



IDENTIFYING DATA

Geological oceanography II

Subject	Geological oceanography II			
Code	V10G061V01308			
Study programme	Grado en Ciencias del Mar			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Mandatory	3rd	2nd
Teaching language	#EnglishFriendly Spanish			
Department				
Coordinator	Alejo Flores, Irene			
Lecturers	Alejo Flores, Irene Nombela Castaño, Miguel Angel Pérez Arlucea, Marta María			
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General description The subject Geological Oceanography II, intends to train the student in the direct and indirect techniques for the characterization of the submarine bottoms, as well as the geological record in marine environments of continental shelf and deep environments (continental slope, continental abyssal plains, dorsal flanks, Ridges and ocean trenches). Therefore this subject has a different approach to the one of the Geological Oceanography I dedicated to the coastal and coastal areas. It is intended therefore that the student acquire the knowledge in the use and application of the latest generation techniques in sea surveys, as well as the ability to plan and develop oceanographic geological field works and prepare and submit reports. Students are required to take this course in responsible and honest behavior. Any form of fraud (i.e. copy and/or plagiarism) intended to falsify the level of knowledge or skill attained by a student in any type of test, report, or work designed for this purpose is considered inadmissible. This fraudulent conduct will be sanctioned with the firmness and rigor that establishes the current regulation.

English Friendly subject: International students may request from the teachers:

- a) resources and bibliographic references in English, b) tutoring sessions in English, c) exams and assessments in English.

Training and Learning Results

Code	
A2	Students can apply their knowledge and understanding in a manner that indicates a professional approach to their work or vocation, and have competences typically demonstrated through devising and sustaining arguments and solving problems within their field of study
A3	Students have the ability to gather and interpret relevant data (usually within their field of study) to inform judgments that include reflection on relevant social, scientific or ethical issues
A4	Students can communicate information, ideas, problems and solutions to both specialist and non-specialist audiences
B2	Plan and execute surveys in the field and laboratory work, applying basic tools and techniques for sampling, data acquisition and analysis in the water column, sea bottom and marine substratum.
B4	Manage, process and interpret the data and information obtained both in the field and in the laboratory.
B5	Develop, implement and write basic or applied projects in oceanography from a multidisciplinary perspective.
C13	Acquire the basic sedimentological, geochemical and geophysical techniques and methodologies used in identification, use and sustainability of the natural resources of coastal and marine environments.
C14	Know basic concepts and events of global change obtained from geological records.
D1	Develop the search, analysis and synthesis of information skills oriented to the identification and resolution of problems.
D5	Sustainability and environmental commitment. Equitable, responsible and efficient use of resources.

Expected results from this subject

Expected results from this subject	Training and Learning Results
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1. Get skills to plan and carry out geological oceanographic surveys	A3	B2	C13	D5
2. Get familiar with oceanographic databases in public repositories	A3	B4	C14	D1
3. To know the basic methods of geophysical exploration	A3	B2 B4	C13 C14	D5
4. To know the basic techniques of compositional analysis and physical properties of sedimentary cores	A2 A3	B2 B4	C13 C14	D5
5. To know and apply the techniques of geochemical characterization in sediments.	A2	B2 B4	C13 C14	D1 D5
6. Get familiar with geophysical and geochemical data processing methods	A3 A4	B4 B5	C13	D1
7. Get skills to write and submit reports	A2 A3 A4	B4 B5	C14	D1
8. Security during the execution of an oceanographic survey	A2	B2	C13	D5

