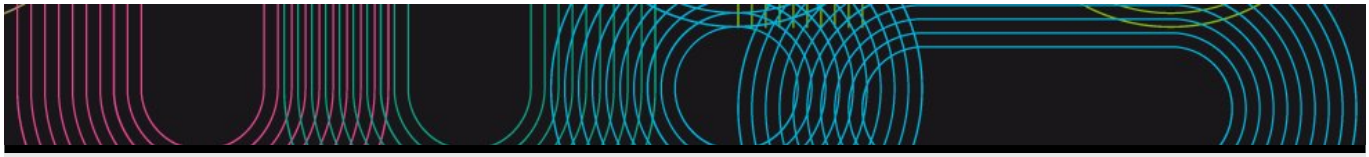

IDENTIFYING DATA				
Chemical Reactions in the Ocean				
Subject	Chemical Reactions in the Ocean			
Code	V10M153V01103			
Study programme	(*)Máster Universitario en Oceanografía			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	5	Mandatory	1st	1st
Teaching language	#EnglishFriendly Spanish			
Department				
Coordinator	Nieto Palmeiro, Óscar			
Lecturers	Álvarez Salgado, Xose Antón Cobelo García, Antonio Gago Duport, Luís Carlos Nieto Cid, María del Mar Nieto Palmeiro, Óscar Padín Álvarez, José Antonio			
E-mail	palmeiro@uvigo.es			
Web	http://masteroceanografia.com/			
General description	In this matter tackle appearances advanced of the chemical oceanography and his relation with the biological processes, physicists and geological. It does emphasis in the thermodynamic and kinetical **appearances of the processes of exchange between compartments, establishing flows between them and standing out the importance in the generation of vertical flows.			

Skills	
Code	
A1	Students who have demonstrated knowledge and understanding that is founded upon and extends and/or enhances that typically associated with the first cycle, and that provides a basis or opportunity for originality in developing and/or applying ideas, often within a research context
A4	Students who can communicate their conclusions, and the knowledge and rationale underpinning these, to specialist and nonspecialist audiences clearly and unambiguously
B2	The students will interpret the behaviour of the global oceanic system and their controlling factors.
B5	The students will be able to develop the sufficient autonomy to participate in research projects and scientific collaborations, especially in interdiscipinary contexts
C1	The students will be able to obtain advanced and relevant knowledge, of skilled and multidisciplinary character, in the field of the oceanography and their application to the marine environment
C4	The students will be able to apply in the practice the obtained knowledge and issue resolutions and judgments in the different oceanography fields
D1	The students will know and will be able to apply the scientific method in the academic and research fields.
D4	The students will be able to understand the need and obligation to perform a continuous training, to a large extent autonomous, for the scientific development, updating the knowledges, skills and attitudes of the professional competences along the life.

Learning outcomes	
Expected results from this subject	Training and Learning Results

Understand and explain from a theoretical and practical point of view the chemical processes that take place in half marine and that are related with the biological processes, physicists and geological that produce in a multicomponent system as it is the ocean and his importance in the generation of vertical profiles.	A1 A4 B2 B5 C1 C4 D1 D4
Comprise the importance of the thermodynamic and kinetical aspects of the processes of exchange of compounds between the atmosphere, the ocean and the sediments, doing a special reference to the methodologies employed to establish flows between environmental compartments.	A1 A4 B2 B5 C1 C4 D1 D4
Understand the behaviour of the C, N, P and Si from a global perspective, basing in the approach of biogeochemical cycles that put of self-evident to importance of the processes of vertical transport in the ocean.	A1 A4 B2 B5 C1 C4 D1 D4
Understand the variables that affect to the biogeochemical cycle of the metals traces in the oceans and purchase the necessary methodology for the study.	A1 A4 B2 B5 C1 C4 D1 D4

Contents	
Topic	
Approximations used in the biogeochecmical models.	Environmental compartments. Main flows between the environmental compartments. Equilibrium and kinetical models.
Models and parametrizations used to characterise the exchange of gases through the interphase waters-atmosphere.	Dissolution of gases in the atmosphere. I exchange atmosphere ocean. Structural appearances of the solubility in gases.
Reactivity of the elements in the superficial waters, transport of the particulate material and segregation in the deep ocean.	Properties of the superficial waters. Introduction to the 1D models with advention + diffusion + reaction through the column of sediments.
Biogeochemical cyles in the ocean.	Utilisation of the models PHREEQC for the modelling of biogeochemical cycles. Training, dissolution and preservation of calcium carbonate and opal.
Vertical transport of organic matter and remineralization.	Dissolved and particulate organic matter in the ocean. Sources of organic matter. Importance of the cycles of the C, O, N and P.
Reactivity and biogeochemical cycles of metals in the ocean	Processes related with the complexation of metals. Chemical speciation under the influence of future changes.

