Course guide
820010 - Q - Chemistry

Last modified: 29/06/2026

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

Degree: BACHELOR'S DEGREE IN BIOMEDICAL ENGINEERING (Syllabus 2009). (Compulsory subject).
BACHELOR'S DEGREE IN ELECTRICAL ENGINEERING (Syllabus 2009). (Compulsory subject).
BACHELOR'S DEGREE IN ENERGY ENGINEERING (Syllabus 2009). (Compulsory subject).
BACHELOR'S DEGREE IN INDUSTRIAL ELECTRONICS AND AUTOMATIC CONTROL ENGINEERING (Syllabus 2009). (Compulsory subject).
BACHELOR'S DEGREE IN MECHANICAL ENGINEERING (Syllabus 2009). (Compulsory subject).
BACHELOR'S DEGREE IN MATERIALS ENGINEERING (Syllabus 2010). (Compulsory subject).

Academic year: 2026 **ECTS Credits:** 6.0 **Languages:** Catalan, Spanish, English

LECTURER

Coordinating lecturer: TATIANA SCARAZZATO - JULIO LÓPEZ RODRÍGUEZ

Others: Primer quadrimestre:
AURELIO CALVET TARRAGONA - Grup: M53, Grup: M54, Grup: M61, Grup: M62, Grup: M81, Grup: M82, Grup: M91, Grup: M92
EVA GALLEGO PIÑOL - Grup: M51, Grup: M52, Grup: M53, Grup: M54
ANTONIO GÁMEZ LÓPEZ - Grup: M41, Grup: M42, Grup: M43, Grup: M44, Grup: M81, Grup: M82, Grup: M83, Grup: M84, Grup: X12, Grup: X22
FRANCISCO JAVIER GIMENEZ IZQUIERDO - Grup: M41
ELENA GUILLEN BURRIEZA - Grup: X23, Grup: X24
JULIO LÓPEZ RODRÍGUEZ - Grup: M61, Grup: M62, Grup: M63, Grup: M64, Grup: M93, Grup: M94, Grup: X11, Grup: X12, Grup: X13, Grup: X14
ESTHER ORTEGA ÁLVAREZ - Grup: M33, Grup: M34, Grup: M43, Grup: M44, Grup: M52, Grup: M71, Grup: M72, Grup: M84
MANUEL RIVAS CAÑAS - Grup: M91, Grup: M92, Grup: M93, Grup: M94, Grup: T11, Grup: T12, Grup: T13, Grup: T14
VIRGINIA SAN ANTONIO BENITO - Grup: M51, Grup: X21, Grup: M73, Grup: M74, Grup: M83, Grup: T13, Grup: T14, Grup: X11
MARGARITA SÁNCHEZ JIMÉNEZ - Grup: X21, Grup: X22, Grup: X23, Grup: X24
TATIANA SCARAZZATO - Grup: M11, Grup: M12, Grup: M13, Grup: M14, Grup: M42
NURIA JIMENEZ DIVINS - Grup: M71, M72, M73, M74
LLUÍS SOLER TURU - Grup: M31, M32, M33, M34

Segon quadrimestre:
ANTONIO GÁMEZ LÓPEZ - Grup: T11, Grup: T13
JULIO LOPEZ RODRIGUEZ - Grup: M21, Grup: M22, Grup: M23, Grup: M24
FRANCISCO JAVIER GIMENEZ IZQUIERDO - Grup: T12
ELENA GUILLEN BURRIEZA - Grup: M11, Grup: M13, Grup: M23
MÒNICA REIG I AMAT - Grup: M12, Grup: M14, Grup: M22, Grup: M24
MANUEL RIVAS CAÑAS - Grup: T11, Grup: T12, Grup: T13, Grup: T14
TATIANA SCARAZZATO - Grup: M11, Grup: M12, Grup: M13, Grup: M14, Grup: T14
KARINA ALEJANDRA TORRES-RIVERO ANDRADE - Grup: M21

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Specific:
5. Understand the fundamental principles of general, organic and inorganic chemistry and apply them in engineering.

