Universitat Autònoma de Barcelona

2023/2024

Marine Paleobiology

Code: 44791
ECTS Credits: 9

Degree	Type	Year	Semester
4318288 Paleobiology and Fossil Record	OB	0	1

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

Sara Tomas Lafaja

Ramon Mercedes Martin

Josep Sanjuan Girbau

External teachers

Carles Martín Closas

Prerequisites

The same as for the studies.

Objectives and Contextualisation

To demonstrate capabilities for the autonomous acquisition of information from paleontological publications in order to develop a synthesis of the most important points.

To apply a logical and coherent analysis protocol to plan and carry out a paleontological study and solve a specific problem.

To develop a teamwork to solve problems related to the paleoenvironment, assuming their responsibility in the individual contribution and integrating it into group contributions and minimizing inequalities based on sex and gender.

To manage the information acquired in a professional business environment to address and solve specific problems in the dating of marine sediments.

To act autonomously to plan and carry out professional tasks, demonstrating originality in the way of approaching and solving specific problems in hydrocarbon exploration.

To act in the development of paleontological projects with ethical responsibility and with respect for human and fundamental rights, diversity and democratic values, as well as the principles of universal accessibility and design for all people, in accordance with the Sustainable Development Goals.

Learning Outcomes

1. CA04 (Competence) Develop a team work to solve problems related to paleoenvironment, assuming its responsibility for individual contribution and integrating it in group contributions and minimizing sex and gender inequalities.
2. CA04 (Competence) Develop a team work to solve problems related to paleoenvironment, assuming its responsibility for individual contribution and integrating it in group contributions and minimizing sex and gender inequalities.
3. CA05 (Competence) Manage the information acquired in a business professional environment in order to tackle and solve specific problems in dating marine sediments.
4. CA06 (Competence) Act with autonomy in order to plan and carry out professional tasks, proving originality in the way to tackle and solve specific problems in the exploration of hydrocarbons.
5. KA03 (Knowledge) Recognise the methods for studying microfossils, invertebrate fossils, and marine ichnofossils in the field, in the laboratory and in desk research.
6. KA04 (Knowledge) Identify the main stages of the evolution of marine biotas (and the global biotic crises that delimit them) from the study of certain fossil associations.
7. SA04 (Skill) Apply marine fossils to solve problems related to the interpretation of the palaeoenvironment, the evolution of biotas and biostratigraphy.
8. SA05 (Skill) Integrate knowledge obtained in a multidisciplinary environment in palaeontology (geology, geochemistry, stratigraphy, biology) to solve evolutionary, palaeoenvironmental and biostratigraphic problems based on marine microfossils, invertebrates and ichnofossils.
9. SA06 (Skill) Convey the acquired knowledge about marine fossils in a text/video/oral presentation, both for a specialised and non-specialised audience.

Content

1. Micropaleontology and biostratigraphy.

1.1. Description of the main groups of marine microfossils in the geological record (calcareous algae, foraminifera, nanofossils, etc.): morphologies, microstructures, paleoecology and evolution.

1.2. Examples of biozonations and their usefulness for correlating marine sedimentary sequences.

1.3. Application of certain groups of microfossils as daters of sedimentary rocks from the Paleozoic to the present.

2. Marine paleoenvironmental models.

2.1. Introduction to marine carbonate 'factories': controls and environmental parameters 2.2. Paleoecology and paleoenvironments dominated by molluscs.

23. Paleoecology and paleoenvironments dominated by echinoderms.

2.4. Paleoecology and paleoenvironments dominated by microbial carbonates.

2.5. Paleoecology and paleoenvironments dominated by planktonic foraminifera, and their use as climatic proxies.

2.6. Paleoecology and paleoenvironments dominated by benthic foraminifera.

2.7. Paleoecology and paleoenvironments dominated by seagrasses, green and red algae.

2.8. Paleoecology and paleoenvironments dominated by corals.

2.9. Paleoecology and paleoenvironments dominated by sponges, brachiopods and bryozoans.

2.10. Sedimentary models in marine systems*3. Taphonomy, paleoecology and ichnology.*

3. Taphonomy, paleoecology and ichnology.

3.1. Main processes and stages of taphonomic alteration; exceptionally preserved outcrops; fossil accumulations; time averaging; taphofacies.

3.2. Paleoecological analysis; population and community analysis; relationships between organisms; reciprocity pairs.

3.3. Bases and tools for the study of organism-substrate interaction; bioturbation, bioerosion and biodeposition; importance of the ichnological record in paleoecological and paleoenvironmental interpretation; ichnofabrics analysis; ichnofacies.

