Course guides
2500204 - QUIMICA1 - Chemistry

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

Degree: (ANG) GRAU EN ENGINYERIA AMBIENTAL (Syllabus 2020). (Compulsory subject).

Academic year: 2020  ECTS Credits: 6.0  Languages: Catalan, Spanish

LECTURER
Coordinating lecturer: IGNACIO SEGURA PEREZ
Others: CARLOS MANUEL HERRERA MESÉN, PATRICIA ROVIRA BASTUS, IGNACIO SEGURA PEREZ

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Specific:
14445. Recognize the biological bases and foundations of the plant and animal field in engineering: notions of genetics, biochemistry and metabolism, physiology, organisms and environment, population dynamics, flows of matter and energy and changes in ecosystems, biodiversity, principles of the kinetics of microbial growth and reactor theory.
14446. Solve mathematical problems that may arise in engineering by applying knowledge about: linear algebra, geometry, differential geometry, differential and integral calculus, optimization, ordinary differential equations.
14447. Obtain basic knowledge about the use and programming of computers, operating systems, databases and basic numerical calculation and applied to engineering.
14448. Manage the basic concepts about the general laws of mechanics and thermodynamics, concept of field and heat transfer, and apply them to solve engineering problems.
14449. Apply the basic principles of general chemistry, organic and inorganic chemistry and their applications in engineering.
14450. Describe the global functioning of the planet: atmosphere, hydrosphere, lithosphere, biosphere, anthroposphere, biogeochemical cycles (C, N, P, S), soil morphology and apply it to problems related to geology, geotechnics, edaphology and climatology.

Generical:
14440. Identify, formulate and solve problems related to environmental engineering.
14441. Apply the functions of consulting, analysis, design, calculation, project, construction, maintenance, conservation and exploitation of any action in the territory in the field of environmental engineering.

TEACHING METHODOLOGY

The course consists of 2 hours per week of classroom activity (large size group) and 1 hour weekly with half the students (medium size group).

The 2 hours in the large size groups are devoted to theoretical lectures, in which the teacher presents the basic concepts and topics of the subject, shows examples and solves exercises.

The 1 hour in the medium size groups is devoted to solving practical problems with greater interaction with the students. The objective of these practical exercises is to consolidate the general and specific learning objectives.

The rest of weekly hours devoted to laboratory practice.

Support material in the form of a detailed teaching plan is provided using the virtual campus ATENEA: content, program of learning and assessment activities conducted and literature.
LEARNING OBJECTIVES OF THE SUBJECT


1. Know the atom and the structure of matter.
2. Understand the bases of thermodynamics and chemical equilibrium.


STUDY LOAD

<table>
<thead>
<tr>
<th>Type</th>
<th>Hours</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hours small group</td>
<td>15,0</td>
<td>10.00</td>
</tr>
<tr>
<td>Hours large group</td>
<td>30,0</td>
<td>20.00</td>
</tr>
<tr>
<td>Guided activities</td>
<td>6,0</td>
<td>4.00</td>
</tr>
<tr>
<td>Self study</td>
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<td>56.00</td>
</tr>
<tr>
<td>Hours medium group</td>
<td>15,0</td>
<td>10.00</td>
</tr>
</tbody>
</table>

Total learning time: 150 h

CONTENTS

The atom

Description:
Introduction to the Chemistry course. The Importance of Chemistry in Environmental Engineering Studies
Light-particle duality of light. Wave-particle duality of matter. Schrödinger 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 Lewis structures. Byte rule
Exercises
Geometry of molecules: the VSEPR theory
Molecular orbital theory. Orbital hybridization
Exercises

Full-or-part-time: 28h 47m
Theory classes: 11h
Practical classes: 1h
Self study: 16h 47m

Laboratories in the classroom

Description:
Laboratory session in the classroom to verify the practical application of the knowledge of the topics

Full-or-part-time: 12h
Laboratory classes: 5h
Self study: 7h

Evaluation

Description:
Laboratory session in the classroom to verify the practical application of the knowledge of the topics

Full-or-part-time: 21h 36m
Laboratory classes: 9h
Self study: 12h 36m

Thermodynamics and Chemical Equilibrium

Description:
Enthalpy of reaction. Gibbs free energy. Entropy
Exercises
Chemical equilibrium. Principles of Le Chatelier
Solvability and acid-base balance
Exercises
Saline and regulatory solutions
Acid-base titrations
Exercises

Full-or-part-time: 36h
Theory classes: 10h
Practical classes: 5h
Self study: 21h
Oxidation-reduction processes and chemical kinetics

Description:
Oxidation-reduction. Nernst equation
Electrochemical and redox cells in environmental 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 mark of the course is obtained from the ratings of continuous assessment and their corresponding laboratories and/or classroom computers.

Continuous assessment consist in several activities, both individually and in group, of additive and training characteristics, carried out during the year (both in and out of the classroom).

The teachings of the laboratory grade is the average in such activities.

The evaluation tests consist of a part with questions about concepts associated with the learning objectives of the course with regard to knowledge or understanding, and a part with a set of application exercises.

EXAMINATION RULES.

If any of the evaluation activities is not carried out in the scheduled period, the grade for that activity will be compatible as zero. It is essential requirements to pass the subject to carry out the activities proposed in the classroom.

BIBLIOGRAPHY

Basic: