Course guide
250551 - QUIMMEDAMB - Environmental Chemistry

Last modified: 21/06/2024

Unit in charge: Barcelona School of Civil Engineering
Teaching unit: 751 - DECA - Department of Civil and Environmental Engineering.

Degree: BACHELOR'S DEGREE IN MARINE SCIENCE AND TECHNOLOGY (Syllabus 2018). (Compulsory subject).

Academic year: 2024 **ECTS Credits:** 6.0 **Languages:** Spanish

LECTURER

Coordinating lecturer: LUCIA FERNANDEZ CARRASCO

Others: LUCIA FERNÁNDEZ CARRASCO

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Specific:
13388. To know and apply the lexicon and concepts of the Marine Sciences and Technologies and other related fields.
13390. Establish a good practice in the integration of common numerical, laboratory and field techniques in the analysis of any problem related to the marine environment.

Generical:
13380. Develop a professional activity in the field of Marine Sciences and Technologies.
13381. Address in a comprehensive manner the analysis and preservation of the marine environment with sustainability criteria.

TEACHING METHODOLOGY

The subject consists of 4.0 hours per week of classroom lessons in the classroom (large group). Of these, and as an average throughout the course, they dedicate 2 hour to the resolution of problems with a greater interaction with the student. Practical exercises are carried out in order to consolidate the general and specific learning objectives. Support material is used in the format of a detailed teaching plan through the ATENEA virtual campus: contents, programming of assessment activities and directed learning and bibliography.

Although most of the sessions will be given in the language indicated, sessions supported by other occasional guest experts may be held in other languages.

To do the laboratory practices you need the following personal protective equipment (PPE):
* Chemical Kit (white lab coat + protection gloves + safety glasses)

LEARNING OBJECTIVES OF THE SUBJECT

The objective of this subject is to provide a solid base of the principles of Chemistry to address a wide variety of issues relevant to the study of the natural environment.
Topics are treated with an important problem-solving component, and include: the atom and the structure of matter, concepts of thermodynamics and equilibrium, oxidation-reduction reactions and chemical kinetics.

1.- Understand the composition and structure of matter. Atomic structure Periodic table. Chemical bonding of sea compounds.
2.- Chemical reactions in the marine environment. Chemical balance. Principle of Le Chatelier. Concentration. Constant balance. Chemical kinetics. Acid-base equilibria. PH concept. Alkalinity. The carbonate-carbonate system. Oxidation-reduction reactions. Redox potential.
3.-Chemical thermodynamics. Status functions. Internal energy. Enthalpy and Gibbs free energy. Law of mass action. Entropy Balance of phases. Clausius-Clapeyron equation.

The objective of this subject is to provide a solid basis for the principles of Chemistry to be able to address the various problems relevant to the study of the natural environment. The topics covered, with an important component of problem solving, include: the atom and structure of matter, concepts of thermodynamics and equilibrium, oxidation-reduction reactions and chemical kinetics. This is where the bases are set in generalist but essential aspects of the 5 major areas of the Marine Sciences and Technologies (Chemistry, Biology, Physics, Geology and Mathematics), as a continuation of the training acquired in the baccalaureate , but with a clear environmental focus and that the bases for the training in Marine Sciences and Technologies will be established.

STUDY LOAD

Type	Hours	Percentage
Hours small group	15,0	10.00
Self study	90,0	60.00
Hours medium group	15,0	10.00
Hours large group	30,0	20.00

Total learning time: 150 h

CONTENTS

Topic 1

Description:
This is proof that what is the description of the subject is
Wave-particle duality of light. Wave-particle duality of matter. Schrödinger's Equation
Energy levels and wave functions of the hydrogen atom. Multielectronic atoms
Exercises

Full-or-part-time: 16h 48m
Theory classes: 5h
Practical classes: 2h
Self study : 9h 48m

Chemical bond and structure

Description:
The Periodic Table and periodic properties of the elements
Ionic and covalent bond. Intermolecular forces
Introduction to the Lewis structures. The octet rule
Exercises
Geometry of molecules: VSEPR theory
Theory of molecular orbitals. Orbitasl hybridation
Exercises

