

Academic Year: (2023 / 2024)

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

Coordinating teacher: GONZALEZ BENITO, FRANCISCO JAVIER

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 (High school)

LEARNING OUTCOMES

CB1. Students have demonstrated possession and understanding of knowledge in an area of study that builds on the foundation of general secondary education, and is usually at a level that, while relying on advanced textbooks, also includes some aspects that involve knowledge from the cutting edge of their field of study.

CB2. Students are able to apply their knowledge to their work or vocation in a professional manner and possess the competences usually demonstrated through the development and defence of arguments and problem solving within their field of study.

CB3. Students have the ability to gather and interpret relevant data (usually within their field of study) in order to make judgements which include reflection on relevant social, scientific or ethical issues.

CB4. Students should be able to communicate information, ideas, problems and solutions to both specialist and non-specialist audiences.

CB5. Students will have developed the learning skills necessary to undertake further study with a high degree of autonomy.

CG10. Being able to work in a multi-lingual and multidisciplinary environment

CE4 Módulo FB. Ability to understand and apply the principles of basic knowledge of general chemistry, organic and inorganic chemistry and their applications in engineering.

CT1. Ability to communicate knowledge orally as well as in writing to a specialized and non-specialized public.

CT2. Ability to establish good interpersonal communication and to work in multidisciplinary and international teams.

CT3. Ability to organize and plan work, making appropriate decisions based on available information, gathering and interpreting relevant data to make sound judgement within the study area.

CT4. Motivation and ability to commit to lifelong autonomous learning to enable graduates to adapt to any new situation.

By the end of this content area, students will be able to have:

RA1.1 knowledge and understanding of the basis of general chemistry and organic and inorganic applied chemistry underlying their branch of engineering;

RA2.2 the ability to apply their knowledge and understanding to identify, formulate and solve problems of general chemistry and, organic and inorganic applied chemistry using established methods;

RA4.2 the ability to design and conduct appropriate experiments, interpret the data and draw conclusions;

RA4.3 workshop and laboratory skills;

RA5.1 the ability to select and use appropriate equipment, tools and methods to solve problems of general chemistry and organic and inorganic applied chemistry;

RA5.2 the ability to combine theory and practice to solve problems of general chemistry and organic and inorganic applied chemistry.

OBJECTIVES

After finishing this subject, students should be able to have:

1. Knowledge and understanding of the chemical basis, organic and inorganic applied chemistry underlying the branch of industrial engineering;
2. The ability to apply their knowledge and understanding to identify, formulate and solve problems of chemical basis, organic and inorganic applied chemistry using established methods;
3. The ability to design and conduct appropriate experiments of chemistry, interpret the data and draw conclusions;
4. Workshop and laboratory skills in chemistry.
5. The ability to select and use appropriate equipment, tools and methods to solve problems of chemical basis, organic and inorganic applied chemistry;
6. The ability to combine theory and practice to solve of chemical basis, organic and inorganic applied chemistry.
7. The ability to function effectively both individually and as a team.

DESCRIPTION OF CONTENTS: PROGRAMME

Topic 0. Introduction to Chemistry, Preliminary concepts
Topic 1. The Atomic Structure. Periodic Properties
Topic 2. Chemical Bonding
Topic 3. States of Matter (I): Gases, Liquids and Solids
Topic 4. States of Matter (II): Solutions: Colligative properties
Topic 5. Thermochemistry
Topic 6. Chemical equilibrium
Topic 7. Acid-base and solubility equilibria
Topic 8. Red-Ox equilibrium and Electrochemistry
Topic 9. Chemical kinetics
Topic 10. Introduction to Chemical Engineering
Topic 11. Introduction to Organic Chemistry. Organic Functions and reactivity

LEARNING ACTIVITIES AND METHODOLOGY

Master classes, tutorial classes in small groups dedicated to resolving student questions and doubts, student presentations, individual tutorials, and individual work by the students; activities dedicated to acquisition of theoretical knowledge related to the lecture course (3 ECTS credits)
Laboratory practical sessions and classes in small groups dedicated to solving question sheets, individual tutorials and individual work by the student; activities dedicated to acquisition of practical skills related to the lecture course (3 ECTS credits)

- Before accessing the laboratories, all students should watch some videos on safety in chemistry laboratories and, after that, they have to pass some virtual questionnaires (Aula Global) in order to demonstrate the contents of the videos are understood.

ASSESSMENT SYSTEM

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

Continuous evaluation (45 %):

- Continuous evaluation will be based on class attendance and assessed tests performed in class (35%).
- Attendance to practical sessions of laboratory and laboratory reports assessment (10%).

Final exam (55%).

Laboratory practices are mandatory for being assessed.

For being averaged with the continuous assessment, marks higher than 4.0 must be obtained in the final exam.

BASIC BIBLIOGRAPHY

- A. VIAN ORTUÑO Introducción a la Química Industrial, Reverté..
- G. CALLEJA, F. GARCIA, A. DE LUCAS, D. PRATS, J.M. RODRIGUEZ Introducción a la Ingeniería Química, Síntesis..

- J. COSTA, S. CERVERA, F. CUNILL, S. ESPLUGAS, C. TEIXIDO, J. MATA Curso de Ingeniería Química, Reverté..
- K. HEINZ BÜCHNER, HANS-HEINRICH MORETTO, P. WODITSCH, Industrial Inorganic Chemistry, Wiley-VCH; 2000..
- K. WEISSERMEL, HANS-JÜRGEN ARPE, Industrial Organic Chemistry, 4th Edition, Wiley & Sons; 1997..
- P.W. ATKINS, L. JONES Chemical Principles, W.H. Freeman & Co, 2001
- R. CHANG. Chemistry,, McGraw-Hill Science, 2006..
- R.T. MORRISON, R.N. BOYRD Química Orgánica, Addison-Wesley Iberoamericana..