

26441 - Applied Sedimentology and Coal & Petroleum Geology

Información del Plan Docente

Academic Year	2017/18
Faculty / School	100 - Facultad de Ciencias
Degree	296 - Degree in Geology
ECTS	5.0
Year	4
Semester	First semester
Subject Type	Optional
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

The course consists of three main complementary activities: theory, laboratory and field classes.

Theory classes are dedicated to reinforce stratigraphic, sedimentological and Basin Analysis basic knowledge, but also to acquire new strategies in relation to the study of sedimentary, non-renewable energy resources, and the geological

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processes controlling their genesis.

Laboratory classes complement theory classes and both are dedicated to achieve the following main objectives:

- a. Know the physical properties of sedimentary particles considering their potential interest for Applied Geology.
- b. Know the main features of coal deposits and oil reservoirs as well as geological processes involved in their genesis.
- c. Use stratigraphic and sedimentological data in the characterisation and evaluation of deposits with economical interest.

During the field classes (three days) many different subjects related to the course will be considered. a) Coal deposits associated to transitional sedimentary environments (2 days); b) Serrablo Natural Gas storage (1 day).

Students will present two different works that permit consolidate learning acquired during the course.

5.2.Learning tasks

- Theory classes (20 hours).

- Laboratory classes (10 sessions * 2 h).

- 3 field trips related to the study of sedimentary, non-renewable resources in Aragón.

- A brief test will be answered after each field trip.

- Students will present two different works: one of them related to the possibilities of exploitation and use of sedimentary deposits at a given area, and the other, a bibliographic work (in pairs) related to an oil basin.

- Different bibliographic resources, mainly in English, are used during the course.

- Examination.

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5.3.Syllabus

- Introduction to fossil resources. Renewable and non-renewable energy resources. Organic matter in sediments: production, accumulation and conservation. Controlling factors.
- Natural resources associated to sedimentary environments.
- Coal. Definitions. The origin of coal. Mires. Main factor controls on mire development. Types of mires.
- Sedimentary environments as producers of organic matter. Continental, transitional and marine environments.
- Coal components. Coal at macroscopical and microscopical scale. Maceral groups. Coal lithotypes and microlithotypes.
- Coalification of organic matter. Controlling factors: T, P and time. Rank, components, and coal types. Characteristics of coal for industrial uses.
- Coal mining methods. Most common uses of coal and worldwide coal resources. Coal in Spain
- Coal and environment.
- Oil and natural gas. Physical and chemical properties. Composition of natural hydrocarbons. Main hydrocarbon families.
- Origin and evolution of oil and natural gas. Transformations during the diagenesis and catagenesis. Kerogen: types and evolution. From kerogen to oil.
- The source rock and oil migration. Identification and evaluation of the source rock. Primary and secondary migration.
- The trap rock: petrophysical properties. Types of trap rocks.
- The seal rock: geological and petrophysical properties. Effectiveness of sealing.
- Oil traps. Types: stratigraphic, structural, mixed and hydrodynamic traps. Oil fields.
- Interest of Oil Geology.

Laboratory classes:

- a) Physical properties of sedimentary particles considering their potential interest for Applied Geology. (2 days).
- b) Research and prospecting of natural resources associated to sedimentary environments (1 day).
- c) Evaluation and prospecting of coal deposits (3 days).

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d) Evaluation of the potential interest of hydrocarbon reserves (4 days).

Field classes:

a) Coal deposits associated to transitional sedimentary environments: the Escucha Formation.
- Main lithological and sedimentological features.
- Mine restoration.

b) Serrablo natural gas storage: Visit to ENAGAS facilities in Sabiñánigo (Huesca).
- The gas field and the geological context.
- Example of gas geological storage

5.4.Course planning and calendar

The course will consist of 5 ECTS (125 hours of student work) to be distributed as follows:

- **20 hours of lectures.** The lectures will be held according to the schedule established by the Sciences Faculty.

- **20 hours of laboratory classes.** They will be spread over 10 sessions of 2 hours. The practical sessions will be held according to the schedule established by the Sciences Faculty and will start the same week than theory classes.

- **3 field trips** complementary to the theoretical and laboratory classes (10% of the final mark) . These fieldtrips represent 10 hours of conventional classroom teaching plus 11 hours of classroom student work in the field. A brief questionnaire will be completed at the end of the field trip. The field trip calendar is published by the Department of Earth Sciences on its web page.

- **Report related to sedimentary natural resources** (30% of the final mark) including the possibilities of mining sedimentary deposits at a given area.

- **Presentation using power point of a bibliographic work related to an oil basin** (30% of the final mark) including the petroleum system and geological factors controlling the existence of the oil field.

At the beginning of practices the teacher will give to the students the necessary information for the proposed report related to aggregates. Moreover at the beginning of the course the geographical area for the bibliographic oil work in pairs will be proposed. The deadline for these works will be indicated the first day of classes.

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- **70 hours of personal work** . It includes study and implementation of works and presentations.

- **5 hours of examination** . Written exam focussed on theoretical and practical lectures and seminars (30 % of the final mark; a minimum of 4 is necessary for passing the exam). On dates and places established by the Faculty of Sciences.

5.5. Bibliography and recommended resources

- BB** Applied coal petrology [recurso electrónico] : the role of petrology in coal utilization / edited by Isabel Suarez-Ruiz and John C. Crelling
- BB** Diessel, Claus F.K.. Coal-bearing depositional systems / Claus F.K. Diessel Berlin [etc.] : Springer-Verlag, 1992
- BB** European coal geology / edited by M.K.G. Whateley and D.A. Spears London : Geological Society, 1995
- BB** Sedimentology of coal and coal-bearing sequences / edited by R. A. Rahmani and R. M. Flores Oxford [etc.] : Blackwell Scientific Publications, 1984
- BB** Stach, E.. Stach's Textbook of Coal Petrology. Gebrüder Brntraeger, 1982
- BB** The petroleum system : from source to trap / edited by Leslie B. Magoon, Wallace G. Dow . - 3rd printing Tulsa (Oklahoma) : The American Association of Petroleum Geologists, 2002
- BB** Thomas, Larry. Coal geology / Larry Thomas Chichester : John Wiley & Sons, 2007
- BB** Thomas, Larry. Handbook of Practical Coal Geology. Wiley-Blackwell, 1992



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- BB** Tissot, Bernard P.. Petroleum formation and occurrence : a new approach to oil and gas exploration / B.P. Tissot, D.H. Welte Berlin [etc.] : Springer-Verlag, 1978
- BB** Warwick, P.. Coal system analysis. GSA Special Papers, 2005