

28802 - Chemistry

Información del Plan Docente

Academic Year	2016/17
Academic center	175 - Escuela Universitaria Politécnica de La Almunia
Degree	424 - Bachelor's Degree in Mechatronic Engineering
ECTS	6.0
Course	1
Period	First semester
Subject Type	Basic Education
Module	---

1.Basic info

1.1.Recommendations to take this course

1.2.Activities and key dates for the course

2.Initiation

2.1.Learning outcomes that define the subject

2.2.Introduction

3.Context and competences

3.1.Goals

3.2.Context and meaning of the subject in the degree

3.3.Competences

3.4.Importance of learning outcomes

4.Evaluation

5.Activities and resources

5.1.General methodological presentation

The learning process designed for this subject is based on the following :

Strong interaction between the teacher/student. This interaction is brought into being through a division of work and responsibilities between the students and the teacher. Nevertheless, it must be taken into account that, to a certain degree, students can set their learning pace based on their own needs and availability, following the guidelines set by the teacher.

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The current subject is conceived as a stand-alone combination of contents, yet organized into three fundamental and complementary forms, which are: the theoretical concepts of each teaching unit, the solving of problems or resolution of questions and laboratory work, at the same time supported by other activities .

The organization of teaching will be carried out using the following steps:

— **Theory Classes** : Theoretical activities carried out mainly through exposition by the teacher, where the theoretical supports of the subject are displayed, highlighting the fundamental, structuring them in topics and or sections, interrelating them.

— **Practical Classes** : The teacher resolves practical problems or cases for demonstrative purposes. This type of teaching complements the theory shown in the lectures with practical aspects.

— **Laboratory Workshop** : The lecture group is divided up into various groups, according to the number of registered students, but never with more than 16 students, in order to make up smaller sized groups.

— **Individual Tutorials**: **Those carried out giving individual, personalized attention with a teacher from the department. Said tutorials may be in person or online.**

5.2.Learning activities

The programme offered to the student to help them achieve their target results is made up of the following activities

Involves the active participation of the student, in a way that the results achieved in the learning process are developed, not taking away from those already set out, the activities are the following:

— **Face-to-face generic activities** :

● **Theory Classes** : The theoretical concepts of the subject are explained and illustrative examples are developed as support to the theory when necessary.

● **Practical Classes** : Problems and practical cases are carried out, complementary to the theoretical concepts studied.

● **Laboratory Workshop** : This work is tutored by a teacher, in groups of no more than 20 students.

— **Generic non-class activities** :

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• Study and understanding of the theory taught in the lectures.

• Understanding and assimilation of the problems and practical cases solved in the practical classes.

• Preparation of seminars, solutions to proposed problems, etc.

• Preparation of laboratory workshops, preparation of summaries and reports.

• Preparation of the written tests for continuous assessment and final exams.

The subject has 6 ECTS credits, which represents 150 hours of student work in the subject during the trimester, in other words, 10 hours per week for 15 weeks of class.

A summary of a weekly timetable guide can be seen in the following table. These figures are obtained from the subject file in the Accreditation Report of the degree, taking into account the level of experimentation considered for the said subject is moderate.

Activity	Weekly school hours
Lectures	2
Laboratory Workshop	2
Other Activities	6

5.3.Program THEORETICAL CONTENTS

Module	Contents
1. THE ATOM AND THE PERIODIC SYSTEM	Topic 1.- The atom. Elemental particles. Atomic models. The

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	<p>Bohr atom. The quantum mechanical model. Atomic orbitals; quantum numbers. Principles for the electronic construction of atoms.</p> <p>Topic 2.- General overview of the periodic table</p> <p>Description of the current periodic table: groups and periods. Study of the electron shell and the periodic system. Periodic properties.</p>
<p>2. THE CHEMICAL BOND</p>	<p>Topic 3 .- The ionic bond</p> <p>General characteristics of the ionic bond. Network energy. General properties of ionic compounds.</p> <p>Topic 4 .- The covalent bond</p> <p>Simplified model: the Lewis theory. Bond polarity and geometry. Valence bond theory. Orbital hybridization. Molecular orbital theory.</p> <p>Topic 5 .- The metallic bond</p> <p>General characteristics of metals. Theories of the metallic bond: the electron sea theory and valence bond theory. Alloys: classes.</p>
<p>3. BONDS BETWEEN MOLECULES</p>	<p>Topic 6 .- Intermolecular bonds</p> <p>Van der Waal forces. Hydrogen bonds.</p>

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<p>4. AGGREGATION STATES</p>	<p>Topic 7 .- The gas state</p> <p>General characteristics of gases. Laws that govern the gas state. Equations of state. Kinetic theory. Gas mixtures: Dalton's Law. Gas diffusion and effusion: Graham's Law. Real gases: The Van der Waal equation.</p> <p>Topic 8 .- The liquid state</p> <p>General characteristics of liquids. Vapour pressure. The effect of temperature on vapour pressure. Critical phenomena. Condensation of vapours and gases. Solidification.</p> <p>Topic 9 .- The solid state</p> <p>Characteristics of solids. Classes of crystal network. Classes of solids based on bonding type. The phase rule and the triple point.</p>
<p>5. INTRODUCTION TO THE STUDY OF SOLUTIONS</p>	<p>Topic 10 .- Introduction to the study of solutions</p> <p>Disperse systems. Types of solutions. Means of expressing concentration. Solid-in-liquid solutions. Liquid-in-liquid solutions. Gas-in-liquid solutions. Colligative properties of solutions. Colloidal solutions.</p>
<p>6. INTRODUCTION TO THE STUDY OF REACTIONS</p>	<p>Topic 11 .- Chemical equilibrium</p> <p>The concept of reaction rate. Reversible</p>

