



Information about the subject

Degree: Bachelor of Degree in Marine Sciences

Faculty: Faculty of Veterinary Medicine and Experimental Sciences

Code: 273005 **Name:** Methods in Oceanography II: Chemical and Biological

Credits: 6,00 **ECTS Year:** 3 **Semester:** 2

Module: Professional

Subject Matter: Oceanography **Type:** Compulsory

Department: Oceanography and Environment

Type of learning: Classroom-based learning

Languages in which it is taught: English, Spanish

Lecturer/-s:

273A	<u>Ana Maria Hernandez Martinez</u> (Responsible Lecturer)	am.hernandez@ucv.es
CAUR	<u>Ana Maria Hernandez Martinez</u> (Responsible Lecturer)	am.hernandez@ucv.es
273GIQ	<u>Carolina Padron Sanz</u> (English Responsible Lecturer)	carolina.padron@ucv.es



Module organization

Professional

Subject Matter	ECTS	Subject	ECTS	Year/semester
Oceanography	36,00	Chemical Oceanography	6,00	3/1
		Geological Oceanography	6,00	3/1
		Marine Biology and Biological Oceanography	6,00	3/1
		Methods in Oceanography I: Physical and Geological	6,00	3/2
		Methods in Oceanography II: Chemical and Biological	6,00	3/2
		Physical Oceanography	6,00	3/1
Marine living resources	12,00	Aquaculture	6,00	3/2
		Fisheries	6,00	3/2
Marine and Coastal Management	18,00	Coastal Planning and Management	6,00	4/1
		Legislation and Economy	6,00	4/1
		Marine Pollution	6,00	4/1



Recommended knowledge

Chemical Oceanography

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 acquires knowledge of oceanographic instrumentation and types of equipment for scientific sampling.
- R2 The student has acquired the ability to organize an oceanographic campaign according to the research to be carried out.
- R3 The student knows how to represent and interpret the results of field campaigns, elaboration of reports, maps and graphs.
- R4 The student knows how to use the techniques of conservation, storage and previous treatment of the samples.
- R5 The student knows how to handle the different techniques of processing, extraction and analysis of marine samples in the determination of biological parameters.
- R6 The student knows and controls the quality and safety criteria of the data obtained during the analysis.



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		
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	



CG14	Leadership abilities.				X
CG16	Capacity to apply theoretical knowledge				X
CG17	Research skills				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
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



Assessment system for the acquisition of competencies and grading system

Assessed learning outcomes	Granted percentage	Assessment method
R1, R2	40,00%	Written test with theoretical and practical questions
R1, R2, R3	30,00%	Delivery of guided assignments, whose objectives and contents will be proposed by the teacher
R1, R2, R3, R4, R5, R6	20,00%	Laboratory test
R1, R2, R3	10,00%	Oral presentation

Observations

According to the general evaluation and qualification regulations, the preferred evaluation system will be by means of continuous evaluation. Specifically:

Learning will be monitored through the completion and correction of questions on the theoretical-practical content at the end of each subject.

In order to obtain an average, a minimum of 5 out of 10 is required in each evaluation instrument, with the exception of the Oceanographic Week report and exhibition.

The delivery of directed work corresponds to a Campaign Design (10%) and the Oceanographic Week Report (20%).

The practical laboratory test includes an exam with quizzes based on the practices of the subject. If the test takes place in the laboratory, it is compulsory to wear a lab coat, as well as the appropriate clothing according to laboratory safety regulations (closed shoes, long trousers, hair tied up).

Failure to comply with the aforementioned rules will make it impossible for the student to take the test.

Attendance at laboratory practicals is compulsory. Only 1 absence is allowed. The teacher will monitor the attendance and attitude of each student. Factors such as attention, degree of participation and interest shown will be taken into account.

The work presentation corresponds to the oceanographic week presentation.



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)



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).

