

## Chemistry II

Academic Year: ( 2022 / 2023 )

Review date: 20-06-2022

Department assigned to the subject: Materials Science and Engineering and Chemical Engineering Department

Coordinating teacher: SAN MIGUEL ARNAZ, VERONICA

Type: Basic Core ECTS Credits : 6.0

Year : 1 Semester : 2

Branch of knowledge: Engineering and Architecture

## REQUIREMENTS (SUBJECTS THAT ARE ASSUMED TO BE KNOWN)

Chemistry at High School

## DESCRIPTION OF CONTENTS: PROGRAMME

## - Electrochemistry

Electrochemical Equilibrium: Electrochemical Systems. Galvanic Cells. Types of Electrodes. Electrode Potentials. Nernst Equation. Concentration Cells.

Potential for Diffusion Potentiometric Evaluations.

Energy and Electrochemistry: Voltaic Cells, Lead battery, Electrolysis, Hydrogen Fuel Cells, Li-ion Batteries.

- Corrosion and Corrosion Control: Electrochemical Aqueous Corrosion, Kinetic of Corrosion. Cathodic Protection, Anodic Protection. Coating.

## - Organic Chemistry

Introduction to Organic Chemistry: Nomenclature. Molecular Structure and Intermolecular Forces. Aromaticity. Organic Reactions.

Isomerism and Stereoisomerism: Properties of Stereoisomers. Configuration and Conformation of Cyclic Molecules.

Alkanes and Cycloalkanes: Properties and Reactivity.

Unsaturated Hydrocarbons: Alkenes and Alkynes. Delocalised pi Bond.

Aromatic Hydrocarbons: Addition Reactions and Stability. Electrophilic Substitution. Derivatives of Benzene.

Alcohols, Phenols, and Ethers: Physical Properties. Synthesis and Reactivity.

Carbonyl Compounds: Aldehydes and Ketones. Resonance, Oxidation, and Reduction. Nucleophilic Addition Reactions. Synthesis.

Carboxylic Acids: Structure and Properties. Salts of Carboxylic Acids. Acidity of Carboxylic Acids. Synthesis and Reactivity. Functional Derivatives of Carboxylic Acids: Acid Chlorides, Acid Anhydrides, Amides, and Esters.

Amines: Characteristics and Structure. Acid-base Properties. Synthesis and Reactivity.

Structural Determination.

## - Biochemistry

Biochemistry and Biophysics of Bioactive Molecules

Energy, Catalysis, and Biosynthesis

Carbohydrates: Monosaccharides, Disaccharides, Polysaccharides. Metabolism of Carbohydrates.

Lipids: Fatty Acids, Oxidation of Fatty Acids.

Amino Acids, Proteins, and Enzymes: Structure, Function, and Interaction of Proteins.

Nucleic acids. Structure of DNA and RNA. Genome Organization.

Replication, Transcription, and Translation of Genetic Information: Replication, Repair, and Recombination. DNA Transcription (RNA Synthesis). The Transcriptome.

RNA Translation (Protein Synthesis). The Proteome.

Genetic Engineering: Recombinant DNA Technology, DNA Sequencing, PCR, Transgenesis.

## LEARNING ACTIVITIES AND METHODOLOGY

AF1. THEORETICAL-PRACTICAL CLASSES. Knowledge and concepts students must acquire. They will receive course notes and will have basic reference texts to help class understanding and subsequent development of working. Students partake in exercises to resolve practical problems. They will perform assessments to acquire necessary abilities. Subjects with 6 credits have 44 hours with 100% on-site instruction.

AF2. TUTORING SESSIONS. Individualized attendance (individual tutoring) or in-group (group tutoring) for students with a teacher. Subjects with 6 credits have 4 hours of tutoring with 100% on-site

attendance.

AF3. STUDENT INDIVIDUAL WORK OR GROUP WORK. Subjects with 6 credits have 98 hours with 0% on-site attendance.

AF8. WORKSHOPS AND LABORATORY SESSIONS. Subjects with 6 credits have 8 hours with 100% on-site instruction.

AF9. FINAL EXAM. Global assessment of knowledge, skills, and capacities acquired throughout the course. It entails 4 hours with 100% on-site attendance.

AF8. WORKSHOPS AND LABORATORY SESSIONS. Subjects with 6 credits have 8 hours with 100% on-site instruction.

MD1. THEORY CLASS. Classroom presentations by the teacher with IT and audiovisual support in which the subject's main concepts are developed, while providing material and bibliography to complement student learning.

MD2. PRACTICAL CLASS. Resolution of practical cases and problems, posed by the teacher, and carried out individually or in group.

MD3. TUTORING SESSIONS. Individualized attendance (individual tutoring sessions) or in-group (group tutoring sessions) for students with teacher as tutor. Subjects with 6 credits have 4 hours of tutoring with 100% on-site attendance.

MD6. LABORATORY PRACTICAL SESSIONS. Applied/experimental learning/teaching in workshops and laboratories under the tutor's supervision.

#### ASSESSMENT SYSTEM

SE1. FINAL EXAM. Global assessment of knowledge, skills and capacities acquired throughout the course.

SE2. CONTINUOUS EVALUATION. Assesses papers, projects, class presentations, debates, exercises, laboratory practices, and workshops throughout the course.

<b>% end-of-term-examination:</b>	45
<b>% of continuous assessment (assignments, laboratory, practicals...):</b>	55

#### BASIC BIBLIOGRAPHY

- David L. Nelson and Michael M. Cox Lehninger Principles of Biochemistry, Macmillan learning, 2000
- H.R.Horton, L.A. Moran, K.G. Scrimgeour, M.D. Perry, J.D. Rawn Principles of Biochemistry, Pearson, 2010
- John McMurry Organic Chemistry, CENGAGE Learning Custom Publishing, 2015
- K. Peter C. Vollhardt and Neil E. Schore Organic Chemistry: Structure and Function, W. H. Freeman, 2018
- R.H. Garret, C.M. Grisham Biochemistry, Wadsworth Publishing Co Inc, 2010

#### ADDITIONAL BIBLIOGRAPHY

- Ahmad Z. PRINCIPLES OF CORROSION ENGINEERING AND CORROSION CONTROL, Elsevier , 2006
- Askeland D.R. and Wright W.J. THE SCIENCE AND ENGINEERING OF MATERIALS, CL Engineering, 2015
- Cid M-M and Bravo J. STRUCTURE ELUCIDATION OF ORGANIC CHEMISTRY, Wiley-VCH, 2015

#### BASIC ELECTRONIC RESOURCES

- . Macmillan Learning: <http://www.macmillanlearning.com/college/us>
- . Spectral Database for Organic Compounds: [http://sdb.sdb.aist.go.jp/sdbs/cgi-bin/cre\\_index.cgi](http://sdb.sdb.aist.go.jp/sdbs/cgi-bin/cre_index.cgi).
- . Organic Chemistry Portal: <http://www.organic-chemistry.org/namedreactions/>