Methodology

The "Marine Paleobiology" module (9 ECTS) is made up of three blocks (two taught at the UB and one at the UAB):

• Micropaleontology and biostratigraphy (2.5 ECTS - UB)

• Marine paleoenvironmental models (3.5 ECTS - UAB)

• Taphonomy, paleoecology and ichnology (3 ECTS - UB)

Each of the blocks is organized into hybrid master classes (which may be both face-to-face and online) generally lasting 2 hours each. During the bulk of these classes, the theoretical concepts related to the three main blocks will be taught, however, more practical and/or applied exercises will also be proposed (as well as the preparation of reports) to try to consolidate the previously explained concepts.

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.

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Activities

Title	Hours	ECTS	Learning Outcomes
Type: Directed			
Exercises in class	20	0.8	CA04, CA05, CA06, SA04, SA05, SA06, CA04

Master Class	75	3	CA05, KA03, KA04, SA04, CA05
Simulation of a practical cases	15	0.6	CA04, CA05, CA06, SA05, CA04

Assessment

Continuous evaluation:

30% to 40% Theoretical tests/synthesis.

30% to 40% Exercises based on theoretical concepts.

20% Activities and Exercises.

10% Attendance and active participation in class.

Within the ranges indicated, the percentages could vary for each of the three blocks that constitute the module.

Examination-based assessment

100% Final exam which will include theoretical questions and possible exercises linked to theory.

Assessment Activities

Title	Weighting	Hours	ECTS	Learning Outcomes
Analysis of Scientific Papers	20%	10	0.4	CA04, KA03, KA04, SA04
Attendance and participation	10%	75	3	CA04, CA06, SA05
Exercises based on theoretical concepts	35%	10	0.4	CA04, KA03, SA05
Online exercises	10%	20	0.8	CA04, CA05, SA04, SA05, SA06

Bibliography

Allison, P.A. & Briggs, D.E.G. (Eds.) 1991. Taphonomy. Releasing the data locked in the fossil record. Topics in Geobiology 9, Plenum Press, 560 pp.

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Behrensmeyer, A.K. 2021. Taphonomy. In: Alderton, D. & Elias, S.A. (Eds.) Encyclopedia of Geology (2nd Edition), Vol. 3 / History of life, Academis Press, Elsevier, pp. 12-22.

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Buatois, L.A. & Mángano, M.G. 2011. Ichnology. Organism-substrate interactions in space and time. Cambridge University Press, New York, 358 pp.

Buatois, L.A., Mángano, M.G. & Aceñolaza, F. 2002. Trazas fósiles. Señales de comportamiento en el registro estratigráfico. MEF, Museo Paleontológico Egidio Feruglio, Argentina, 382 pp.

Hemminga, M. A., & Duarte, C. M. (2000). Seagrass ecology. *Cambridge University Press*.

James, N. P., & Jones, B. (2015). *Origin of carbonate sedimentary rocks*. John Wiley & Sons.

Kiessling, W., Flügel, E., & Golonka, J. (2002). Phanerozoic reef patterns. *SEPM Society for Sedimentary Geology.*

Knaust, D. & Bromley, R.G. (Eds.) 2012. Trace fossils as indicators of sedimentary environments. Elsevier, Developments in Sedimentology 64, 924 pp.

Mángano, M.G. & Buatois, L.A. (Eds.) 2016. The trace-fossil record of major evolutionary events. Vol. 1: Precambiran and Paleozoic & Vol. 2: Mesozoic and Cenozoic. Topics in Geobiology 39 & 40, Springer, 358 pp & 485 pp.

Molina, E. 2017. Micropaleontología (3ª Edición). Prensas de la Universidad de Zaragoza, 686 pp.

Reijmer, J. J. G. (2014). Carbonate factories. *Encyclopedia of Marine Geosciences*. doi 10.1007/978-94-007-6644-0_136-1.

Seilacher, A. 2007. Trace fossil analysis. Springer, 226 pp.

Selden, P.A. & Nudds, J.R. 2012. Evolution of Fossil Ecosystems (2nd Edition). Elsevier, 288 pp.

Tucker, M. E., & Wright, V. P. (2009). Carbonate sedimentology. John Wiley & Sons.

Software

Basic software: Office (Word, Excel, Power Point) or similar

Drawing software: (Adobe Illustrator, Corel Draw, Inkskape)