Planning			
	Class hours	Hours outside the classroom	Total hours
Project based learning	15	20	35
Seminars	10	15	25
Practices through ICT	10	12	22
Laboratory practical	5	5	10
Mentored work	7	15	22
Presentation	1	2	3
Seminars	1	2	3
Problem and/or exercise solving	1	4	5
*The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.			

Methodologies	
	Description
Project based learning	It consists in the exhibition of contents by part of the professor, analysis of competitions, explanation and demonstration of capacities, skills and knowledges in the classroom, using like methodology to participatory masterclass and in which the function of the professor is to explain the theoretical foundations of the distinct matters.
Seminars	Sessions of groupal work oriented by the professor, whose purpose is the research of data or information in libraries, databases, internet, etc. The professor indicates the need of extension of knowledges and orients in the research. This methodology carries implicit a load of work no face-to-face significant that it will have to be quantified in the programming of each matter, matter or module.
Practices through ICT	Session of groupal work for the resolution of problems in the classroom of computing, supervised by the professor. Significant construction of the knowledge through the interaction and activity of the student.
Laboratory practical	Activities developed in spaces and with specialized equipments that improve the significant construction of the knowledge through the interaction and activity of the student. It is carried out at th laboratory and the function of the professor is to present the aims, orient the work and realise the follow-up of the student.
Mentored work	Realisation in group of a work on a subject of the matter with participation shared. The professor presents the aims, orients and tutorizes the work, with participation shared with the students.
Presentation	Exhibition in group of the tutored work.
Seminars	Significant construction of the knowledge through the interaction between tutor and student by means of sessions of tutorial activities personalised or in group very reduced, where the professor orients and resolves doubts.

Personalized assistance	
Methodologies	**Description**
Project based learning	Any doubts that arise to the students, can consult it through the forums that are enabled for this on the platform Moovi, being able to be answered by both the faculty and the rest of the students. In addition, they can arrange a personal appointment with the faculty to attend to their questions in their respective office or in the virtual office (campusremotouvigo.gal).
Laboratory practical	Any doubts that arise to the students, can consult it through the forums that are enabled for this on the platform Moovi, being able to be answered by both the faculty and the rest of the students. In addition, they can arrange a personal appointment with the faculty to attend to their questions in their respective office or in the virtual office (campusremotouvigo.gal).
Practices through ICT	Any doubts that arise to the students, can consult it through the forums that are enabled for this on the platform Moovi, being able to be answered by both the faculty and the rest of the students. In addition, they can arrange a personal appointment with the faculty to attend to their questions in their respective office or in the virtual office (campusremotouvigo.gal).
Seminars	It does not have place
Seminars	Any doubts that arise to the students, can consult it through the forums that are enabled for this on the platform Moovi, being able to be answered by both the faculty and the rest of the students. In addition, they can arrange a personal appointment with the faculty to attend to their questions in their respective office or in the virtual office (campusremotouvigo.gal).
Mentored work	Any doubts that arise to the students, can consult it through the forums that are enabled for this on the platform Moovi, being able to be answered by both the faculty and the rest of the students. In addition, they can arrange a personal appointment with the faculty to attend to their questions in their respective office or in the virtual office (campusremotouvigo.gal).
Presentation	Any doubts that arise to the students, can consult it through the forums that are enabled for this on the platform Moovi, being able to be answered by both the faculty and the rest of the students. In addition, they can arrange a personal appointment with the faculty to attend to their questions in their respective office or in the virtual office (campusremotouvigo.gal).
Tests	**Description**
Problem and/or exercise solving	In the review of examinations

Assessment						
	Description	Qualification	Training and Learning Results			
Laboratory practical	The learning attitude will be evaluated during visits to the IIM-CSIC research laboratories.	10	A1 A4	B5	C1 C4	D1 D4
Mentored work	Students will present a working report of the supervised project using ICT technologies.	25	A1 A4	B2 B5	C1 C4	D1 D4

Presentation	The students will exhibit the supervised work done using ICT technologies.	10	A4		C4	D1
Problem and/or exercise solving	The student will have to answer succinctly a series of questionnaires that will be carried out throughout the course. The ability to understand and relate the concepts learned during the course will be evaluated.	55	A1 A4	B2 B5	C1 C4	D1 D4

Other comments on the Evaluation

To pass the subject, each and every test conducted throughout the subject must be passed with a minimum rating of 5 points.