Transversal:
2. EFFICIENT ORAL AND WRITTEN COMMUNICATION - Level 1. Planning oral communication, answering questions properly and writing straightforward texts that are spelt correctly and are grammatically coherent.

TEACHING METHODOLOGY

The course consists of lectures in which the teaching staff present the learning objectives associated with the different course contents, followed by their application through the resolution of practical examples. Active student participation is encouraged during the resolution of practical cases by proposing a wide range of numerical problems and motivating students through real-life cases related to the field of chemistry. Throughout the course, students are provided with learning materials and resources to guide and support their learning process, enabling them to consolidate the chemistry knowledge acquired progressively during the course.

LEARNING OBJECTIVES OF THE SUBJECT

Each student to acquire basic scientific knowledge on the subject of Chemistry.
Introduce students to the methodologies and tools necessary to achieve resolution of problems encountered in the various topics of the course.
That each student knows or problem solving exercises in all subjects of the course.
Educating students in the realization of a safe working in the laboratory.
Each student is able to work efficiently in the laboratory.
Educating students on the importance of independent work to assimilate concepts, solve exercises and critically analyze the result.
Know that each student seeking information, synthesize it, and assimilate concepts

STUDY LOAD

Type	Hours	Percentage
Self study	90,0	60.00
Hours small group	7,5	5.00
Hours large group	52,5	35.00

Total learning time: 150 h

CONTENTS

CHAPTER 1- CHEMICAL EQUILIBRIUM

Description:
1. Concentration and stoichiometry
2. Chemical equilibrium
3. Enthalpy, entropy and free energy
4. Equilibrium constant
5. Le Chatelier Principle

Specific objectives:
1. To describe the concept of chemical equilibrium
2. To describe the equilibrium constant
3. To determine the variation of the equilibrium constant with variation in total pressure, volume or concentration

Full-or-part-time: 15h
Theory classes: 6h
Self study : 9h

CHAPTER 2- ACID-BASE EQUILIBRIA

Description:
1. Definition of acid and base. Brönsted and Lowry theory.
2. Strength of acids and bases. pH.
3. Determination of the pH of monoprotic or diprotic acids. Mass and charge balances. Logarithmic diagrams.
4. Mixtures of monoprotic acids and bases. Buffer solutions.

Specific objectives:
1. To identify when a chemical species is acidic or alkaline.
2. To identify when an acid or a base is strong or weak.
3. To determine the pH of acids or bases by using mass and charge balances and logarithmic diagrams.
4. To determine the pH of mixtures of monoproctic acids and bases.
5. To identify when a solution buffers the pH.

Full-or-part-time: 25h
Theory classes: 10h
Self study : 15h

CHAPTER 3- SOLUBILITY

Description:
1. Solubility and solubility product
2. Precipitation
3. Common-ion solubility
4. Solubility in the presence of ácid-base parallel reactions

Specific objectives:
1. To identify the solubility of a solid
2. To determine the solubility of non-soluble solids
3. To determine the solubility of non-soluble solids if there is a common-ion effect
4. To determine the solubility of non-soluble solids in systems with acid-base parallel reactions

Full-or-part-time: 20h
Theory classes: 8h
Self study : 12h

CHAPTER 4- REDOX REACTIONS

Description:
1. Semi-reactions and redox reactions
2. Standard reduction potential. pe and equilibrium constant
3. Nernst equation
4. Latimer and Pourbaix diagrams
5. Batteries and electrolysis

Specific objectives:
1. To identify oxidizing and reduction reactions as well as oxidizing and reducing species
2. To determine equilibrium constants of redox reactions
3. To calculate pe values by using Nernst equation
4. To interpret Latimer and Pourbaix diagrams

Full-or-part-time: 30h
Theory classes: 12h
Self study : 18h

CHAPTER 5- ATOMIC STRUCTURE AND PERIODIC TABLE

Description:
1. Origin of the chemical elements
2. Atomic number, Mass number, isotopes
3. Schrödinger Equation. Quantic numbers. Electronic configuration. Pauli Exclusion principle, Aufbau Principle, Hund's Rule.
4. Periodic table
5. Oxidation state of the elements
6. Periodic properties.

Specific objectives:
1. To deduce the electronic configuration of elements and ions
2. To deduce the oxidation state of the elements from the electronic configuration
3. To compare periodic properties from different elements

Full-or-part-time: 22h 30m
Theory classes: 9h
Self study : 13h 30m

CHAPTER 6- THE CHEMICAL BOND

Description:
1. Lewis theory: the octet rule. Lewis structures. Lewis acids and bases
2. Formal charge associated to an atom. Ressonance.
3. VSEPR theory
4. Polarity of a bond and of a mollecule
5. Intermolecular forces

Specific objectives:
1. To determine the Lewis structure of a molecule, including the formal charge of the atoms
2. To deduce the geometry of a mollecule from the Lewis structure
3. To deduce the polarity of a molecule depending on the different chemical bonds

Full-or-part-time: 18h 45m
Theory classes: 7h 30m
Self study : 11h 15m

LABORATORY

Description:
Three laboratory practicals will be carried out, in which the course contents will be applied. For each laboratory practical, students must submit a pre-laboratory report before the laboratory session and a final report after completing the practical.

Full-or-part-time: 18h 45m
Laboratory classes: 7h 30m
Self study : 11h 15m

GRADING SYSTEM

Any academic fraud, plagiarism or use or possession of unauthorised means in an assessment activity leads to a mark of zero (0) for the affected test or assignment. Furthermore, in accordance with the University's regulations, if disciplinary proceedings are initiated the subject is recorded as "Pending Assessment" until a decision is reached. These incidents are managed in accordance with the **Action Framework for Academic Integrity in Assessment at the UPC**.

The final mark will consist of three inputs:
1) Midterm exam (Date to be provided by the School): EP
2) Laboratory practicals grade: the grade for each laboratory practical will be determined based on the assessment of the corresponding pre-laboratory report and final laboratory report. The final laboratory practicals grade will be the average of the grades obtained in the three laboratory practicals.: Elab
3) Final exam: EF

The course is evaluated from:
NF = 0.15*Elab + 0.36*EP + 0.49*EF
Laboratory sessions are mandatory, in case of absence to any of the sessions, the final qualification of the course will be NP (not presented).

Re-evaluation exam will account for EP and EF
The students will be able to access the re-assessment test that meets the requirements set by the EEBE in its Assessment and Permanence Regulations (https://eebe.upc.edu/ca/estudis/normatives-academiques/documents/eebe-normativa-avaluacio-i-permanencia-18-19-aprovat-je-2018-06-13.pdf)

EXAMINATION RULES.

A non-programmable calculator is required for all written assessments. During the assessments, the use or possession of electronic devices with data transmission capabilities, notes, or formula sheets is not permitted under any circumstances.

BIBLIOGRAPHY

Basic:
- Ralph H. Petrucci ... [et al.]. Química general : principios y aplicaciones modernas [on line]. 11ª ed. Madrid [etc.]: Pearson Prentice Hall, cop. 2017 [Consultation: 09/06/2020]. Available on: http://www.ingebook.com/ib/NPcd/IB_BooksVis?cod_primaria=1000187&codigo_libro=6751. ISBN 9788490355343.
- Aguilar Sanjuán, Manuel. Introducción a los equilibrios iónicos. 2ª ed. Barcelona [etc.]: Reverté, 1999. ISBN 8429175504.

Complementary:
- Brown, Theodore L. Química : la ciencia central [on line]. 12ª ed. Mèxico [etc.]: Pearson, 2014 [Consultation: 29/04/2020]. Available on: http://www.ingebook.com/ib/NPcd/IB_BooksVis?cod_primaria=1000187&codigo_libro=4690. ISBN 9786073222358.
- Casabó i Gispert, Jaume. Estructura atómica y enlace químico [on line]. Barcelona [etc.]: Reverté, cop. 1996 [Consultation: 29/04/2020]. Available on: http://www.ingebook.com/ib/NPcd/IB_BooksVis?cod_primaria=1000187&codigo_libro=1455. ISBN 9788429193343.

RESOURCES

Other resources:
During the course, different documents related to the subjects will be found in the ATENEA platform.