Information about the subject

Degree: Bachelor of Degree in Marine Sciences

Faculty: Faculty of Veterinary Medicine and Experimental Sciences

Code: 273004 **Name:** Methods in Oceanography I: Physical and Geological

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: Spanish

Lecturer/-s:

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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

Physical and geological oceanography knowledge

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 knows the importance of data collection in physical and geological oceanography.
R2	The student acquires knowledge of oceanographic instrumentation and types of equipment for scientific sampling.
R3	The student applies the study of positioning systems and cartography for a correct oceanographic sampling.
R4	The student has acquired the ability to organize an oceanographic campaign according to the research to be carried out.
R5	The student knows and applies the oceanographic data processing software.
R6	The student knows how to represent and interpret the results of field campaigns, elaboration of reports, maps and graphs.

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
CG9	Interpersonal skills		x		
CG10	Critical and self-critical capacity			x	

CG11	Capacity to learn				x
CG12	Capacity to adapt to new situations				x
CG13	Capacity to produce new ideas (creativity)			x	
CG14	Leadership abilities.				x
CG16	Capacity to apply theoretical knowledge				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
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			

Assessment system for the acquisition of competencies and grading system

Assessed learning outcomes	Granted percentage	Assessment method
R1, R2, R3	40,00%	Written test with theoretical and practical questions
R1, R2, R3, R4, R5, R6	35,00%	Delivery of guided assignments, whose objectives and contents will be proposed by the teacher
	0,00%	Laboratory test
R5, R6	15,00%	Problem-solving and issues related to the use of specific software
R1, R2, R3, R4	10,00%	Oral presentation

Observations

This subject cannot be assessed by means of a single assessment. According to the general assessment and grading regulations, the preferred assessment system will be by continuous assessment. Specifically: The item ‘Solving problems and related questions using specific computer programs’ will be assessed by continuous assessment, with the student having to hand in the exercise carried out at the end of each practice (it will be essential to hand in all the exercises requested). The final evaluation of this item will consist of a practical exam of the concepts seen in the subject and in which the student will have to program different routines using the Python programming language. Therefore, attendance to the practical is MANDATORY.
A minimum of 5 out of 10 in the written test and in the rest of the evaluation instruments is required in order to obtain an average. If a final mark of 5 points is not obtained in each section and only one of them has been passed, the course will be failed, even if the weighted average is equal to or higher than 5. The weighted average is also subject to the student having submitted all the required work. The mark obtained may suffer a penalty of up to 10% for late delivery of the work requested.
The delivery of supervised work will be both individual and group work.
The evaluation percentage of this evaluation instrument is broken down into 20% for individual and/or pair work and 15% for the group work (Oceanographic Week Report or alternative work).
The presentation of the group work must be presented to the teacher on the indicated date for its approval and subsequent public defence.
The grade obtained may be penalised by up to 10% for spelling mistakes. Students on international exchange programmes are exempt from this penalty.
The use of tools based on artificial intelligence (AI) is subject to the discretion of the lecturer, 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)

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	24,00	0,96
PRACTICAL CLASSES M2	R2, R3, R4, R5, R6	24,00	0,96
LABORATORY M3	R2	2,00	0,08
SEMINAR M4	R1, R2	3,00	0,12
GROUP PRESENTATION OF ASSIGNMENTS M5	R2, R3, R4, R5, R6	2,00	0,08
TUTORIAL M6	R1, R2, R3, R4, R5, R6	2,00	0,08
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, R3, R4, R5, R6	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
UNIT 1. INTRODUCTION TO SAMPLING METHODS IN PHYSICAL AND GEOLOGICAL OCEANOGRAPHY.	1.1 Introduction to the scientific sampling 1.2 Physical and Geological processes 1.3 Temporal and spatial scales of physical processes in the ocean 1.4 Basic sampling requirements 1.5 Sampling errors
UNIT 2. OCEANOGRAPHIC INSTRUMENTATION AND OBSERVATIONAL METHODS.	2.1 Functional elements and general characteristics of instruments 2.2 Data acquisition using oceanographic equipment and instrumentation 2.3 Water column, sea floor and subsoil samplers. Grain sizes, textures and components analysis. 2.5 Meteorological data: wind and precipitation. 2.6 Water level measurements 2.7. Waves measurements 2.8 Mooring.
UNIT 3. PLANNING AND EXECUTION OF SAMPLING.	3.1 Cartography and positioning 3.2 The satellite positioning system: GPS. 3.3 Coastal cartography methods 3.4 The oceanographic campaign
UNIT 4. OCEANOGRAPHIC DATA PROCESSING.	4.1 Processing and data analysis 4.2 Short, medium and long-term wave analysis

Organization of the practical activities:

