

## 26421 - Micropalaeontology

### Información del Plan Docente

Academic Year	2018/19
Subject	26421 - Micropalaeontology
Faculty / School	100 - Facultad de Ciencias
Degree	296 - Degree in Geology
ECTS	6.0
Year	3
Semester	Second semester
Subject Type	Compulsory
Module	---

### 1.General information

#### 1.1.Aims of the course

#### 1.2.Context and importance of this course in the degree

#### 1.3.Recommendations to take this course

### 2.Learning goals

#### 2.1.Competences

#### 2.2.Learning goals

#### 2.3.Importance of learning goals

### 3.Assessment (1st and 2nd call)

#### 3.1.Assessment tasks (description of tasks, marking system and assessment criteria)

### 4.Methodology, learning tasks, syllabus and resources

#### 4.1.Methodological overview

The methodology followed in this course is oriented towards the achievement of the learning objectives. A wide range of teaching and learning tasks are implemented, such as lectures, laboratory sessions, fieldwork and autonomous work and study.

Students will learn and practice the micropaleontological techniques. The most relevant microfossil groups in applied micropaleontology will be studied and interpreted in terms of evolution, biostratigraphy and paleoecology. Introduction to the scientific research by means of the study of a micropaleontological sample.

## 26421 - Micropalaeontology

### 4.2. Learning tasks

This 6 ECTS course is organized as follows:

- **Lectures** (25 hours). Two weekly hours. Students are expected to participate actively in class.
- **Laboratory sessions** (31 hours). 2.5 weekly hours. It involves the study of a micropaleontological sample for the practical assignment.
- **Fieldwork** (0.4 ECTS: 4 hours). At Arguis-Monrepós, Huesca.
- **Exam** (2 hours).
- **Autonomous work and study** (90 hours). It comprises the study of theory and the completion of the practical assignment.

### 4.3. Syllabus

This course will address the following topics:

#### Lectures

##### Section I: Fundamentals

- **Topic 1.** Micropaleontology. Concept, history and present state of the concept: Aims, programming and evaluation. Concept. History of Micropaleontology. Interest and relation with other disciplines. Applied Micropaleontology.
- **Topic 2.** Methodology. Samplings, laboratory techniques and research methods: Methodology of sampling and collecting materials. Laboratory preparation techniques. Observational methods, study and classification. Methods based on informatics software.
- **Topic 3.** Taphonomy. Particularities of microfossil fossilization: Taphonomy and Micropaleontology. Production processes. Biostratigraphic processes. Fossilization processes. Lithogenetic relevance.
- **Topic 4.** The microfossils and the biological classification: The biological classification. Taxonomy and systematic. The biological classification in Micropaleontology.

##### Section II: Systematic

- **Topic 5.** Foraminifera: Biology, organization of the shell and classification: General characteristics. Biology of foraminifera. Organization of the shell. Classification. Origin and evolution.
- **Topic 6.** Planktic Foraminifera. Globigerinina: Biology. Systematic. Evolution and extinction. Biostratigraphy. Ecology and paleoecology. Taphonomy and fossilization.
- **Topic 7.** Benthic Foraminifera. Lagenina, Involutinina, Robertinina,...: General characteristics and classification. Suborders Lagenina, Involutinina, Robertinina, Spirillinina, Carterinina and Silicoloculinina.
- **Topic 8.** Benthic Foraminifera. Rotaliina: General characteristics and classification. Microforaminifera (serial and spiral forms). Larger Foraminifera (orbitoidids, orthofragminids, lepidocyclinids, nummulitids, etc.). Evolution and extinction. Biostratigraphy. Paleoecology.
- **Topic 9.** Benthic Foraminifera. Miliolina: General characteristics and classification. Microforaminifera (cornuspiroids and milioloids). Larger foraminifera (soritoids and alveolinoids). Evolution and extinction. Biostratigraphy. Paleoecology.
- **Topic 10.** Benthic Foraminifera. Fusulinina: General characteristics and classification. Parathuraminoids, endothiroids and fusulinids. Evolution and extinction. Biostratigraphy. Paleoecology.
- **Topic 11.** Benthic Foraminifera. Allogromiina and Textulariina: General characteristics and classification. Suborder Allogromiina. Suborder Textulariina. Orbitolinoids. Evolution and extinction. Biostratigraphy. Paleoecology.
- **Topic 12.** Radiolaria: General characteristics. Biology, morphology and classification. Evolution. Ecology and paleoecology. Biostratigraphy. The radiolaritic genesis.
- **Topic 13.** Tintinnids: History of their study. Biology of recent tintinnids. The lorica of fossil tintinnids. Sample preparations. Fossil record of tintinnids. Calpionellids and related microfossils. Paleobiogeography. Biostratigraphy.
- **Topic 14.** Bacteria: Biology. Classification. Metabolism. Ecology. Cyanobacteria: their relevance as stromatolite builders. Other examples of bacterial sedimentogenesis.
- **Topic 15.** Coccolithophorids and other calcareous nannofossils: General characteristics. Biology. Morphology of

## 26421 - Micropalaeontology

coccoliths. Classification. Evolution. Ecology and paleoecology. Biostratigraphy.