Full-or-part-time: 31h 12m
Theory classes: 10h
Practical classes: 3h
Self study : 18h 12m

Examination

Full-or-part-time: 33h 36m
Laboratory classes: 14h
Self study : 19h 36m

Thermodynamics and Chemical Equilibrium

Description:
Reaction enthalpy Gibbs free energy. Entropy
Exercises
Chemical equilibrium. Le Chatelier's principle
Solubility and Acid-base equilibrium
Exercises
Saline solutions and buffers
Acid-base titration
Exercises

Full-or-part-time: 36h
Theory classes: 10h
Practical classes: 5h
Self study : 21h

Processes of oxidation-reduction and chemical kinetics

Description:
Oxidation-reduction. Nernst equation
Electrochemical cells and redox in biological processes
Exercises
Introduction to chemical kinetics. Arrhenius Equation. Catalysts
Nuclear chemistry and chemical kinetics
Exercises

Full-or-part-time: 26h 24m
Theory classes: 7h
Practical classes: 4h
Self study : 15h 24m

GRADING SYSTEM

Ordinary Evaluation (EO) The qualification of the continuous evaluation is obtained from the weighted arithmetic mean of the exercises/problems (Pr) delivered during the course, of the directed activities such as assignments or reports (Tr) and of the partial exams (Ex , which will have the same value). Two partial exams will be carried out and they will count 70% of the grade. Problems will count 15% and directed activities will count 15%. The final mark will be: EO=0.7*(average of Ex1 and Ex2)+0.15*(average of Pr) +0.15*(average of Tr). To pass, the EO grade must be greater than or equal to 5.0. Re-evaluation (RE) The qualification and admission criteria for the RE are as follows: students who failed the ordinary evaluation and who have regularly taken the evaluation tests for the failed subject will have the option of taking a RE test. in the period established in the academic calendar. Students who have already passed the EO cannot be submitted to the RE of a subject, nor are students classified as not submitted or who have not submitted all the exercises/problems (Pr) and/or the papers and reports (Tr) of the workshops/laboratories. The RE test will consist of a single exam that covers all the content of the course. The maximum grade for the reassessment will be five (5.0) and the final grade for the course will be the maximum grade between the continuous assessment and the reassessment exam, that is, MAX(EO/RE). The non-attendance of a student summoned to the re-evaluation test, held in the set period, may not lead to another test at a later date. Extraordinary evaluations will be carried out for those students who, due to accredited force majeure, have not been able to take any of the continuous evaluation tests. These tests must be authorized by the corresponding head of studies, at the request of the professor responsible for the subject, and will be carried out within the corresponding school period.

EXAMINATION RULES.

If any of the laboratory or continuous assessment activities are not carried out in the scheduled period, it will be considered a zero score. The tests will be carried out individually, with multiple choice questions that can be theoretical or problem type questions. The exams can include short questions to be developed by the students and exercises to be solved.

BIBLIOGRAPHY

Basic:

- Petrucci, R.H. Química general: principios y aplicaciones modernas [on line]. 11a ed. Madrid: Pearson Prentice Hall, 2017 [Consultation: 09/12/2020]. Available on: http://www.ingebook.com/ib/NPcd/IB_BooksVis?cod_primaria=1000187&codigo_libro=6751. ISBN 9788490355336.
- Baird, C.; Cann, M. Química ambiental. 2a ed. Barcelona: Reverté, 2014. ISBN 9788429179156.
- Domènech, X.. Fundamentos de química ambiental. Madrid: Síntesis, 2014. ISBN 9788490770573.
- Peterson, W.R. Fundamentos de nomenclatura química [on line]. Barcelona: Reverté, 2012 [Consultation: 26/02/2021]. Available on: https://ebookcentral.proquest.com/lib/upcatalunya-ebooks/detail.action?docID=3430484. ISBN 9788429175745.

RESOURCES

Other resources:

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