Chemistry II

Academic Year: (2020 / 2021) **Review date: 22-07-2020**

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

Coordinating teacher: SAN MIGUEL ARNANZ, 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

OBJECTIVES

CB1. Students have demonstrated knowledge and understanding in a field of study that builds upon their general secondary education, and is typically at a level that, whilst supported by advanced textbooks, includes some aspects that will be informed by knowledge of the forefront of their field of study
CB2. Students can apply their knowledge and understanding in a manner that indicates a professional approach to their work or vocation, and have competences typically demonstrated through devising and sustaining arguments and solving problems within their field of study
CB3. Students have the ability to gather and interpret relevant data (usually within their field of study) to inform judgments that include reflection on relevant social, scientific or ethical issues
CB4. Students can communicate information, ideas, problems and solutions to both specialist and non-specialist audiences
CB5. Students have developed those learning skills that are necessary for them to continue to undertake further study with a high degree of autonomy
CG2. Learn new methods and technologies from basic scientific and technical knowledge, and being able to adapt to new situations.
CG3. Solve problems with initiative, decision making, creativity, and communicate and transmit knowledge, skills and abilities, understanding the ethical, social and professional responsibility of the engineering activity. Capacity for leadership, innovation and entrepreneurial spirit.
CG5. Use the theoretical and practical knowledge acquired in the definition, approach and resolution of problems in the framework of the exercise of their profession.
CE7. Understand and apply the principles of basic knowledge of general and inorganic chemistry and its use in engineering.
CE8. Understand and handle the basics of organic chemistry and its use in the production of complex materials and biological systems.
CT1. Work in multidisciplinary and international teams as well as organize and plan work making the right decisions based on available information, gathering and interpreting relevant data to make judgments and critical thinking within the area of study.
RA1. To have acquired sufficient knowledge and proved a sufficiently deep comprehension of the basic principles, both theoretical and practical, and methodology of the more important fields in science and technology as to be able to work successfully in them;
RA2. To be able, using arguments, strategies and procedures developed by themselves, to apply their knowledge and abilities to the successful solution of complex technological problems that require creating and innovative thinking;
RA3. To be able to search for, collect and interpret relevant information and data to back up their conclusions including, whenever needed, the consideration of any social, scientific and ethical aspects relevant in their field of study;
RA6. To be aware of their own shortcomings and formative needs in their field of specialty, and to be able to plan and organize their own training with a high degree of independence.

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

The evaluation will be composed of a final exam (worths 50% of the final grade) and a continuous evaluation (50%). It is mandatory to achieve a minimum mark of 4/10 in the final exam. Besides, laboratory practices are mandatory for being assessed.

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

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

% end-of-term-examination:	50
% of continuous assessment (assigments, laboratory, practicals…):	50

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