



PERSONA CIÈNCIA EMPRESA  
UNIVERSITAT RAMON LLULL

## COURSE: GENERAL CHEMISTRY

**SUBJECT MATTER:** Chemistry

**MODULE:** Basic Formation

**PROGRAM:** Degree in Chemical Engineering

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### GENERAL CHARACTERISTICS

**Type:**  Basic Formation,  Compulsory,  Elective  
 Final Degree Project,  Internship

**Duration:** Annual

**Semester/s:** S1 and S2

**Number of ECTS credits:** 12,0

**Language / s:** Spanish, Catalan, English

### DESCRIPTION

#### SHORT DESCRIPTION AND JUSTIFICATION

General Chemistry examines and deepens the concepts studied during the bachelor and introduces new concepts that are considered basic to adapt the level of students' knowledge to the needs of the subjects included in subsequent courses. Specifically:

- The chemical language that allows designing and formulating the inorganic and organic chemical elements and compounds, in accordance with the IUPAC standard rules.
- The concepts related to the stoichiometry of substances, the concentration of dissolutions and the stoichiometry of reactions, and their application to the quantitative analysis of mixtures of substances.
- Basic knowledge of chemistry and quantum mechanics related to the structure of matter: structure of atoms, periodic properties of the elements, linkage and structure of the molecules, how they interact to give rise to the different aggregation states and the own states of the matter.
- Knowledge that allows describing the ideal physico-chemical systems in equilibrium (gaseous systems, aqueous solution systems) and predicting the physical and chemical transformations that these systems experience by submitting them to different actions.

#### COMPETENCES

- CB1: That students have demonstrated that they possess and understand knowledge in an area of study that is based on general secondary education, and is usually found at a level that, while supported by advanced textbooks, also includes some aspects that involve knowledge from the cutting edge of their field of study.
- CB2: That students know how to apply their knowledge to their work or vocation in a professional manner and possess the competences that are usually demonstrated through the elaboration and defense of arguments and the resolution of problems within their area of study.
- E1: Be able to understand and apply basic knowledge of Mathematics, Chemistry, Physics, Computer Science, Economics, Graphic Expression and Biology for application in the field of Chemical Engineering.



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- E7: Be able to identify, formulate and solve basic problems in Mathematics, Chemistry, Physics, Computer Science, Biology, Economics and Graphic Expression and problems in the fields of Chemical Engineering and Chemistry.
- FB4: Ability to understand and apply the basic knowledge principles of general chemistry, organic and inorganic chemistry and their applications in engineering.

### PREREQUISITES

According to the program planning and academic regulations.

### CONTENTS

- 1) Atomic structure.
- 2) The periodic table of the elements and their periodic properties.
- 3) Chemical bond (theories and bonding types) and intermolecular forces.
- 4) Basic nomenclature and formulation in inorganic chemistry
- 5) Basic nomenclature and formulation in organic chemistry.
- 6) Stoichiometry of substances and reactions. Fundamentals of chemical reactivity.
- 7) Aggregation states of matter.
- 8) Physical balance between different phases: study of systems with a component and dissolutions
- 9) Chemical equilibrium in homogeneous gas systems.
- 10) Ionic balances in aqueous solutions of acids, bases and low soluble salts.
- 11) Electrochemistry (electrolysis and batteries).

### METHODOLOGY

### LEARNING ACTIVITIES

Learning activities	Hours	ECTS credits	Competences
Lectures	86	3,2	CB1, E1, FB4
Case and Problem-Solving Sessions	35	1,3	CB1, CB2, E1, E7, FB4
Seminars	16	0,6	CB1, CB2, E1, E7, FB4
Practical & Lab Work	--	--	--
Presentations	--	--	--
Personal Study	176	6,5	CB1, CB2, E1, E7, FB4
Assessment Tasks (Exams, Continuous Assessment...)	11	0,4	CB1, CB2, E1, E7, FB4
<b>TOTAL</b>	<b>324</b>	<b>12,0</b>	



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## TEACHING METHODOLOGY

**Lectures:** The concepts included in the program are presented, using the classic techniques: board and projections. In some classes, teaching experiences are interspersed which facilitate the understanding of some concepts and favour the participation of the students. Dynamic classes are encouraged in which the question-answer game can benefit not only the student who asked the question, but also his or her classmates.

**Case and Problem-Solving Sessions:** There are collections of exercises and problems, which are given to students throughout the course. With the exercises, we try to help the student to understand, deepen and relate the concepts studied in the lectures. With the problems, the students learn to use the theoretical concepts with agility and reinforce their comprehension. Exercises and problems, corresponding respectively to the parts of theory and of problems of the exams, are thickening these collections, with what is tried to avoid that the students feel surprised in their first university exams. Problems/exercises-type and problems/exercises that present greater difficulties for the students are solved in class.

**Seminars:** They are taught on a specific subject, or part of the subject, in order to reinforce it or, simply, to attend to the doubts that have arisen to the students when studying without the limitation that the time factor imposes to the other types of class.

**Individual and group answering questions in the professor's office:** Students can ask the professor individually or in groups of two to five people.

**Personal Study:** It is necessary to acquire the competences of each subject and to assimilate the knowledge exposed in the sessions of exposition of concepts and sessions of resolution of exercises, problems and cases, using, when it is necessary, the recommended material of consultation. They also include the preparation of tasks related to the other activities, and the preparation of exams.

**Assessment Tasks (Exams, Continuous Assessment...):** tasks carried out during or after the end of the course (follow-up checks, partial examinations, final examinations).

## ASSESSMENT

### ASSESSMENT METHODS

Assessment methods	Weight	Competences
Final Exam	50%	CB1, CB2, E1, E7, FB4
Midterm Exam/s	30%	CB1, CB2, E1, E7, FB4
Continuous Assessment Activities	20%	CB1, E1, FB4
Reports and Presentations	-	-
Lab or Field Work	-	-
Projects	-	-
Host Student Evaluation	-	-
Participation	-	-
<b>TOTAL</b>	100%	



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### LEARNING OUTCOMES

- The student must demonstrate that he or she has understood the basic concepts of the subject. The student must be able to explain these concepts correctly. Must demonstrate proficiency in differentiating, relating and using these concepts. (CB1, E1, FB4)
- The student must demonstrate sufficiency to interpret the statement of exercises and problems. The student must demonstrate sufficiency to question the validity of a model in the face of a new experimental fact that drives the advance of science. Must demonstrate sufficiency to pose the chemical equations related to the exercises and problems posed. Must demonstrate sufficiency to pose and solve with certainty the calculation algorithms necessary to solve the problems. (CB2, E7)

### QUALIFICATION

The assessment of the subject takes into account the qualifications obtained by the student in following assessment activities:

- **1 inorganic nomenclature test and 1 organic nomenclature test**
- **4 controls CO** (follow-up activities of approximately 1.5 hours that are carried out throughout the year)
- **2 partial exams EP** (exams programmed in the middle and the end of the academic year, with an approximate duration of 4 hours per exam)
- **1 final exam (first call) EF** (final exam in which the whole subject is evaluated and with an approximate duration of 5 hours).

To evaluate the subject according to what is established in the following sections, the score of the two nomenclature tests may not be less than 80%. Otherwise, the final grade of the subject will be a maximum of 3.5.

#### **Qualification in the first call**

The final qualification (**NF**) is the best score chosen from the following three values:

- a)  $NF = 0,20 \cdot \text{averageCO} + 0,30 \cdot \text{averageEP} + 0,50 \cdot EF$
- b)  $NF = 0,20 \cdot \text{averageCO} + 0,80 \cdot EF$
- c)  $NF = 0,20 \cdot \text{averageCO} + 0,80 \cdot \text{averageEP}$

- The student always has the right to carry out the final exam, but **if by means of the evaluation carried out with CO and EP** the student obtains a qualification equal or superior to six, he/she can resign to the final examination.

Equation b) is only applicable if the student has completed the two partial exams (**EP**) with an average mark of not less than 2.5.



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### **Qualification in the second call.**

If the student does not pass the subject on the first call, he may take the make-up exam, in which he will obtain a new mark (**ER**). In this call, the best score of the following two values will be chosen as the final grade (**NF**):

a)  $NF = 0,20 \cdot \text{averageCO} + 0,80 \cdot ER$

b)  $NF = ER$

- Equation a) is only applicable if the make-up exam mark (**ER**) is at least 4.0.
- Equation b) is only applicable if the student has taken the exam of the first call.

### **Additional aspects.**

The controls and exams (**CO**, **EP**, **EF**, **ER**) are scored on a **scale of 0 to 100 points**. The final grades (**NF**) are calculated on this same scale and are transformed to the **0 to 10 point scale (NFE)** using the following equations:

$NF < 60$	$NFE = 0,0 + (NF-0) \cdot 5,0/60,0$	Fail
$60 \leq NF < 70$	$NFE = 6,0 + (NF-60) \cdot 1,0/10,0$	Satisfactory
$70 \leq NF < 85$	$NFE = 7,0 + (NF-70) \cdot 2,0/15,0$	Good
$85 \leq NF$	$NFE = 9,0 + (NF-85) \cdot 1,0/15,0$	Excellent

It should be noted that the pass score corresponds to a 5 on the scale from 0 to 10 points and to a 60 on the scale from 0 to 100 points. The student's record will appear on the scale from 0 to 10 points.

## **ASSESSMENT OF THE COMPETENCES**

For the evaluation of CB1, E1 and FB4 competences, the final grade of the course (**NFE**) will be used as indicator.

For the evaluation of CB2 and E7 competences, the indicator will be the grade calculated from the problems part included in the midterm exams (**EP**) and final exams (**EF**, **ER**). The calculation shall be made using equations equivalent to those presented in the section Qualification.

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### DOCUMENT HISTORY

### PREVIOUS REVISIONS

### CURRENT REVISION

March 25<sup>th</sup> 2019 / Dr. Francesc Broto Puig and Dra. Laia Ros Blanco