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	<p>and irreversible reactions. Chemical equilibrium: the equilibrium constant. Le Chatelier's principle. Stable, unstable and metastable systems.</p> <p>Topic 12.- Neutralisation reactions</p> <p>The acid-base concept. Aqueous solutions: pH of aqueous solutions. Acid-base strengths. Equilibrium constants. Salt hydrolysis.</p>
<p>7. INTRODUCTION TO THE CHEMICAL ANALYSIS AND THE ORGANIC CHEMISTRY</p>	<p>Topic 13.- Introduction to Analytical Chemistry in Materials</p> <p>Gravimetric Methods. Volumetric Methods. Spectroscopic Methods and Others</p> <p>Topic 14.- Organic Chemistry</p> <p>Organic Compounds and Formulation. Isomerism. Types of Chemical Bonds. Organic Reactions.</p>

PRACTICAL CONTENTS

Each student will undertake a total of six practicals during the academic year during the period assigned for them. In order to pass the subject, students must attend these practicals and submit a report once they have been completed.

The content of the practical course is as follows:

<p>Practical 1</p>	<p>Standards in Chemical Laboratory</p>
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	<i>Techniques, Equipment and Safety</i>
Practical 2	Solution Preparation <i>Na₂CO₃ 0,1 M from Na₂CO₃ solid; CaCl₂ 0,1 M from CaCl₂ 2 M</i>
Practical 3	Filtration <i>Gravity Filtration and Vacuum Filtration</i>
Practical 4	Volumetric Analysis <i>Water hardness; carbonates and bicarbonates in water.</i>
Practical 5	Distillation

5.4.Planning and scheduling

SECTION	Topic	Nº hours
0 y 1	Presentation. Atom (<i>Topic 1</i>) and the Periodic System (<i>Topic 2</i>)	10
2 y 3	The Chemical Bond (<i>Topics 3, 4 y5</i>) and Intermolecular Bonds(<i>Topic 6</i>)	12
4	Aggregation Sates (<i>Topics 7, 8 y 9</i>)	6

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5	Introduction to the study of solutions (<i>Topic 10</i>)	8
6	Introduction to the study of reactions (<i>Topics 11 y 12</i>)	8
7	Intro to Analysis Chemistry and Organic Chemistry (<i>Topics 13 y 14</i>)	4
	Practical Course	5
	Exams	7
TOTAL		60

The dates of the final exams will be those that are officially published at <http://www.eupla.es/secretaria/academica/examen.html>.

The written assessment tests will be related to the following topics:

- **Test 1** : Topics 1,2.
- **Test 2** : Topics 3,4,5,6.
- **Test 3** : Topics 7,8,9,10.
- **Test 4** : Topics 11,12.

5.5. Bibliography and recommended resources

References and resources

Basic material prepared by the lecturer:

GONZÁLEZ PAÚLES, J. y BURBANO GARCÍA, G. Apuntes de Química para el Grado en Ingeniería Civil. *Ed. Eupla. 2011.*

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GONZÁLEZ PAÚLES, J. Química General. Apuntes del curso práctico. Ed. Eupla.2010. ISBN 978-84-692-8044-7

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BIBLIOGRAPHY

- Gonzalez Paúles, J . Burbano García, G.. Apuntes de Química para el grado de ingeniería civil/Javier Gonzalez Paúles y Gloria Burbano García.. - 1ª Edición Eupla:La Almunia de doña godina(Zaragoza), 2011
- González Paúles, J.. Química General. Apuntes del curso práctico/ Javier González Paúles. - 1ª edición Eupla:La Almunia de doña godina(Zaragoza), 2010
- Química : un proyecto de la American Chemical Society / [versión española por Roberto Martínez-Alvárez, Mª Josefa Rodríguez Yunta, Luis Sánchez Martín] Barcelona [etc.] : Reverté, D.L. 2005
- Química / Ronald J. Gillespie ... [et al.] ; versión española por Aurelio Beltrán Barcelona [etc.] : Reverté, D.L. 1990
- Negro, José Luis. Iniciación al lenguaje químico inorgánico / José Luis Negro. Madrid: Alhambra, 1979
- Nyman, C.J.. Problemas de química general y análisis cualitativo / C.J. Nyman y G.B. King ; traducción de A. López-Lago . - [1a ed. española] Madrid : AC, D.L.1978
- Peterson, W.R. Formulación y nomenclatura química inorgánica/ W.R. Peterson. - 14 edición Barcelona: Edunsa, 1987
- Sienko, Michell J.. Problemas de química / M.J. Sienko Barcelona [etc.] : Reverté, D.L.1987
- Mahan, Bruce H.. Química : curso universitario / Bruce M. [sic] Mahan, Rollie J. Myers ; versión en español de María Isabel Pouchan...[et al.] . - 4a ed. Wilmington, Delaware [etc] : Addison-Wesley Iberoamericana, cop. 1990