- **Topic 16.** Diatoms and silicoflagellates: Groups of siliceous nanoplankton. General characteristics and classification. Diatoms (Bacillariophyta). Silicoflagellates (Silicoflagellata).
- **Topic 17.** Dinoflagellates, acritarchs and chitinozoa: Groups of organic nanoplankton. General characteristics and classification. Dinoflagellates. Acritarchs. Chitinozoa.
- **Topic 18.** Pollen and spores: Morphology. Classification. Interests and limits in Micropaleontology. Taphonomy. Palaeoenvironmental reconstruction. Evolution and extinction.
- **Topic 19.** Calcareous algae: General characteristics and classification. Red algae (Rhodophyta). Green algae (Chlorophyta). Charophyta.
- **Topic 20.** Briozoa: General characteristics and classification. Biology. Systematic (Stenolaemata, Gymnolaemata and Phylactolaemata). Evolution and extinction. Biostratigraphy. Paleocology.
- **Topic 21.** Ostracods: Biology. Morphology of the valves. Ontogenetic variability and sexual dimorphism. Classification. Ecological limiting factors. Paleocology. Biostratigraphy. Evolution and extinction.
- **Topic 22.** Other microfossil groups and incertae sedis: Spicules of porifera. Sclerites of alcionaria. Sclerites of holothurians. Microbraquiopods. Pteropods. Statolites and conchostraceans. Scolecodonts. Ascidians. Tecamoebians. Incertae sedis microfossils.
- **Topic 23.** Conodonts: Fossil record of primitive cordata. Paleobiologic interpretation. Morphology of the conodontal elements. Composition, structure and growth. Natural associations. Paleocology. Evolution and extinction. Biostratigraphy.
- **Topic 24.** Others vertebrate microfossils: The skeleton of vertebrates. Fossil eggshells. Main microvertebrate groups. Taphonomy and paleoecology. Stratigraphic paleontology.

### Section III: Applications

- **Topic 25.** Paleocology and paleoenvironmental reconstruction by microfossils: Ecology and Paleocology. Limiting factors. Classification of marine environments. Paleoenvironmental reconstruction. Quantitative analyses. Isotopic analyses: paleotemperatures and productivity.
- **Topic 26.** Global paleobiogeography and paleogeography by microfossils: Areas of distribution and mechanisms of dissemination. Barriers of dispersion. Distribution of the micropaleontological groups in oceanic environments. Paleobiogeography by microfossils and continental drifting.
- **Topic 27.** Biostratigraphy. Limits and advantages of microfossils: Biostratigraphic units. Microfossils as guide taxa. Biozonations in Micropaleontology. Limitations of the biostratigraphic scale. Conceptual foundations of Biostratigraphy and Biochronology.
- **Topic 28.** Methods of stratigraphic correlation by microfossils: Biostratigraphic methods. Biomagnetostratigraphic methods. Filogenetic methods. Ecobiostratigraphic methods. Quantitative and statistic methods. Quimiostratigraphic methods. Ciclostratigraphic methods. Eventostratigraphic methods. Applications of microfossils to the chronostratigraphic and geochronologic scales. Interest and utility of microfossils biostratigraphy in Geology and associated industry.
- **Topic 29.** Evolution. Modes and causes of evolution and extinction by microfossils: Evolution and species. Modes of evolution. Biodiversity. Extinction: patterns of extinction and causes.
- **Topic 30.** Origin of life and evolution of the microbiota during the Precambrian: The Hadean Eon: beginning of prebiotic evolution. The Archean Eon: a bacterial planet. The Proterozoic Eon: a changing world.
- **Topic 31.** General history of microbiota. Microfacies: Brief history of the Phanerozoic microbiota. Analysis of microfacies of carbonate rocks. Examples of microfacies in thin sections.

### **Laboratory sessions**

Learning and training in the micropaleontological techniques. Identification of the most useful microfossils and their application to the solution of biostratigraphic, paleoecological and evolutive problems. Study of a micropaleontological sample, as practice individual research, during the second half of each practical session.

- Session 1. Taphonomy. Types and groups of microfossils.
- Session 2. Organization of foraminifera. Thin section technique.
- Session 3. Planktic foraminifera (Globigerinina). Washing levigate technique.
- Session 4. Benthic foraminifera (Lagenina and small rotaliina).

## 26421 - Micropalaeontology

- Session 5. Benthic foraminifera (larger foraminifera). Oriented section technique.
- Session 6. Benthic foraminifera (Textulariina). Rocks with abundant foraminifera.
- Session 7. Radiolaria, tintinnids and nannofossils. Smear technique.
- Session 8. Pollen and spores, calcareous algae and bryozoa.
- Session 9. Ostracods and other invertebrate microfossils.
- Session 10. Conodonts and vertebrate microfossils. Rocks with other microfossils.
- Session 11. Microfacies.

### Fieldwork

- Trip to the Cretaceous and Tertiary of Arguis-Monrepós (Huesca)

### 4.4.Course planning and calendar

- This course is a second semester course. Classes will start the first academic week and will last for 13 weeks.
- Lectures: Mondays and Tuesdays from 12 to 1pm.
- Laboratory sessions: Tuesdays from 3.30pm to 6pm and from 6pm to 8.30pm and Wednesdays from 12 to 2.30pm.

Further information concerning the timetable, classroom, office hours, assessment dates and other details regarding this course will be provided on the first day of class or please refer to the Faculty of Sciences and Earth Sciences Department websites (<https://ciencias.unizar.es>, <https://cienciatierra.unizar.es>) and Moodle.

### 4.5.Bibliography and recommended resources