

Course Unit: **935017 - Industrial technical facilities**

Year 2 Semester 3 ISCED Code: 531 ECTS: 6

Type of Course Unit: Compulsory Delivery Mode: Face-to-face Language of Instruction: Portuguese

COURSE COORDINATOR: Nuno Bartolomeu Mendes Godinho de Alvarenga

HOURS OF WORK

TOTAL HOURS	Contact Hours								Hours in autonomous work
	Theory	Theory and practice	Practical and laboratory work	Field work	Seminar	Internship	Tutorial guidance	Other	
150	30		45						75

Prerequisites (if applicable): Not applicable

LEARNING OUTCOMES (knowledge, skills and competence)

- Recognize the structure of the atom.
- Identify and establish electronic energies and electronic configurations of the atoms.
- Recognize and interpret the periodic variation of the properties of atoms and the periodic table.
- Identify the various types of chemical bonds possible, relating them to the properties of matter.
- Interpret and use information from the chemical equation as the written translation of the chemical reaction.
- Recognize, interpret and utilize the various concentration units used in chemical analysis.
- Recognize and analyze different types of reactions: precipitation, acid-base and redox.
- Interpret the concept of chemical equilibrium, knowing its application to different chemical reactions.
- Recognize and analyze acid-base reactions, including its use in volumetric analysis.
- Recognize and analyze precipitation reactions.
- Identify and balance the oxidation-reduction reactions.
- Recognize some fundamental concepts of thermodynamics.

CONTENTS

Structure of the Atom: atomic theories. Atomic number and mass spectroscopy. Energies and electronic configurations.

Chemical periodicity: Periodic Table and periodic variation of the properties of atoms.

Chemical Bonds: Ionic, Covalent, and Metallic. Intermolecular forces.

Chemical reactions: Chemical equations. Writing and balance of chemical equations. Stoichiometric calculations. Limiting reagents. Yield of a reaction.

Solutions: electrolytes and non-electrolytes. The hydration. Concentration of solutions. Dilutions.

Chemical Equilibrium: Concept. Principle of Le Châtelier. Equilibrium constant. Heterogeneous equilibrium.

Acid-base reactions and equilibrium.

Precipitation reactions and Equilibrium of Solubility.

Oxidation-Reduction Reactions and Electrochemistry.

DEMONSTRATION OF THE CONTENTS COHERENCE WITH THE COURSE UNIT'S LEARNING OUTCOMES

The syllabus help to achieve the learning objectives set out, since it allow students to:

- . acquire or develop knowledge about structure of the atom.
- . acquire knowledge about the behavior of electrons in the atom.
- . recognize and interpret the periodic variation of the properties of atoms.
- . interpret and use the information from the chemical equation.
- . recognize, interpret and utilize the various concentration units.
- . recognize and analyze the concept of Chemical Equilibrium.
- . develop concepts related reactions Acid-Base, including its application in volumetric analysis.
- . recognize and analyze precipitation reactions.
- . develop skills to identify and balance oxidation-reduction reactions.
- . develop skills to recognize some fundamental concepts of Thermodynamics.

TEACHING METHODOLOGIES

Lectures, practical classes of problem solving, development of practical laboratory work, reports on the results obtained in the experimental work and oriented study.

DEMONSTRATION OF THE COHERENCE BETWEEN THE TEACHING METHODOLOGIES AND THE LEARNING OUTCOMES

The teaching of the course is based on two fundamental pillars: theoretical and practical classes and laboratory classes.

The practical classes will consist of a piece of expository session, which will serve to introduce the fundamental concepts of the discipline associated with the program content, followed by a practice session, in which they carry out the resolution of exercises that aim to apply these concepts.

The laboratory classes are intended mainly to the implementation of a laboratory protocol that allows the student a first contact with laboratory techniques for chemical analysis. In these techniques will be used some of the concepts that are part of the syllabus covered previously in theoretical and practical lessons, including: preparation of aqueous solutions of known concentration, dilution of solutions, acid-base titrations, acid-base indicators, precipitation titrations and oxidation-reduction titrations.

The aim of these lab classes is fundamentally provide a more practical view of theoretical concepts, as well as instigating the initiative and participation of students.

EVALUATION METHODS

75% of the evaluation obtained from a written exam + 25% of the evaluation obtained from reports of laboratory classes.

MAIN BIBLIOGRAPHY

- Chang, R., Goldsby, K. (2014). General Chemistry - The Essential Concepts. 7th Edition. McGraw Hill, International Edition.
- Goldberg, D.E. (1997). Schaum's 3000 Solved Problems in Chemistry, Revised Edition. McGraw Hill, International Edition.