	Content	Place	Hours
PR1.	Sampling requirements and sensor choice: case study.	Lecture room	1,00
PR2.	Sampling of physicochemical parameters in the water column.	Boat	1,00
PR3.	Introduction to programming.	Computer	4,00
PR4.	Temperature, salinity and density profiles representation using MATLAB.	Computer	2,00
PR5.	Instrumentation seminar.	Boat	1,00
PR6.	Timeseries representation (wave parameters).	Computer	2,00
PR7.	Beach topography and beach profiles.	Field visit	1,00
PR8.	Seminar: oceanographic cruise planning and execution.	Lecture room	2,00
PR9.	Oceangraphic cruise.	Lecture room	8,00
PR10.	Oceanografic week.	Marine station	4,00
PR11.	Short term wave analysis	Computer	4,00
PR12.	Medium term wave analysis	Computer	2,00

Temporary organization of learning:

Block of content	Number of sessions	Hours
UNIT 1. INTRODUCTION TO SAMPLING METHODS IN PHYSICAL AND GEOLOGICAL OCEANOGRAPHY.	3,00	6,00
UNIT 2. OCEANOGRAPHIC INSTRUMENTATION AND OBSERVATIONAL METHODS.	11,00	22,00
UNIT 3. PLANNING AND EXECUTION OF SAMPLING.	6,00	12,00
UNIT 4. OCEANOGRAPHIC DATA PROCESSING.	10,00	20,00

References

BASIC

Allen, P.A. and Allen, J.R., (2005). Basin analysis. Principles and applications. Estados Unidos: Blackwell Science Ltd. 549 pp.

Alyuruk, H. (2019) R and python for oceanographers: a practical guide with applications. Elsevier, Amsterdam. 180 p

Castelló, M. (2007). Escribir y comunicarse en contextos científicos y académicos. Barcelona: Graó. 224 pp.

Emery, W.J., and Thomson, R.E., (2014). Data Analysis Methods in Physical Oceanography, 3ª edición. Elsevier Science. 673 pp.

Flor, G., (2004). Geología Marina. Oviedo: Universidad de Oviedo. 576 pp.

Grasshoff, K., Krembling, K., and Ehrhardt, M., (2002). Methods of Seawater Analysis. 3ª Edición. Koln (Colonia): Wiley. 600pp

García Estévez, J.M., Olabarria, C., Rolán-Álvarez, E., and Rosón, G., (2011). Métodos y técnicas en investigación marina. Vigo: Tecnos. 404 pp.

Karnauskas, K., (2020). Physical Oceanography and Climate. Cambridge: Cambridge University Press. 247 pp.

Mudroch, A., and Azcue, J.M., (1995). Manual of Aquatic Sediment Sampling. Estados Unidos: Lewis. 240 pp

Nichols, G., (2004). Sedimentology and Stratigraphy. Estados Unidos: Blackwell Science Ltd. 355 pp.

Pond, S. and Pickard, G.L., (2003). Introductory Dynamical Oceanography. Reino Unido: Pergamon Press, 329 p.

Rosón Porto, G. and Varela, R. A., (2008). Métodos en Oceanografía Física. Barcelona: Anthias. 126 pp.

Siedler, G., Griffies, S.M., Gould, J., and Church, J.A. (2013). Ocean circulation and climate: A 21st Century perspective. Amsterdam: Academic Press. 868 pp

Stewart, R. H., (2004). Introduction to Physical Oceanography. Texas: Texas University.

Talley, L.D., Pickard, G.L., Emery, W.J. and Swift, J.H., (2011). Descriptive Physical Oceanography: An Introduction, 6ª edición. Londres: Elsevier. 555 pp.

COMPLEMENTARY

Brown, E., Colling, A., Park, D., Phillips, J., Rothery, D. y Wright, J., (2002). Waves, tides and shallow-water processes. Reino Unido: The Open University. 227 pp.

Brown, E., Colling, A., Park, D., Phillips, J., Rothery, D. y Wright, J., (2002). Ocean Circulation. Reino Unido: The Open University. 286 pp.

Brown, E., Colling, A., Park, D., Phillips, J., Rothery, D. y Wright, J., (2002). Seawater: its composition, properties and behaviour. Reino Unido: The Open University. 168 pp.

WEBSITES

Copernicus Marine Service: https://marine.copernicus.eu

Python's book: https://ellibrodepython.com
NOAA.http://oceanexplorer.noaa.gov/technology/technology.html
Processing Oceangraphic Data. U.S. Navy Hydrographic Office. https://ia800202.us.archive.org/19/items/processingoceano00lafo/processingoceano00lafo_bw.pdf
TEOS-10.http://www.teos-10.org/
The Global Ocean Observing System(GOOS). http://www.ioc-goos.org/