

## 60436 - Facies analysis and sedimentary models: principles and applications

### Información del Plan Docente

Academic Year	2016/17
Academic center	100 - Facultad de Ciencias
Degree	541 - Master's in Geology: Techniques and Applications
ECTS	5.0
Course	1
Period	Second semester
Subject Type	Optional
Module	---

### 1. Basic info

#### 1.1. Recommendations to take this course

It is recommended to have previous knowledge on Natural Sciences. Students have to hold a Bachelor's degree in Chemistry, Physics, Biology, Geology, Geography, Environmental Sciences, Marine Sciences, or Engineering.

#### 1.2. Activities and key dates for the course

The classes will start at the beginning of the second semester, and the exams/assessments will be held at the end of the class period (see calendar on the website of the Faculty of Sciences).

### 2. Initiation

#### 2.1. Learning outcomes that define the subject

The aim of this course is to analyse sedimentary facies, facies architecture at different scales, sedimentary models, as well as factors controlling basin sedimentation. This general view on the interpretation of sediments and sedimentary rocks will be useful in the analysis of sedimentary basins, geological history, exploration of natural resources as well as the assessment of natural risks related to sedimentary processes.

#### 2.2. Introduction

Introduction

### 3. Context and competences

#### 3.1. Goals

#### 3.2. Context and meaning of the subject in the degree

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### 3.3.Competences

### 3.4.Importance of learning outcomes

### 4.Evaluation

### 5.Activities and resources

#### 5.1.General methodological presentation

- To interpret sediments and sedimentary rocks;
- To understand and establish the lateral and vertical facies trends of sedimentary successions;
- To know different sedimentary environments as well as their most characteristics sedimentary processes;
- To study sedimentary sequences in order to establish sedimentary models;
- To reconstruct sedimentary environments and their evolution in time;
- To interpret the geological factors that control the evolution of the sedimentary basin successions and to compare the main inferred changes with those recognised at regional or global scale.

#### 5.2.Learning activities

##### Assessment details

Two modalities:

1) Continuous assessment. Including:

- Individual oral presentation of a subject related to the analysis and interpretation of sediments/sedimentary rocks linked to Module II (50% of the final mark);
- Individual written report of a subject related to the analysis and interpretation of sediments/sedimentary rocks linked to Module III (50% of the final mark).

2) Final assessment (for students that do not have passed the course by means of continuous assessment):  
Theoretical-practical exam (100% of the final mark).

#### 5.3.Program

##### Lectures

- **Module I, Introduction** (2 h): Facies and facies analysis; Internal factors (physical, biological and chemical processes) and external factors (climate and tectonics) controlling basin sedimentation;

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- **Module II, 2-D and 3-D sedimentary models in continental environments** (4 h): Facies architecture, genetic factors and interest of sediments in alluvial, lacustrine and aeolian environments;

- **Module III, 2-D and 3-D sedimentary models in marine environments** (4 h): Facies architecture, genetic factors and interest of sediments in coastal, continental platform, and submarine slope-ocean environments.

### Practical sessions

Laboratory practices (P) (2.4 ECTS, 24 h)

- P1 (2.5 h): Coring of a borehole in present lacustrine sediments; lithological description, photographing, sampling, graphical representation and computer processing of data;

- P2 (2.5 h): Physico-chemical analyses on the sedimentary samples taken in P1; macro- and microscopic textural characterization of components in the sediments;

- P3 (2 h): Establishment and interpretation of sedimentary units with palaeoenvironmental significance; interpretation of physico-chemical and biological processes;

- P4 (5 h): Facies, architectural elements and megasequences in alluvial environments; analysis of facies heterogeneities at different scales;

- P5 (2.5 h): Facies analysis from thin-section to outcrop scale of sandy sedimentary bodies in shallow-marine environments;

- P6 (2.5 h): Architectural elements and facies heterogeneities of reefal facies in shallow to deep marine environments (fossil coral reefs, sponge mounds and microbialites);

- P7 (2.5 h): Sedimentological characterization of offshore sandy deposits (turbiditic flows, storms or internal waves?);

- P8 (2.5 h): Sedimentological characterization of offshore muddy deposits rich in organic matter; relationship with accumulation rates, anoxia, climate and relative sea-level changes;

- P9 (2 h): Facies architecture in response of relative sea-level changes; examples of carbonate platforms using *Carbonate* computer program.

Field practices (C) (1,6 ECTS, 3 field trips- 2 mid-day field trips and 1 full day field trip-)

C1 (4 h): Present lacustrine environments (core sampling in borehole: linked to P1 and P3);

C2 (4 h): Architectural elements and facies heterogeneities of terrigenous continental environments (Pleistocene, Ebro Basin) and their usefulness for the analysis of allogenic and autogenic changes in sedimentation (linked to P4);

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C3 (8 h): Architectural elements and facies heterogeneities of sandy, muddy and reefal sedimentary bodies in carbonate platforms (Jurassic, Iberian Basin) (linked to P5 and P6).

### 5.4.Planning and scheduling

- 1) Lectures (1,0 ECTS): 10 sessions of 1 hour
- 2) Laboratory practices (2,4 ECTS): 8 sessions of 2.5 hours and 2 sessions of 2 hours
- 3) Field practices (1,6 ECTS): 2 mid-day field trips and 1 full day field trip
- 4) 75 hours of personal student work

(The specific schedule of activities is published in the Faculty of Sciences' website)

### 5.5.Bibliography and recommended resources

- Carbonates in continental settings : facies, environments, and processes / editors, A.M. Alonso-Zarza and L.H. Tanner . - [1st ed.] Amsterdam [etc.] : Elsevier, 2010
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