In the event that in any test the minimum grade is not reached, the questionnaire will be repeated or a new paper will be delivered with the relevant corrections in the July call.

The official dates of evaluation can be found in this link:

http://masteroceanografia.com/horarios/

Sources of information

Basic Bibliography

J.P. Riley y R. Chester, **Introducción a la química marina**, 1ª edición en castellano y ediciones en inglés, A.G.T., 1989

Susan M. Libes, **Introduction to marine biogeochemistry**, 2ª edición, Elsevier-Academic Press, cop., 2009

Robert A. Berner, **Early diagenesis : a theoretical approach**, Princeton University Press, cop., 1980

Patrick L. Brezonik, **Chemical kinetics and process dynamics in aquatic systems**, Lewis, cop., 1994

Antonio C. Lasaga, **Kinetic theory in the earth sciences**, Princeton University Press, cop., 1998

R. Chester y T.D. Jickells, **Marine Geochemistry**, 3ª edición, Willey Blackwell cop., 2012

Complementary Bibliography

Frank J. Millero, **Chemical oceanography**, 4ª edición, CRC Press, 2013

J. P. Riley, R. Chester (eds.), **Chemical oceanography**, Academic Press, 1989

C.A.J. Appelo, D. Postma, **Geochemistry, groundwater and pollution**, 2ª edición, CRC Press, 2005

Recommendations

Other comments

The student who wishes, can attend personalized tutorials to solve doubts. To optimize the time, it is necessary for the student to contact the teacher well in advance.

Students are required to teach this subject, responsible and honest conduct. Any form of fraud (e.g. copying and/or plagiarism) aimed at distorting the level of knowledge or skill achieved by students in any type of test, report or work designed for this purpose is inadmissible. Fraudulent conduct may be suspended during a full course. An internal register of these proceedings shall be kept in order to request the Rectorate to open disciplinary proceedings in the event of a repeat offence.

Contingency plan

Description

=== EXCEPTIONAL PLANNED MEASURES ===
In the face of the uncertain and unpredictable evolution of the health alert triggered by COVID-19, the University establishes an extraordinary planning that will be activated when the administrations and the institution itself determine it based on safety criteria, health and responsibility, and ensuring teaching in a non face-to-face or non face-to-face setting. These already planned measures guarantee, when it is mandatory, the development of teaching in a more agile and effective way to be known in advance (or with a long advance) by pupils and teachers through the standardised and institutionalised tool of the DOCNET teaching guides.

=== ADAPTATION OF METHODOLOGIES ===

Not applicable

* Teaching methodologies to be modified

- Laboratory practice
Laboratory practices that cannot be done in face-to-face mode will be done in the form of a simulation through the virtual classroom (Remote Campus) that the University of Vigo has the disposition of teachers and students. After the virtual classroom session, they will have to present the corresponding report according to the criteria and indications of the trainee teachers.

- Introductory activities:
- Master Lesson: The
The sessions of these activities that cannot be done in person, will be carried out through the virtual classroom that the University of Vigo has the disposition of teachers and students.

* Off-site student care (tutoring)

Students can consult their questions by appointment in the teacher□s virtual office: Room 1752, access code coDC4elw

On the TEMA platform is enabled the Forums section, where a forum will be open for each classroom topic taught, as well as several forums for laboratory practices, problem classes and seminars. In this way, students will be able to ask questions that can be answered by both teachers and/or classmates/classmates.

* Modifications (if applicable) of the contents to be imparted

* Additional bibliography to facilitate self-learning

Websites and related videos will be used to complement the training of students, which will be made available to students on the TEMA platform.

* Other amendments

=== ADAPTATION OF THE EVALUATION ===
* Tests already carried out
Test *XX: [Previous Weight 00%] [Proposed Weight 00%]

Not applicable

* Evidence pending and ongoing
Test *XX: [Previous Weight 00%] [Proposed Weight 00%]

- Practice report
- Work
- Problem solving and exercises

Does not change the weighting in the final note

* Tests to be modified
[Previous test] => [New test]

Not applicable

* New evidence

* Additional information