



## Information about the subject

**Degree:** Bachelor of Degree in Marine Sciences

**Faculty:** Faculty of Veterinary Medicine and Experimental Sciences

**Code:** 270222 **Name:** Tracers in Marine Sciences

**Credits:** 6,00 **ECTS** **Year:** The course is not offered this academic year **Semester:** 1

**Module:** Optional Itinerary: Ocean Dynamics

**Subject Matter:** Tracers in Oceanography **Type:** Elective

**Department:** Oceanography and Environment

**Type of learning:** Classroom-based learning

**Languages in which it is taught:**

**Lecturer/-s:**



## Module organization

### Optional Itinerary: Ocean Dynamics

| Subject Matter                | ECTS | Subject                       | ECTS | Year/semester   |
|-------------------------------|------|-------------------------------|------|---|
| Dynamic Physical Oceanography | 6,00 | Dynamic Physical Oceanography | 6,00 | This elective is not offered in the academic year 25/26 |
| Paleoceanography              | 6,00 | Paleoceanography              | 6,00 | This elective is not offered in the academic year 25/26 |
| Mathematical Models           | 6,00 | Mathematical Models           | 6,00 | This elective is not offered in the academic year 25/26 |
| Tracers in Oceanography       | 6,00 | Tracers in Marine Sciences    | 6,00 | This elective is not offered in the academic year 25/26 |
| Atmosphere-Ocean Interaction  | 6,00 | Atmosphere-Ocean Interaction  | 6,00 | 0/1   |

## Recommended knowledge

None



## Learning outcomes

At the end of the course, the student must be able to prove that he/she has acquired the following learning outcomes:

- R1        The student understands and recognizes the different tracers in oceanography.
- R2        The student understands and recognizes the different tracers in oceanography.
- R3        He designs and is capable of carrying out a field campaign to obtain current and fossil sediments.
- R4        The student applies the use of microfossils as tracers in the reconstruction of paleoenvironments in the coastal area.
- R5        The student analyses the results obtained and applies them in troubleshooting. The student develops a scientific paper.



## Competencies

Depending on the learning outcomes, the competencies to which the subject contributes are (please score from 1 to 4, being 4 the highest score):

| BASIC |  | Weighting |   |   |   |
|-------|--|-----------|---|---|---|
|       |  | 1         | 2 | 3 | 4 |
| CB2   | Students are able to apply knowledge to their work in a professional way and have the competences enabling them to state and defend views and opinions as well as perform problem-solving tasks in their field of study. |           |   | X |   |
| CB4   | Command of a foreign language  |           |   | X |   |
| CB5   | Students develop the necessary learning skills to undertake further studies with a high level of autonomy.   |           |   | X |   |

| GENERAL |  | Weighting |   |   |   |
|---------|--|-----------|---|---|---|
|         |  | 1         | 2 | 3 | 4 |
| CG1     | Capacity to analyze and synthesize   |           |   | X |   |
| CG2     | Capacity to organize and plan  |           | X |   |   |
| CG3     | Mastering Spanish oral and written communication   |           |   | X |   |
| CG5     | Knowing and applying Basic ITC skills related to marine science  |           |   | X |   |
| CG6     | Capacity to manage information (capacity to look for and analyze information coming from different types of sources) |           | X |   |   |
| CG7     | Decision making  |           |   | X |   |
| CG8     | Capacity to work in interdisciplinary and multidisciplinary team   |           |   | X |   |
| CG10    | Critical and self-critical capacity  |           |   | X |   |
| CG11    | Capacity to learn  |           |   | X |   |



|      |   |  |  |  |   |
|------|---|--|--|--|---|
| CG12 | Capacity to adapt to new situations     |  |  |  | X |
| CG16 | Capacity to apply theoretical knowledge |  |  |  | X |
| CG18 | Sensibility to environmental issues.    |  |  |  | X |

| SPECIFIC |   | Weighting |   |   |   |
|----------|---|-----------|---|---|---|
|          |   | 1         | 2 | 3 | 4 |
| CE1      | Knowing and understanding contents, principles and theories related to Oceanography   |           |   | X |   |
| CE2      | Knowing basic sampling techniques of water column, organisms, sediment and sea-bottoms as well as basic techniques of dynamic and structural variable measurement |           |   | X |   |
| CE4      | Understanding laws regulating use of marine resources and environment   |           |   | X |   |
| CE5      | Applying marine environment use planning techniques as well as resource sustainable management  |           |   | X |   |
| CE6      | Applying marine instrument techniques   |           |   | X |   |
| CE7      | Collecting, assessing, processing and interpreting oceanographic data, following the most recent theories   |           | X |   |   |
| CE8      | Identifying and analyzing new problems and proposing solution strategies  |           |   | X |   |
| CE9      | Knowing how to carry out experiments and measurements both in the laboratory and during sample collection   |           |   | X |   |
| CE10     | Knowing how to use planning, designing and implementing research tools while surveying and assessing results  |           |   | X |   |
| CE11     | Knowing how to do fieldwork and laboratory experiments in a safe and responsible way, promoting teamwork  |           |   | X |   |
| CE12     | Describing, classifying and mapping sea bottoms and coastal areas   |           |   | X |   |
| CE18     | Practical experience of researching into marine climate   |           | X |   |   |
| CE19     | Deeply understanding operating systems of maritime orientated companies, identifying their problems and proposing solutions                                       |           |   | X |   |



CE22 Practical experience of methods of marine environmental impact assessment

X

## Assessment system for the acquisition of competencies and grading system

| Assessed learning outcomes | Granted percentage | Assessment method   |
|----------------------------|--------------------|---|
| R1, R2, R3, R4, R5         | 50,00%             | Written test with theoretical and practical questions   |
| R1, R2, R3, R4, R5         | 40,00%             | Delivery of guided assignments, whose objectives and contents will be proposed by the teacher |
| R1, R2, R3, R4, R5         | 10,00%             | Oral presentation   |

### Observations

This course is not eligible for single evaluation. According to the general evaluation and qualification regulations, the preferred evaluation system will be continuous evaluation. Attendance at practical sessions is mandatory.

