Display understanding of the size of the space and time dimensions of Earth processes, on different scales.
- Draw up and interpret geological maps and other means of depicting geological information (columns, correlation frames, geological cross-sections, etc.)
- Identify and tackle environmental problems, plan land-use and know the principles of prevention and mitigation of geological risks.
- Obtain information from texts written in other languages.
- Plan the exploration and sustainable development of geological resources.
- Process, interpret and present laboratory data using qualitative and quantitative techniques, and suitable computer programmes.
- Recognise theories, paradigms, concepts and principles in the field of geology and use them in different areas of application, whether scientific or technical.
- Recognise, depict and reconstruct tectonic structures and the processes that generate them and relate types of rocks and structures to geodynamic environments.
- Show initiative and adapt to problems and new situations.
- Suitably transmit information, verbally, graphically and in writing, using modern information and communication technologies.
- Synthesise and analyse information critically.
- Work in teams, developing the social skills needed for this.
- Work independently.

Learning Outcomes

1. Correctly interpret geological information with applications in the exploration of hydrocarbons and mineral deposits, and in geological engineering.
2. Correctly sample industrial mineral and rock deposits.
3. Draw up geological cross-sections or other types of presentation for geological data in order to characterise hydrocarbon reserves and mineral deposits.
4. Draw up subsoil interpretation tables and graphs in relation to geological engineering.
5. Evaluate the environmental problems related to mining, industrial rock and hydrocarbon exploitations.
6. Explain the genesis processes of the principal types of mineral deposits, and their evolution across time.
7. Obtain information from texts written in other languages.
8. Process, interpret and present analysis results.
9. Relate Earth processes to those of mineral and oil genesis.
10. Relate the theories and principles of geology to the exploration of reserves and mineral deposits, and to problem solving in geological engineering.
11. Show initiative and adapt to problems and new situations.
12. Solve problems in reserves, mineral deposits and geological engineering based on field and laboratory observations and the concepts studied.
13. Suitably transmit information, verbally, graphically and in writing, using modern information and communication technologies.
14. Synthesise and analyse information critically.
15. Use geochemical methods to detect and study mineral deposits.
16. Work in teams, developing the social skills needed for this.
17. Work independently.

Content

1. - Theoretical classes
1.- Petroleum, composition and geochemical characterization.
1.2.- The petroleum geologists in the past and nowadays. Socio-economic aspects. Development of the oil industry from the beginning to the current state-of-the-art. Sustainability, energy transition and future of the oil industry.
1.3.- Concept of petroleum system. Source rock, migration, reservoir rock and traps. Plays and prospects, basin, province and oil field.
1.4 - Classification of reservoirs.
1.5.- Tools and techniques for the characterization of reservoirs.
1.6.- Principles of characterization of reservoirs and geological controls.
1.7.- Exploration of non-conventional hydrocarbons and introduction to production techniques.

2.- Seminars and practical exercises
2.1.- In both cases the active participation of the students is required and they deal with real cases, to face the corresponding problems searching solutions. Both types of activities are intended to reinforce and apply different theoretical aspects. Individual results are discussed among students under the mentoring and control of the teacher, and conclusions must be reached involving more than one scenario. The different possibilities must be defended and properly argued by the students. The activities want favoring and increasing the critical capacity facing real problems of socio-economic interest. The student is required to have a critical vision for the future of the hydrocarbons problem as a non-renewable resource, as well as the role of hydrocarbons in the transition to other more sustainable energy resources.

2.2.- Different practical exercises are carried out in groups of 2-4 students on some types of reservoirs, conventional and non-conventional, formed in different times and sedimentary environments and types of traps. The differnt single works must be presented and discussed with the rest of the students, through debates obtaining conclusions as well as uploading the different synthesis works, in pdf documents, into the corresponding spaces created in the Moodle platform of this subject.

Methodology

The theoretical part of this course will follow the program indicated above, according to lectures given by the faculty. This activity includes a recommendation of the basic bibliography of each topic, and general guidelines will be given so that students can complete their learning independently. Students will be provided with bibliographic material that allows open digital distribution, or in other cases, links to specific information of interest as a starting point. Open dissemination material will also be provided of the examples fundamentally of subsoil discussed in class.

All information will be provided in the CV of the subject, and the teacher reserves the right to provide also the presentations prepared by the students and presented in class.
In no case the teacher accepts the obligation to provide notes, since the course is almost entirely supported by the CV resource of the course, and it is there where all the content that is subject of the exam is exposed in an orderly manner.

