

Academic Year/course: 2021/22

## 30004 - Chemistry

### Syllabus Information

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**Academic Year:** 2021/22

**Subject:** 30004 - Química

**Faculty / School:** 110 - Escuela de Ingeniería y Arquitectura

**Degree:** 436 - Bachelor's Degree in Industrial Engineering Technology

**ECTS:** 6.0

**Year:** 1

**Semester:** 436-First semester o Second semester

107-First semester

**Subject Type:** Basic Education

**Module:**

## 1. General information

### 1.1. Aims of the course

The course and its expected results meet the following approaches and goals:

It is expected that students acquire a general view of Chemistry and its importance in our society, so that they are able to apply both the theoretical and practical knowledge of Chemistry in the development of their profession as industrial engineers.

These approaches and objectives are aligned with some of the Sustainable Development Goals, SDGs, of the 2030 Agenda (<https://www.un.org/sustainabledevelopment/en/>) and certain specific goals, in such a way that the acquisition of the Learning outcomes of the subject provide training and competence to the student to contribute to a certain extent to their achievement:

Goal 2: Zero hunger

Target 2.4 By 2030, ensure sustainable food production systems and implement resilient agricultural practices that increase productivity and production, that help maintain ecosystems, that strengthen capacity for adaptation to climate change, extreme weather, drought, flooding and other disasters and that progressively improve land and soil quality.

Goal 3: Good health and well-being

Target 3.9 By 2030, substantially reduce the number of deaths and illnesses from hazardous chemicals and air, water and soil pollution and contamination.

Goal 6: Clean water and sanitation

Target 6.3 By 2030, improve water quality by reducing pollution, eliminating dumping and minimizing release of hazardous chemicals and materials, halving the proportion of untreated wastewater and substantially increasing recycling and safe reuse globally.

Goal 9: Industry, innovation and infrastructure

Target 9.4 By 2030, upgrade infrastructure and retrofit industries to make them sustainable, with increased resource-use efficiency and greater adoption of clean and environmentally sound technologies and industrial processes, with all countries taking action in accordance with their respective capabilities.

Goal 12: Responsible consumption and production

Target 12.4 By 2020, achieve the environmentally sound management of chemicals and all wastes throughout their life cycle, in accordance with agreed international frameworks, and significantly reduce their release to air, water and soil in order to minimize their adverse impacts on human health and the environment.

Target 12.5 By 2030, substantially reduce waste generation through prevention, reduction, recycling and reuse.

### 1.2. Context and importance of this course in the degree

This course is scheduled in the first semester of the first year of the Bachelor's Degree in Industrial Engineering Technology. It belongs to the basic training of degrees of the Industrial Engineering branch. The basic concepts learned in Chemistry will serve as a basis for subsequent subjects, such as Materials Engineering, Environmental Engineering and Industrial Chemical Processes.

### 1.3. Recommendations to take this course

To have acquired the competences of the previous educational stages.

In the case of not having studied Chemistry in the high school it is strongly recommended to take the so-called "zero course" promoted by EINA.

## 2. Learning goals

### 2.1. Competences

Upon passing this subject, students will be more competent to...

Solve problems and make decisions with initiative, creativity and critical thinking.

Learn continuously and develop autonomous learning strategies.

Understand and apply the basic knowledge principles of general chemistry, organic and inorganic chemistry and their applications in engineering.

### 2.2. Learning goals

To pass this subject, students must demonstrate the following results...

0. Basic knowledge of risk prevention in the laboratory.

1. Define the basic principles of general chemistry, organic chemistry, and inorganic chemistry.

2. Identify the basic laws that control chemical reactions: thermodynamics, kinetics, and equilibrium.

3. Solve exercises in a complete and reasoned way.

4. Make adequate use of theoretical concepts in the laboratory through the correct and safe use of basic material and equipment.

5. Use rigorous language in chemistry.

6. Present and interpret data and results.

### 2.3. Importance of learning goals

Learning goals of chemistry are important because they provide tools for further learning and for the professional performance of industrial engineers.

The acquisition of a basic knowledge of chemistry related to many of the industrial activities must constitute a fundamental aspect of the graduate's training.