IN-CLASS LEARNING ACTIVITIES

	LEARNING OUTCOMES	HOURS	ECTS
ON-CAMPUS CLASS M1	R1, R2, R3	16,00	0,64
PRACTICAL CLASSES M2	R1, R2, R3, R4, R5	4,00	0,16
LABORATORY M3	R1, R2, R3, R4, R5, R6	28,00	1,12
SEMINAR M4	R1	2,00	0,08
GROUP PRESENTATION OF ASSIGNMENTS M5	R2	2,00	0,08
TUTORIAL M6	R1, R2, R3, R4, R5, R6	5,00	0,20
ASSESSMENT M8	R1, R2, R3, R4, R5, R6	3,00	0,12
TOTAL		60,00	2,40

LEARNING ACTIVITIES OF AUTONOMOUS WORK

	LEARNING OUTCOMES	HOURS	ECTS
GROUP WORK M9	R2	40,00	1,60
INDEPENDENT WORK M10	R1, R2, R3, R4, R5, R6	50,00	2,00
TOTAL		90,00	3,60



Description of the contents

Description of the necessary contents to acquire the learning outcomes.

Theoretical contents:

Content block	Contents
Methods in chemical oceanography.	<ol style="list-style-type: none">1. Introduction to the chemical analysis in the marine environment2. Sampling basis and strategies in the marine environment.3. Pre-treatment of liquid samples and extraction methods.4. Pre-treatment of solid samples and extraction methods.5. Quality and accuracy of the data obtained.
Methods in biological oceanography	<ol style="list-style-type: none">1. Experimental design and sampling methodologies for pelagic communities.2. Preservation and pre-treatment of planktonic communities.3. Determination of the biomass and planktonic metabolism.4. Other methodologies of interest in Oceanography. Traps and satellites .



Organization of the practical activities:

	Content	Place	Hours
PR1.	Planning an oceanographic campaign for the study of the distribution of metals and other practical case studies.	Lecture room	4,00
PR2.	Sampling of seawater and sediments. Fixation and conservation of the samples.	Boat	2,00
PR3.	Extraction and quantification of organic compounds (oils and fats) from seawater.	Laboratory	2,00
PR4.	Spectrophotometric determination of iron in seawater.	Laboratory	2,00
PR5.	Pre-treatment of seawater samples and extraction of heavy metals.	Laboratory	2,00
PR6.	Spectrophotometric characterization of Mn and Cd. Qualitative and quantitative analysis. Data treatment.	Laboratory	3,00
PR7.	Extraction of heavy metals from marine sediments by acid digestion and by Microwave-Assisted Extraction (MAE).	Laboratory	2,00
PR8.	Spectrophotometric characterization of Cr (VI). Qualitative and quantitative analysis. Data treatment.	Laboratory	3,00
PR9.	Extraction of organic compounds from organic samples by Soxhlet and Ultrasounds.	Laboratory	2,00
PR10.	Extraction and determination of photosynthetic pigments (Chla) using the photometric method.	Laboratory	2,00
PR11.	Estimation of primary phytoplankton production. Winkler method.	Laboratory	2,00
PR12.	Collection of phytoplankton and zooplankton samples in the water column by oceanographic bottles. Filtration, fixation and conservation of samples.	Boat	2,00



PR13.	Determination of phytoplankton biomass in real samples. Calpe.	Laboratory	6,00
PR14.	Data treatment.	Laboratory	2,00

Temporary organization of learning:

Block of content	Number of sessions	Hours
Methods in chemical oceanography.	20,00	40,00
Methods in biological oceanography	10,00	20,00

References

- Manual for the Geochemical Analyses of Marine Sediments and Suspended Particulate Matter. (1995) Reference Methods for Marine Pollution Studies No. 63, UNEP.
- GARCÍA-SOTO, C. (Ed.) Oceanografía y satélites. (2009). Editorial Tébar, Madrid (España). pp. 502
- Surface water sampling methods and analysis — technical appendices. Standard operating procedures for water sampling methods and analysis, 2009.
- PÉREZ GALVÁN, F.J.; TORRES PADRÓN, M. E. Métodos en Oceanografía II: Parte Química. Prácticas de Laboratorio. (2004). Las Palmas. Servicio de Publicaciones de la Universidad de Las Palmas de Gran Canaria.
- Métodos Normalizados para el Análisis de Aguas Potables y Residuales. Varios Autores (1992). Ed. APHA – AWWA – WPCF.
- AENOR. Calidad del Agua. Medio Ambiente – Tomo 1. Recopilación Normas UNE.
- WURL, O. Practical Guidelines for the Analysis of Seawater (2009) CRC Press. Boca Raton. Florida. pp. 408