The practical exercises are based on real cases. They deal with different aspects, in accordance with the theoretical content. Each practice must be handed in at the end of the practice session, or, if applicable, within a deadline established in agreement with the group and deposited in the space provided in the CV of the subject. In any case, the practices can also be part of the questions of the exams.

A research work on a real case reservoir chosen by the students will be presented orally, based on the concepts learned in the class and on a bibliographic review.

Annotation: Within the schedule set by the centre or degree programme, 15 minutes of one class will be reserved for students to evaluate their lecturers and their courses or modules through questionnaires.

Activities

Title	Hours	ECTS	Learning Outcomes
Type: Directed			
Practical exercises	14	0.56	14, 11, 1, 2, 6, 4, 8, 9, 3, 13, 17
Theory	20	0.8	1, 10, 2, 6, 7, 4, 8, 15, 9, 12, 3, 5
Type: Supervised			
Mentoring of works either being individual or in group	10	0.4	14, 11, 1, 2, 6, 15, 9, 3, 13
Type: Autonomous			
Study of the theory, completion of practical exercises, and preparation of synthesis works	41	1.64	14, 11, 1, 10, 2, 6, 7, 4, 8, 15, 9, 3, 13, 17, 16, 5

Assessment

Continuous evaluation

1.- Evaluation of the theoretical content.
According to the arithmetic and/or weighted average of the grades obtained in a minimum of two partial exams.

2.- Evaluation of the practical exercises and research seminar.
According to the correction of a dossier with the set of the finished practices that the student will deliver the day and time fixed, in agreement with the teacher, in the corresponding space provided in the CV of the subject.

Note on the evaluation
The completion and delivery of the practical exercises and the research seminar is mandatory to pass the subject. It is the student's responsibility to ensure that the digital information that he/she submits directly within the CV environment and in the corresponding place, has been uploaded correctly and can be opened without any difficulty. Files that are corrupted, infected by viruses or Trojans, etc., or that cannot be opened, will not be considered as submitted and consequently will not be evaluated (0 grade).

Second-chance exams
The students who have not passed the subject by continuous evaluation will be able to take a final synthesis test on the assigned day and time. The content of the final test, in all cases, will consist of a part of evaluation of the theoretical content, and may also include a practical part. In this case, the grade of this final test will replace the grade previously obtained by continuous evaluation and the scoring criteria will follow the same % as in the case of continuous evaluation.

Single evaluation

Students who have opted for the single evaluation will take a final exam (to be held on the same day as the final exam) consisting of a theory test (60%), a practical test (20%), and the oral presentation of a research paper (20%). The latter must be done on the assigned day, together with the rest of the class. In addition, it will be mandatory to hand in all the practical exercises done during the course on the day of the final exam.

Second-chance exams
Students who have not passed the course in the final exam will be able to take a second-chance exam. The

content of this exam will consist of an evaluation of the theoretical content, and may also include a practical part. In this case, the grade of this final exam will replace the grade previously obtained and the grading criteria will follow the same % as in the case of continuous evaluation.

Assessment Activities

Title	Weighting	Hours	ECTS	Learning Outcomes
Exams of theory	80%	11	0.44	14, 11, 1, 10, 2, 6, 7, 4, 15, 9, 12, 3, 13, 17, 16, 5
Practical exercises and seminars	20%	4	0.16	14, 11, 1, 2, 6, 4, 8, 15, 9, 12, 5

Bibliography

Basic recomended bibliography:

Bend. S.L. (2010). Petroleum Geology eTextbook (ver 1.1). AAPG Spetial Publication on CD-ROM

Bjorlykke, K (2010). Petroleum Geoscience: From Sedimentary Environments to Rock Physics, Springer

Bronlow A.H. (1996) Geochemistry, Prentice Hall

Killops S.D., Killops, V.J. (1993). An introduction to organic geochemistry. Harlow: Longman. Copublished in the USA by John Wiley

Rider, M (2006) - The Geological Interpretation of Well Logs- II edition - Rider french consulting Ltd

Selley, R. C. (1998) - Elements of petroleum Geology- II edition - Academic press

Slatt R. (2006). Stratigraphic Reservoir Characterization for Petroleum Geologists, Geophysicists and Engineers. Handbook of petroleum exploration and production. Vol. 6. John Cubit (Ed). Elsevier

Software

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