



## Course guide

### 2500206 - GECQUIMIC2 - Chemistry II

**Last modified:** 01/10/2023

**Unit in charge:** Barcelona School of Civil Engineering  
**Teaching unit:** 751 - DECA - Department of Civil and Environmental Engineering.

**Degree:** BACHELOR'S DEGREE IN ENVIRONMENTAL ENGINEERING (Syllabus 2020). (Compulsory subject).

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

#### LECTURER

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**Coordinating lecturer:** LUCIA FERNANDEZ CARRASCO

**Others:** LUCIA FERNANDEZ CARRASCO, DAVID TORRENS MARTÍN

#### DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

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##### Specific:

14446. Solve mathematical problems that may arise in engineering by applying knowledge about: linear algebra, geometry, differential geometry, differential and integral calculus, optimization, ordinary differential equations.
14447. Obtain basic knowledge about the use and programming of computers, operating systems, databases and basic numerical calculation and applied to engineering.
14448. Manage the basic concepts about the general laws of mechanics and thermodynamics, concept of field and heat transfer, and apply them to solve engineering problems.
14449. Apply the basic principles of general chemistry, organic and inorganic chemistry and their applications in engineering.
14450. Describe the global functioning of the planet: atmosphere, hydrosphere, lithosphere, biosphere, anthroposphere, biogeochemical cycles (C, N, P, S), soil morphology and apply it to problems related to geology, geotechnics, edaphology and climatology.

##### General:

14440. Identify, formulate and solve problems related to environmental engineering.
14441. Apply the functions of consulting, analysis, design, calculation, project, construction, maintenance, conservation and exploitation of any action in the territory in the field of environmental engineering.
14444. Apply business management techniques and labor legislation.

## TEACHING METHODOLOGY

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The course consists of 2 hours per week of classroom activity (large size group) and 1 hour weekly with half the students (medium size group).

The 2 hours in the large size groups are devoted to theoretical lectures, in which the teacher presents the basic concepts and topics of the subject, shows examples and solves exercises.

The 2 hour in the medium size groups is devoted to solving practical problems with greater interaction with the students. The objective of these practical exercises is to consolidate the general and specific learning objectives. Also some practical issues are developed and the dedication to some environmental projects with a greater interaction with the students are analysed.

Support material in the form of a detailed teaching plan is provided using the virtual campus ATENEA: content, program of learning and assessment activities conducted and literature.

Although most of the sessions will be given in the language indicated, sessions supported by other occasional guest experts may be held in other languages.

To do the laboratory practices you need the following personal protective equipment (PPE):

\* Chemical Kit (white lab coat + protection gloves + safety glasses)

## LEARNING OBJECTIVES OF THE SUBJECT

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Organic compounds on Earth and ocean-atmosphere exchange processes. Structure of organic compounds. Reactivity and isomerism of organic compounds. Hydrocarbons: classification and reactions. Organic stereochemistry. Organic reactivity.

1. Understand the chemistry of gas-liquid interactions
2. Describe organic compounds of both natural and anthropogenic origin and their role in environmental processes.

Chemistry II. Establishing the foundations of the chemistry of gas-liquid interactions and the description of organic compounds (of natural and anthropogenic origin) and their role in a variety of environmental processes.

## STUDY LOAD

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Type	Hours	Percentage
Hours small group	15,0	10.00
Self study	90,0	60.00
Hours large group	30,0	20.00
Hours medium group	15,0	10.00

**Total learning time:** 150 h

## CONTENTS

### General aspects of organic chemistry. Chemical nomenclature.

#### Description:

The organic compounds natural and synthetic are currently so numerous that after the first few initials designations the first chemical organic, it is established by the International Union of Pure and Applied Chemistry (IUPAC)

In this subject, the alkenes and some of the derivatives of the non-saturated compounds are studied.

The non-saturated organic compounds can have cyclic or acyclic structures.

Organic compounds that have the same chemical formula but different structures and therefore different properties will be analyzed.

Linear organic compounds can be presented with double or triple bonds

Compounds with unsaturated cyclic structures in carbon-carbon bonds of the rings and their characteristics will be studied.

Classification and analysis of organic compounds present in nature and from products of productive organic synthesis. Action on the media.

Description of organic pollutants in the environment: air, soil, aquifers: effects on the environment

Description of alcohols and phenols.