Contents

Topic	
THEMATIC UNITY I-: INTRODUCTION TO THE MARINE GEOLOGICAL RESEARCH IN THE SEA	THEME 1.- Introduction to the subject Geological Oceanography II. Introduction to the geological oceanography technologies applied to the study of shelf and deep sea environments. Presentation of public data repositories.
THEMATIC UNITY -II: POSITION SYSTEMS IN THE SEA	THEME 2.- Topic to select a position system. Global position systems and integration with acoustic position systems.
THEMATIC UNITY III-: ACOUSTIC SYSTEMS IN DEEP SEA	THEME 3.- Acoustic underwater and sonar systems. THEME 4.- Sidescan Sonar
THEMATIC UNIT IV-: MARINE SEISMIC SURVEYING	THEME 5.- Marine Seismic surveying: conceptual aspects. THEME 6.- Description of the diferents equipment and collected records
THEMATIC UNIT V-: MARINE GRAVIMETRY SURVEYING	THEME 7.- Gravimetry surveying and its application to marine research.
THEMATIC UNIT -VI-: MARINE MAGNETIC SURVEYING	THEME 8.- Magnetic surveying and its application to marine research.
THEMATIC UNIT-VII-: MARINE GEOTHERMAL FLOW	THEME 9.- Geothermal flow and its application to marine research.
THEMATIC UNIT -VIII: ELECTROMAGNETIC AND RADIOMETRIC SURVEYING IN MARINE ENVIRONMENTS	THEME 10.- Electromagnetic and radiometric surveying and its application to marine research.
THEMATIC UNIT IX-: SAMPLING SEDIMENTS AND ROCKS METHODS IN SHELF AND DEEP SEA ENVIRONMENTS.	THEME 11.- Sampler methods for Particulate Suspended Matter and bottom sediment samples at deep environments. THEME 12.- Deep sea coring technics. methods. Ocean Drilling Projects.
THEMATIC UNIT X-: OCEANOGRAPHY INFRASTRUCTURES	THEME 13.- Geophysical observation into the corers. THEME 14.: Sampler platforms in geological oceanography. THEME 15: New technology in submarine observatories.
THEMATIC UNIT -XI: PLANNING OCEANOGRAPHIC SURVEYS	THEME 16.: Project and planification of oceanographic surveys.

Planning

	Class hours	Hours outside the classroom	Total hours
Introductory activities	1	0	1
Lecturing	24	48	72
Laboratory practical	15	16	31
Mentored work	2	13	15
Seminars	5	12	17
Field practice	5	6	11
Objective questions exam	1	0	1
Objective questions exam	2	0	2

*The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.

Methodologies

	Description
Introductory activities	Detailed introduction about the content of the subject and the methodology followed aswell as the form of evaluation, field trips, practical classes and seminars. The materials necessary to follow lectures and practical sessions and references will be presented.

Lecturing	This include the theoretical contents about all methods used in Oceanography Geology surveys, including selected aplicated examples. The student will be evaluated about this content in a final exam.
Laboratory practical	Laboratory practices consist of three thematic blocks divided into 5 sessions: 1- Corer description and interpretation. 2- Introduction to the interpretation of seismic records: reflection and refraction systems. 3- Data processing, with an specific software, for the elaboration of bathymetric maps (the computer classroom will be used). Attendance is MANDATORY.
Mentored work	In groups of two or three students, the students will choose a applied scientific study on the subject for an oral presentations. The student will show there ability to work as a team and his ability to make an oral presentation on a scientific topic. In the ensuing discussion, the capacity for synthesis and understanding of the proposed topic will be evaluated. The activity is MANDATORY.
Seminars	The seminars that students will have to hold and deliver, consists of three sessions: 1- Handling of nautical charts, navigation parameters, point positioning and sampling path. Key tools for the preparation and conduct of oceanographic surveys. 2- Interpretation of Side Scan Sonar records. 3- Exhibition of examples of studies applied in Geological Oceanography, focusing into the specific methodology used for each specific work. Debate and analysis of the topic presented. These activities are MANDATORY.
Field practice	There will be a session onboard the B/O Mytilus along the Ria de Vigo were the student will participate in a oceanographyc survey. The objetive is to be able to familiarize themselves with the systems of acquisition of submarine acoustic data and of marine sediment samples (sediment cores, dredgers, etc.). It is also intended that they become familiar with the organization and procedure of an oceanographic survey, for which smaller groups of work will be created to carry out the activity on board the oceanographic vessel. At the end of the activity, each group will have to produce a "cruise report". Some of the collected data will be worked out in practical sessions. The activity is MANDATORY.

