Course guide
250551 - QUIMMEDAMB - Environmental Chemistry

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: 2022  ECTS Credits: 6.0  Languages: Spanish

LECTURER
Coordinating lecturer: LUCIA FERNANDEZ CARRASCO
Others: LUCIA FERNANDEZ CARRASCO, DAVID TORRENS MARTÍN

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 1 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.

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.


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

<table>
<thead>
<tr>
<th>Type</th>
<th>Hours</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Guided activities</td>
<td>6,0</td>
<td>4.00</td>
</tr>
<tr>
<td>Hours large group</td>
<td>30,0</td>
<td>20.00</td>
</tr>
<tr>
<td>Hours small group</td>
<td>15,0</td>
<td>10.00</td>
</tr>
<tr>
<td>Hours medium group</td>
<td>15,0</td>
<td>10.00</td>
</tr>
<tr>
<td>Self study</td>
<td>84,0</td>
<td>56.00</td>
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</tbody>
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**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:** 19h 12m
- Theory classes: 6h
- Practical classes: 2h
- Self study: 11h 12m

### 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. Orbital hybridation**

**Full-or-part-time:** 28h 47m
- Theory classes: 9h
- Practical classes: 3h
- Self study: 16h 47m
### 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. Orbital hybridation
Exercises

**Full-or-part-time:** 28h 47m
- Theory classes: 9h
- Practical classes: 3h
- Self study: 16h 47m

### 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
Thermodynamics and Chemical Equilibrium

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

The qualification of the subject is obtained from the qualifications of continuous evaluation of partial or final tests, exercises and directed activities. The teacher will provide the assessment criteria during the first week of the course.
EXAMINATION RULES.

Failure to perform a laboratory or continuous assessment activity in the scheduled period will result in a mark of zero in that activity.

BIBLIOGRAPHY

Basic: