

## Course guide

### 240017 - 240017 - Chemistry I

**Last modified:** 09/06/2023

**Unit in charge:** Barcelona School of Industrial Engineering  
**Teaching unit:** 713 - EQ - Department of Chemical Engineering.

**Degree:** BACHELOR'S DEGREE IN INDUSTRIAL TECHNOLOGY ENGINEERING (Syllabus 2010). (Compulsory subject).

**Academic year:** 2023    **ECTS Credits:** 6.0    **Languages:** Catalan, Spanish

#### LECTURER

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**Coordinating lecturer:** Abdelilah Alla Bedahnane  
Montserrat García Álvarez

**Others:** Abdelilah Alla Bedahnane  
Montserrat García Álvarez  
Joana Lalueza Baro

#### TEACHING METHODOLOGY

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Classroom sessions:

- Theory Classes: The necessary theoretical concepts for the development of the subject will be introduced. They will be taught with the aid of audiovisual resources.
- Problem-solving Classes: The theoretical knowledge will be applied to problem-solving, actively involving the students in the process.
- Experimental Activities: Practical work complementing the theory or problem-solving classes, allowing students to relate theoretical concepts to experimental determinations. These activities can be done individually or in groups.
- Directed Activities: Additional assignments to further explore specific topics covered in the face-to-face classes. These activities can be done individually or in groups.

#### LEARNING OBJECTIVES OF THE SUBJECT

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- Provide an introduction to the basic principles of both inorganic and organic chemistry necessary for the effective understanding of subjects related to various areas of engineering.
- Apply the acquired basic knowledge to comprehend the structure and bonds of different materials, in order to understand the physical and chemical properties of the main compounds of interest in the field of engineering.

#### STUDY LOAD

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| Type              | Hours | Percentage |
|-------------------|-------|------------|
| Hours large group | 56,0  | 93.33      |
| Hours small group | 4,0   | 6.67       |

**Total learning time:** 60 h

## CONTENTS

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### Lecture 1: Fundamentals of chemistry

**Description:**

Atoms. Electronic structure and periodic properties. Molecules and molar masses. Percent composition. Chemical formulas

**Full-or-part-time:** 10h

Theory classes: 4h

Self study : 6h

### Lecture 2: Chemical bond

**Description:**

Formation and types of chemical bonds. Covalent bond. Lewis structures. Resonance. Molecular geometry and hybridization of the atomic orbitals. Double and triple bonds.

**Full-or-part-time:** 20h

Theory classes: 4h

Practical classes: 4h

Self study : 12h

### Lecture 3: Intermolecular forces and solid structures

**Description:**

Polarity. Van der Waals forces. Hydrogen bonds. Types of solids. Crystal structures. Metallic packings. Ionic structures. Molecular solids. Properties and applications in engineering of metallic compounds and ionic compounds.

**Full-or-part-time:** 20h

Theory classes: 4h

Practical classes: 4h

Self study : 12h

### Lecture 4: Introduction to Organic Chemistry

**Description:**

Types of organic compounds. Functional groups. Constitutional isomerism. Stereoisomerism. Introduction to organic reactions. Electronic effects.

**Full-or-part-time:** 30h

Theory classes: 6h

Practical classes: 6h

Self study : 18h

### Lecture 5: Hydrocarbons

**Description:**

Alkanes. Conformational isomerism. Combustion reactions. Alkenes. Geometric stereoisomerism. Alkynes. Addition reactions in alkenes and alkynes. Aromatic hydrocarbons. Electrophilic aromatic substitution. Petroleum. Halogenated derivatives. Compounds of Industrial interest.

**Full-or-part-time:** 30h

Theory classes: 6h

Practical classes: 6h

Self study : 18h

### Lecture 6: Organic compounds and functional groups

**Description:**

Alcohols and ethers. Carbonyl compounds. Carboxylic acids and their derivatives. Amines and amides. Products of industrial interest. Polyesters and Polyamides.

**Full-or-part-time:** 30h

Theory classes: 6h

Practical classes: 6h

Self study : 18h

## GRADING SYSTEM

The final grade (NF) will be:

$$NF = \max. (EF, 0,2*EP+0,2*PAC + 0.05* NP+0,55*EF)$$

- 1) Continuous assessment grade: PAC
- 2) Mid-term exam grade: EP
- 2) Practice grade: NP
- 3) Exam grade: EF

The final reassessment grade will be calculated based on:  $NF = 1.0*ReAv$

Reassessment exam grade: ReAv

## BIBLIOGRAPHY

**Basic:**

- Callister, William D; Rethwisch, David G. Materials science and engineering . 9th ed. S I version. Hoboken, New Jersey [etc.] : John Wiley & Sons, cop. 2015. ISBN 9781118319222.
- Petrucci, Ralph H; Pando García-Pumarino, Concepción; Rodríguez Renuncio, Juan A; Iza Cabo, Nerea; Bissonnette, Carey; Madura, Jeffry D; Herring, F. Geoffrey. Química general : principios y aplicaciones modernas . Undécima edición. ©2017. ISBN 9788490355336.
- Atkins, P. W; Jones, Loretta; Laverman, Leroy. Chemical principles : the quest for insight . Seventh edition. New York : W. H. Freeman Macmillan Learning, [2016]. ISBN 9781464183959.
- Wade, L. G; Simek, Jan William. Química orgánica . Novena edición. Ciudad de México : Pearson Educación, 2017. ISBN 9786073238472.
- Casabó i Gispert, Jaume. Estructura atómica y enlace químico . Barcelona [etc.] : Reverté, cop. 1996. ISBN 8429171894.
- Quiñoá Cabana, Emilio; Riguera, Ricardo. Nomenclatura y representación de los compuestos orgánicos : una guía de estudio y autoevaluación . 2a ed. Madrid [etc.] : McGraw-Hill, cop. 2005. ISBN 8448143639.
- Sales i Cabré, Joaquim; Vilarrasa i Llorens, Jaume. Introducció a la nomenclatura química : inorgànica i orgànica . 5a ed. Barcelona [etc.] : Reverté, 2003. ISBN 8429175512.
- Peterson, W. R. Formulación y nomenclatura química orgánica : (introducción) . Barcelona : EUNIBAR, 1977. ISBN 8485257073.



**Complementary:**

- Smith, William F; Hashemi, Javad. Fundamentos de la ciencia e ingeniería de materiales . 5a ed. México [etc.] : McGraw-Hill, cop. 2014. ISBN 9786071511522.
- García Martín, Tomás; Hart, Harold. Química orgánica . 12<sup>a</sup> ed. Madrid [etc.] : McGraw-Hill, cop. 2007. ISBN 9788448156572.