Analysis of the characteristics of aldehydes and ketones, methods of obtaining and applications.

Obtaining and applications, description of properties.

In this topic, the characteristic reactions of some of the most interesting organic compounds will be described from the environmental point of view and in the mechanisms that describe how these reactions take place.

#### Specific objectives:

Learn and understand the structure of organic compounds and their properties. As is its process of obtaining and applications.

Analyze the nomenclatures for chiral organic compounds and for alkene isomers.

To know the natural and artificial organic compounds and their possible effect on the natural environment. Analysis of organic pollutants.

Interaction of organic pollutants and the environment.

Discussion of the structure, function and synthesis of organic compounds containing the main functional groups.

Differentiate between substitution, addition and elimination reactions Differentiation between different organic reaction mechanisms

#### Full-or-part-time: 72h

Theory classes: 30h

Self study : 42h

### Exercise resolution

#### Description:

Proposal sessions and guided problem solving

#### Full-or-part-time: 36h

Practical classes: 15h

Self study : 21h

### Laboratory sessions

#### Description:

Classroom laboratory classes

#### Specific objectives:

To know how the organic compounds are determined or characterized experimentally by means of different analysis techniques.

#### Full-or-part-time: 36h

Laboratory classes: 15h

Self study : 21h



## GRADING SYSTEM

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Ordinary Assessment (EO) The continuous assessment grade is obtained from the weighted arithmetic average of the exercises/problems (Pr) delivered during the course, of the activities directed as assignments or reports (Tr) and of the Partial exams (Ex, which will have the same value). There will be two partial exams and they will count for 70% of the grade. Problems will count 15% and directed activities will count 15%. The final grade will be:  $*EO=0.7*(\text{average of Ex1 and Ex2})+0.15*(\text{average of Pr})+0.15*(\text{average of Tr})$ . To pass, the \*EO grade must be greater than or equal to 5.0. Re-evaluation (RE) The criteria for qualification and admission to the RE are as follows: students suspended in the ordinary assessment and who have appeared regularly in the assessment tests of the suspended subject will have the option to take an RE test in the period set in the academic calendar. Students who have already passed the \*EO, or students who are classified as not presented or who have not submitted all the exercises/problems (Pr) and/or assignments and reports will not be able to present themselves for the RE of a subject (Tr) of workshops/laboratories. The RE test will consist of a single exam covering all course content. The maximum grade for the reassessment will be five (5.0) and the final grade for the course will be the maximum grade between the continuous assessment and the reassessment exam, i.e.  $MAX(EO/RE)$ . The non-attendance of a student called to the re-evaluation test, held in the fixed period, cannot give rise to the completion of another test with a later date. Extraordinary assessments will be carried out for those students who, due to accredited force majeure, have not been able to take any of the continuous assessment tests. These tests must be authorized by the corresponding head of studies, at the request of the teacher responsible for the subject, and will be carried out within the corresponding teaching period.

## EXAMINATION RULES.

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If one of the laboratory or continuous assessment activities is not carried out in the scheduled period, it will be considered as a zero score. The tests will be carried out individually, with test-type questions that can be theoretical or problem-type questions. The exams may include short questions to be developed by the students and exercises to be solved.

## BIBLIOGRAPHY

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### Basic:

- Baird, C.; Cann, M. Química ambiental. 2a ed. Barcelona: Reverté, 2014. ISBN 9788429179156.
- Petrucci, R. H. [i 3 més]. Química general: principios y aplicaciones modernas [on line]. 11a ed. Madrid: Pearson Prentice Hall, 2017 [ Consultation: 09/12/2020]. Available on: [http://www.ingebook.com/ib/NPcd/IB\\_BooksVis?cod\\_primaria=1000187&codigo\\_libro=6751](http://www.ingebook.com/ib/NPcd/IB_BooksVis?cod_primaria=1000187&codigo_libro=6751). ISBN 9788490355336.
- Wade, L.G. Química orgánica [on line]. 9a ed. México: Pearson Educación, 2016 [Consultation: 29/10/2020]. Available on: [http://www.ingebook.com/ib/NPcd/IB\\_BooksVis?cod\\_primaria=1000187&codigo\\_libro=6676](http://www.ingebook.com/ib/NPcd/IB_BooksVis?cod_primaria=1000187&codigo_libro=6676). ISBN 9786073238472.