

## SUBJECT TEACHING GUIDE

G1040 - Chemistry

Degree in Electrical Engineering

Academic year 2022-2023

1. IDENTIFYING DATA					
Degree	Degree in Electrical Engineering			Type and Year	Core. Year 2
Faculty	School of Industrial Engineering and Telecommunications				
Discipline	Subject Area: Chemistry Basic Training Module				
Course unit title and code	G1040 - Chemistry				
Number of ECTS credits allocated	6	Term	Semester based (1)		
Web					
Language of instruction	Spanish	English Friendly	No	Mode of delivery	Face-to-face

Department	DPTO. DE QUIMICA E INGENIERIA DE PROCESOS Y RECURSOS.				
Name of lecturer	LORENA GONZALEZ LEGARRETA				
E-mail	lorena.glezlegarreta@unican.es				
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Other lecturers	GEMA RUIZ GUTIERREZ				

3.1 LEARNING OUTCOMES
- Student will gain an understanding of naming organic and inorganic simple compounds
- Students will gain an understanding of the matter composition, chemical bond, periodic properties of elements of which matter is made up and how elements interact to form the three states of matter
- Students will know aspects of the structure, properties and reactivity of organic and inorganic compounds, especially designed for industrial use
- Students will gain an understanding of setting up problems and questions on the subject
- Students should be able to analyse and explain electrochemistry processes
- Students should be able to recognize and appreciate the impact of the scientific principles of chemistry and electrochemistry in their future professional performance

#### 4. OBJECTIVES

This subject's goal is to provide students with basic knowledge on chemistry to develop chemistry related skills in relation with their future professional performance as engineers

#### 6. COURSE ORGANIZATION

##### CONTENTS

1	<p><b>MODULE 1. BASIC PRINCIPLES OF CHEMISTRY AND THEIR APPLICATION TO ENGINEERING SYSTEMS.</b></p> <p>Lesson 1. <b>ATOMS, ELEMENTS AND COMPOUNDS.</b> Origins of modern chemistry. Taxonomy of chemical species. Introduction to the periodic table. Periodic relationships among the elements. Reactions in aqueous solutions.</p> <p>Lesson 2. <b>INTRODUCTION TO BONDING.</b> Ionic bonding, lattice energy. Properties of ionic crystal. Covalent bond, polar bonds and polar molecules. Intermolecular forces. Properties of covalent molecules. Properties of metals, semiconductors, and insulators.</p> <p>Lesson 3. <b>THERMOCHEMISTRY.</b> Energy changes in chemical reactions. Introduction to thermodynamics. Enthalpy in chemical reaction. Calorimetry. Standard enthalpy of formation and reaction. Heat of solution and dilution.</p> <p><b>PRACTICAL CLASSES</b> <b>LABORATORY SESSIONS 1, 2 AND 3</b></p>
2	<p><b>MODULE 2. CHEMICAL EQUILIBRIUM AND ELECTROCHEMISTRY.</b></p> <p>Lesson 4. <b>CHEMICAL EQUILIBRIUM.</b> Chemical equilibrium, equilibrium constant, heterogeneous equilibria, multi-stage equilibria, degree of dissociation, factors that modify the chemical equilibrium.</p> <p>Lesson 5. <b>ACID-BASE EQUILIBRIUM.</b> Properties of acids and bases, definitions of acids and bases, relative strengths of acids and bases, self-ionization of water, pH scale, ionization constant of acid and base, ratio between ionization constants acid-base conjugate pairs, diprotic and polyprotic acids, acid-base properties of salts, buffer solutions.</p> <p>Lesson 6. <b>OXIDATION-REDUCTION REACTIONS.</b> Redox reactions, oxidation number, balancing redox reactions.</p> <p>Lesson 7. <b>ELECTROCHEMICAL CELL.</b> Electrochemical cell, standard electrode potential, energy of electrochemical cell, effect of concentration on cell emf, Nernst equation, concentration cell.</p> <p>Lesson 8. <b>ELECTROLYTIC CELL.</b> Electrolysis, quantitative aspects of electrolysis.</p> <p><b>PRACTICAL CLASSES</b> <b>LABORATORY SESSIONS 4 AND 5</b></p>

### 7. ASSESSMENT METHODS AND CRITERIA

Description	Type	Final Eval.	Reassessn	%
Exam part 1	Written exam	No	Yes	35,00
Exam part 2	Written exam	Yes	Yes	35,00
Laboratory classes	Laboratory evaluation	No	Yes	15,00
Personal work and practical classes (problem solving)	Work	No	No	15,00
TOTAL				100,00
Observations				
Continuous assessment requires to perform exams 1 and 2 as well as laboratory practical work, taking also into account personal work and practical classes (problem solving).				
Observations for part-time students				
For part-time students, single assessment. The students will be able to pass the subject by presenting themselves to the evaluation exams 1 and 2, and/or the extraordinary exam.				

### 8. BIBLIOGRAPHY AND TEACHING MATERIALS

#### BASIC

American Chemical Society, "Química" un proyecto de la ACS. Ed. Reverté, 2007.

R. Chang, "Química". Ed. Mc Graw Hill, (9ª Ed.) 2007.

R.H. Petrucci, W.S. Harwood, F.G. Herring. "Química General". Ed. Mc Graw Hill, 2007.

J. Vale, C. Fernández, M. Piñero, M. Alcalde, R. Villegas, L. Vilches, B. Navarrete, Á García. "Problemas resueltos de Química para Ingenieros." Ed. Thomson, 2004.