## 3. Assessment (1st and 2nd call)

### 3.1. Assessment tasks (description of tasks, marking system and assessment criteria)

Students must demonstrate that they have achieved the expected learning outcomes through the following evaluation activities:

Continuous evaluation consisting of three theoretical-practical written tests, on the dates to be announced in due course, and each of them will mean 30% of the grade. Only students who have attended all practical laboratory sessions will be entitled to continuous assessment. Learning goals 1, 2, 3, 5 and 6 will be assessed.

Completion of laboratory practices, whose continuous evaluation, based on observation, fulfilment of tasks, preparation and delivery of preliminary questions and reports, will represent 10% of the final grade. Assessment of learning goals 3, 4, 5 and 6.

Students who do not choose continuous evaluation, who do not pass the subject by this procedure or who would like to improve their grade (in this case, the best of the obtained grades will prevail), a global test will be held on the dates designated by EINA. Evaluation of all learning goals.

#### Global test

It will consist of an exam composed of several parts, which include theoretical-practical questions of the subject (90% of the grade) and a laboratory exam, which must be passed in order to pass the subject, and which will account for 10% of the student's grade. Evaluation of all learning goals.

## 4. Methodology, learning tasks, syllabus and resources

### 4.1. Methodological overview

The methodology followed in this course is oriented towards the achievement of the learning objectives. It favors the understanding of the general chemistry principles as well as the development of the active learning of students. A wide range of teaching and learning tasks are implemented, such as lectures in large group sessions, practice sessions, laboratory sessions, tutorials, autonomous work and assessment tasks.

Students are expected to participate actively in the class throughout the semester.

Classroom materials will be available via Moodle. These include a repository of the lecture notes used in class, the course syllabus, as well as other course-specific learning materials, including a discussion forum.

Further information regarding the course will be provided on the first day of class.

## 4.2. Learning tasks

This is a 6 ECTS course organized as follows:

- **Theory sessions** (3.5 ECTS: 35 hours). Lectures will be used in most cases, and information will be transmitted orally with TIC support.
- **Practice sessions** (1.5 ECTS: 15 hours). During classrooms of the solution of problems, the participation of students will be promoted.
- **Laboratory sessions** (1 ECTS: 10 hours). Students will acquire skills in laboratory material handling, deduction, communication, team working and analytical capabilities. The solution of preliminary questions enhances the autonomous work. Special efforts are devoted to the importance of security norms and correct handling of residues, key points in engineering.

## 4.3. Syllabus

The course will address the following topics:

### Lectures

#### Contents for the first midterm exam (15 hours)

Topic 1.- Periodic system of elements

Topic 2.- Chemical bond and compounds

Topic 3.- Fundamental laws of Chemistry

Topic 4.- Properties of gases and liquids

#### Contents for the second midterm exam (20 hours)

Topic 5.- Chemical thermodynamics

Topic 6.- Chemical kinetics

Topic 7.- Inorganic and organic compounds

#### Contents for the third midterm exam (15 hours)

Topic 8.- Introduction to electrochemistry

Topic 9.- Chemical composition of aqueous solutions

Topic 10.- Study of chemical equilibrium

### Laboratory sessions:

Session 0: Introduction to chemistry laboratory (1 hour)

Session 1: Gases and preparation of solutions (3 hours)

Session 2: Reaction kinetics. Redox reactions (3 hours)

Session 3: Chemical equilibrium. Standardization of hydrochloric acid (3 hours)

## 4.4. Course planning and calendar

In addition to lectures, practical sessions, and laboratory sessions, it is expected that students invest 10 hours for lab reports, 74 hours for autonomous work and 6 hours for exams (consisting of multiple-choice questions, chemical nomenclature, short answer questions, and problem-solving questions).

Outside of office hours, tutorials can be arranged with the teaching staff by electronic mail.

Further information concerning the timetable, classroom, office hours, assessment dates and other details regarding this course will be provided on the first day of class or please refer to the following links:

<https://eina.unizar.es/>, <https://titulaciones.unizar.es/guias16/index.php%3Fasignatura=30004>, <https://moodle2.unizar.es/add/>.

## 4.5. Bibliography and recommended resources

The bibliography of the subject can be accessed via this link:

[http://biblos.unizar.es/br/br\\_citas.php?codigo=30004&year=2020](http://biblos.unizar.es/br/br_citas.php?codigo=30004&year=2020)