Personalized assistance

Methodologies	Description
Introductory activities	This first part corresponds to the presentation of the subject: activities that will be developed along the course, material that will be needed, and to specify the deliverables that the students will have to present along the course. The evaluation system to be followed will also be presented. The active participation of the students will be encouraged, basically aimed at clarifying all the doubts related to the approach and development of the subject. Students are invited to contact the teacher to clarify doubts at all times, preferably in person, individually, or in a group. It is necessary to contact the teacher sufficiently in advance by email or using the virtual secretary.
Lecturing	The active participation of the students in the classes will be encouraged, encouraging the discussion and approach of small questions to be solved in class. The student can contact at all times with the teacher to clarify doubts, in person, individually, or in a group. If the doubts require greater personal attention to solve problems they can ask for personalized tutorials. It is necessary to contact the teacher sufficiently in advance by email or using the virtual secretary.
Laboratory practical	The exercises presented in the three Practical blocks will be solved in the same classroom in order to resolve the doubts gradually as they arise as the work progresses in the complexity of the exercises. The active participation of students will be encouraged. Each practice will have a deliverable for evaluation. Once completed, the student can contact at all times with the teacher to clarify doubts, preferably in person, individually, or in a group. If the doubts require greater personal attention will be agreed a tutorial to solve problems. It is necessary to contact the teacher sufficiently in advance by email or using the virtual secretary.
Field practice	An oceanography Survey will be carried out in the B/O Mytilus, in groups of 5-6 students, where they will put into practice the methodology involved in Geological Oceanography cruises. Some of the data collected on board will be worked out in practical sessions. After the activity, each group of students must produce a survey report to be evaluated. This will include: a description of the methodology achieved and collected data. Students who wish may attend personalized tutorials to resolve doubts. Contacting the teacher sufficiently in advance by email or using the virtual secretary is necessary.
Mentored work	In groups of two or three persons, students will choose a current publication that shows an applied practical work of any of the equipment and methodologies that are included in the assignment. They will have to give their colleagues an oral exposition of the work and present a written paper in an article format. Students who wish may attend personalized tutorials to resolve doubts. Contacting the teacher sufficiently in advance by email or using the virtual secretary is necessary.

Seminars	The practical exercises presented in the different seminars sessions will be solved in the same classroom in order to resolve the doubts gradually as they arise as the work progresses in the complexity of the exercises. The active participation of students will be encouraged. Once completed, the student can contact at all times with the teacher to clarify doubts, preferably in person, individually, or in a group. If the doubts require greater personal attention, a tutorial to solve problems will be agreed upon. Contacting the teacher sufficiently in advance by email or using the virtual secretary is necessary.
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Assessment						
	Description	Qualification	Training and Learning Results			
Laboratory practical	Attendance at the laboratory practices is MANDATORY. The correct implementation of the exercises proposed in these practices will be evaluated.	15	A2 A3	B2 B4	C13 C14	D1
Mentored work	The assignment of individual or paired work will be evaluated, assessing both the preparation of the topic, the presentation of a summary document of the subject as well as the presentation of the same. This activity is MANDATORY	15	A2 A3 A4	B5	C13 C14	D1
Seminars	Seminar attendance is MANDATORY. The correct implementation of the exercises proposed in these seminars will be evaluated.	10	A2 A3	B2 B4	C13 C14	D1
Field practice	Attendance at the sea survey is MANDATORY. The correct implementation of the exercises proposed in these practices will be evaluated.	10	A2 A3	B2 B4 B5	C13	D5
Objective questions exam	Questions and exercises to assess understanding, analytical capacity and synthesis of acquired knowledge, mainly in relation to the content of the first thematic blocks of the master classes. It will be done throughout the course.	10	A2 A3 A4	B2 B4	C13 C14	D1 D5
Objective questions exam	Questions and exercises to assess understanding, analytical capacity and synthesis of acquired knowledge, mainly in relation to ALL the content of the theoretical classes. This exam will coincide with the 1st chance official date.	40	A2 A3 A4	B2 B4	C13 C14	D1 D5

Other comments on the Evaluation

Continuous assessment option

It will be **necessary to obtain a minimum of 5 points (out of 10)** in all the Methodologies/Tests to carry out the weighting and pass the subject.

Global assessment option

The application for this evaluation option must be submitted in the time and manner determined by the Center, which will be published prior to the academic start. Given the experimental nature of the practices, seminars and studies excursion, attendance at them is mandatory to be eligible for this evaluation option. **Failure to attend any of these activities, with no justified cause invalidates this possibility, as well as the opportunity for extraordinary evaluation (2nd opportunity).**

Second opportunity assessment (July)

Exams of each of the Items NOT passed in the 1st opportunity evaluation.