The use of artificial intelligence (AI)-based tools is subject to the discretion of the teacher, who may establish specific limits or conditions depending on the training or assessment activity.

### MENTION OF DISTINCTION:

In accordance with the regulations governing the assessment and grading of subjects in force at UCV, the distinction of "Matrícula de Honor" (Honours with Distinction) may be awarded to students who have achieved a grade of 9.0 or higher. The number of "Matrículas de Honor" (Honours with Distinction) may not exceed five percent of the students enrolled in the group for the corresponding academic year, unless the number of enrolled students is fewer than 20, in which case a single "Matrícula de Honor" (Honours with 9 Distinction) may be awarded. Exceptionally, these distinctions may be assigned globally across different groups of the same subject. Nevertheless, the total number of distinctions awarded will be the same as if they were assigned by group, but they may be distributed among all students based on a common criterion, regardless of the group to which they belong. The criteria for awarding "Matrícula de Honor" (Honours with Distinction) will be determined according to the guidelines stipulated by the professor responsible for the course, as detailed in the "Observations" section of the evaluation system in the course guide.



## Learning activities

The following methodologies will be used so that the students can achieve the learning outcomes of the subject:

- M1 Teacher presentation of contents, analysis of competences, explanation and in-class display of skills, abilities and knowledge.
- M2 Group work sessions supervised by the professor. Case studies, diagnostic tests, problems, field work, computer room, visits, data search, libraries, on-line, Internet, etc. Meaningful construction of knowledge through interaction and student activity.
- M3 Activities carried out in spaces with specialized equipment.
- M4 Supervised monographic sessions with shared participation.
- M5 Application of multidisciplinary knowledge.
- M6 Personalized and small group attention. Period of instruction and/or guidance carried out by a tutor to review and discuss materials and topics presented in classes, seminars, readings, papers, etc.
- M8 Set of oral and/or written tests used in initial, formative or additive assessment of the student.
- M9 Group preparation of readings, essays, problem-solving, seminars, papers, reports, etc. to be presented or submitted in theoretical , practical and/or small-group tutoring sessions. Work done on the university e-learning platform ([www.plataforma.ucv.es](http://www.plataforma.ucv.es) )
- M10 Student's study: Individual preparation of readings, essays, problem-solving, seminars, papers, reports, etc. to be presented or submitted in theoretical, practical and/or small-group tutoring sessions. Work done on the university e-learning platform ( [www.plataforma.ucv.es](http://www.plataforma.ucv.es) ).



## IN-CLASS LEARNING ACTIVITIES

|   | LEARNING OUTCOMES  | HOURS        | ECTS        |
|---|--------------------|--------------|-------------|
| ON-CAMPUS CLASS<br>M1                   | R1, R2, R3, R4, R5 | 30,00        | 1,20        |
| PRACTICAL CLASSES<br>M2                 | R1, R2, R3, R4, R5 | 10,00        | 0,40        |
| LABORATORY<br>M3                        | R1, R2, R3, R4, R5 | 10,00        | 0,40        |
| SEMINAR<br>M4                           | R1, R2, R3, R4, R5 | 3,00         | 0,12        |
| GROUP PRESENTATION OF ASSIGNMENTS<br>M5 | R1, R2, R3, R4, R5 | 2,00         | 0,08        |
| TUTORIAL<br>M6                          | R1, R2, R3, R4, R5 | 3,00         | 0,12        |
| ASSESSMENT<br>M8                        | R1, R2, R3, R4, R5 | 2,00         | 0,08        |
| <b>TOTAL</b>                            |                    | <b>60,00</b> | <b>2,40</b> |

## LEARNING ACTIVITIES OF AUTONOMOUS WORK

|                         | LEARNING OUTCOMES  | HOURS        | ECTS        |
|-------------------------|--------------------|--------------|-------------|
| GROUP WORK<br>M9        | R1, R2, R3, R4, R5 | 20,00        | 0,80        |
| INDEPENDENT WORK<br>M10 | R1, R2, R3, R4, R5 | 70,00        | 2,80        |
| <b>TOTAL</b>            |                    | <b>90,00</b> | <b>3,60</b> |





## Description of the contents

Description of the necessary contents to acquire the learning outcomes.

Theoretical contents:

| Content block | Contents   |
|---------------|--|
| CONTENTS      | Main tracers in Oceanography: Radioactive tracers and fluorescent tracers.<br>Tracers as markers of water masses.<br>Microfossils as tracers.<br>Calculation of diffusion coefficients from tracers. |

Temporary organization of learning:

| Block of content | Number of sessions | Hours |
|------------------|--------------------|-------|
| CONTENTS         | 30,00              | 60,00 |

## References

- 1.- Matthew H. England, Ernst Maier-Reimer. Using Chemical Tracers to Assess Ocean Models, 2001.
- 2.- Wallace Smith Broecker and Tsung-Hung Peng. Tracers in the sea, Lamont-Doherty Geological Observatory, Columbia University 1982.
- 3.- Bruce A. Warren and Carl Wunsch. Evolution of physical oceanography :scientific surveys in honor of Henry Stommel, MIT Press, Cambridge, Mass, 1981.
- 4.- David R. Turner, Keith A. Hunter. The biogeochemistry of iron in seawater, J. Wiley,, Chichester 2001.