Date, time and place of exams will be published in the official web of Marine Sciences Faculty: <http://mar.uvigo.es/index.php/en/alumnado-actual-2/examenes-3>

Others considerations

Students are strongly requested to fulfil a honest and responsible behaviour. It is considered completely unacceptable any alteration or fraud (i.e., copy or plagiarism) contributing to modify the level of knowledge and abilities acquired in exams, evaluations, reports or any kind of teacher's proposed work. Fraudulent behaviour may cause failing the course for a whole academic year. An internal dossier of these activities will be built and, when reoffending, the university rectorate will be asked to open a disciplinary record

Sources of information

Basic Bibliography

- Danovaro, R., **Methods for the Study of Deep-Sea Sediments, Their Functioning and Biodiversity**, CRC Press. 458 pp.
- Hailwood, E.A., Kidd, R., **Marine Geological Surveying and Sampling. Marine geophysical Researches.**, Kluwer academic Publishers. 12:169pp,
- Hüneke, H., Mulder, T., **Deep-Sea Sediments (Developments in Sedimentology)**, Elsevier Science, 750 pp.,
- Jones, E.J.W., **Marine Geophysics**, John Wiley & Sons, LTD. Chichester. 466 pp.,
- Kearey, Ph. Brooks, M., Hill, I., **An Introduction to Geophysical exploration Third edition**, Blacwell Scientific Publications, 262 pp.,
- Lowrie, W., **Fundamentals of Geophysics. Second Edition.**, Cambridge University Press, 354 pp.,
- Mudroch, A. y Azcue, J.M., **Handbook of Techniques for Aquatic Sediments Sampling. Second Edition.**, Lewis Publishers. London. 256 pp.,
- Musset, A.E., Aftab, M., **Looking into the earth. An Introduction to Geological Geophysics.**, Cambridge University Press. 470 pp.,
- NOAA - National Geophysical Data Center, <http://www.ngdc.noaa.gov/mgg/mggd.html>,
- McQuilling, R., Bacon, M., Barclay, W., **An Introduction to seismic interpretation**, Graham & Trotman, 287 pp.,
- Complementary Bibliography**
- Flor, Germán, **Geología Marina**, Librería Servitec,
- Kennet, J., **Marine geology**, Prentice-Hall, inc., 813 pp.,
- Lillie, R.J., **Whole Earth Geophysicist. An introductory textbook for Geologist & Geophysicists.**, Prentice Hall, Inc. 361 pp.,
- Lozano, L., **Introducción a la Geofísica.**, Ed. Paraninfo, Madrid.,
- McQuilling, R., Arduo, D.A., **Exploring the Geology of Shelf Seas.**, Graham & trotman limited. Gulf Publishing Company, 234 pp.,
- Mienert, J., Weaver, P., (Eds), **European margin sediment dynamics. Side scan sonar and seismic images.**, Springer.,
- Rebesco M, Camerlenghi A (eds), **Contourites**, Developments in Sedimentology, 60, Elsevier, pp 688,
- Reynolds, J.M., **An Introduction to Applied and Environmental Geophysics.**, John Wiley, Chichester.,
- Seibold, E. y Berger, W.H., **The Sea Floor. An Introduction to Marine geology. 3rd edition.**, Springer Verlag, 369 pp.,
- Shanmugam, G., **Deep-Water Processes and Facies Models: Implications for Sandstone Petroleum Reservoirs: 5 (Handbook of Petroleum Exploration and Production)**, Elsevier Science, 496 pp.,
- Sheriff, R., **Encyclopedic Dictionary of Exploration Geophysics. Second Edition.**, Society of Exploration Geophysicists, 323 pp,
- Sheriff, R.E., **Geophysical Methods**, Prentice Hall. Englewood Cliffs, New York,
- Telford, W.M.; Geldart, L.P., Sheriff, R.E., **Applied Geophysics, 2nd Edition.**, Cambridge University Press, 770 pp.,
- Trabant, P.K., **Applied High-Resolution Geophysical Methods Offshore Geoengineering Hazards.**, D. reidel Publishing Company. International Human Resources Development Corporation. Boston., 265 p.,
- Udias, A., Mézcua, J., **Fundamentos de Geofísica**, Ed. Alhambra. 419 pp,
- Wille, P. C., **Sound images of the Ocean in Research and Monitoring.**, Springer-Verlag, 471,
- OpenCourseWare, <http://ocw.mit.edu/index.htm>,

Recommendations

Subjects that continue the syllabus

Basin Analysis/V10G061V01406

Applied marine geology/V10G061V01403

Subjects that are recommended to be taken simultaneously

Physical oceanography II/V10G061V01307

Subjects that it is recommended to have taken before

Geology: Geology 1/V10G061V01103

Geology: Geology 2/V10G061V01108

Coastal and marine sedimentary habitats/V10G061V01207

Sedimentology/V10G061V01205

Geological oceanography I/V10G061V01303