

Course guide

230458 - QOB - Organic Chemistry and Biochemistry

Last modified: 25/05/2023

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

Degree: BACHELOR'S DEGREE IN ENGINEERING PHYSICS (Syllabus 2011). (Compulsory subject).

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

LECTURER

Coordinating lecturer: Consultar aquí / See here:
<https://telecos.upc.edu/ca/estudis/curs-actual/professorat-responsables-coordinadors/responsables-assignatura>

Others: Consultar aquí / See here:
<https://telecos.upc.edu/ca/estudis/curs-actual/professorat-responsables-coordinadors/professorat-assignat-idioma>

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Specific:

1. Knowledge of the chemistry laws. Knowledge of the main chemical methods of producing materials and nanomaterials. Ability to conduct and analyze basic chemical reactions.
2. Knowledge of the organic chemistry basis and their use in the production of complex materials and biological systems. Ability to develop the activity in a chemistry lab and produce compounds and/or materials.

Generical:

3. ABILITY TO IDENTIFY, FORMULATE, AND SOLVE PHYSICAL ENGINEERING PROBLEMS. Planning and solving physical engineering problems with initiative, making decisions and with creativity. Developing methods of analysis and problem solving in a systematic and creative way.

Transversal:

2. TEAMWORK - Level 1. Working in a team and making positive contributions once the aims and group and individual responsibilities have been defined. Reaching joint decisions on the strategy to be followed.
1. EFFECTIVE USE OF INFORMATION RESOURCES - Level 1. Identifying information needs. Using collections, premises and services that are available for designing and executing simple searches that are suited to the topic.
4. SELF-DIRECTED LEARNING - Level 1. Completing set tasks within established deadlines. Working with recommended information sources according to the guidelines set by lecturers.

TEACHING METHODOLOGY

Inside class: 2,6 ECTS. Seminal classes (theory + seminars) with the participation of the student. Homework (individual and/or team). Tutorial.

Outside class: 3,4 ECTS. Exercises and projects (theory or seminars).

LEARNING OBJECTIVES OF THE SUBJECT

- Justify the reactivity of the main organic functional groups.
- Define and explain the different basic biochemical functions that allow life to exist.
- Characterize chemical compounds with the most common structural identification techniques.



STUDY LOAD

Type	Hours	Percentage
Hours large group	65,0	43.33
Self study	85,0	56.67

Total learning time: 150 h

CONTENTS

1. INTRODUCTION TO ORGANIC COMPOUNDS

Description:

Bonds in organic compounds. Lewis theory. Resonant structures. Formal charges. Intermolecular forces in organic compounds. Functional groups. Reaction intermediates. Electronic effects. Classification of organic reactions.

Full-or-part-time: 20h

Theory classes: 8h

Guided activities: 4h

Self study : 8h

2. ISOMERISM AND STEREOISOMERISM

Description:

Type of isomers. Structural isomers. Stereoisomers. Enantiomers. Racemic mixtures. Optical activity. Configuration of chiral centers. Absolute and relative configurations. Diastereoisomers. Carbohydrates: The glyceraldehyde. Monosaccharides, disaccharides and polysaccharides.

Full-or-part-time: 16h

Theory classes: 6h

Guided activities: 4h

Self study : 6h

3. ALKANES AND CYCLOALKANES

Description:

Characteristics and structure of alkanes. Conformational analysis. Newman projections. Chemical properties. Halogenation of alkanes. Combustion processes.

Full-or-part-time: 10h

Theory classes: 4h

Guided activities: 2h

Self study : 4h

4. ALKENES AND ALKYNES

Description:

Nomenclature, structure and physical properties. Obtaining alkenes and alkynes. Addition reactions to double and triple bond. Hydrogenation. Dienes. Oxidation and combustion. Metal salts of alkynes. Ethylene and acetylene.

Full-or-part-time: 8h

Theory classes: 4h

Self study : 4h



5. AROMATIC HYDROCARBONS

Description:

Nomenclature, structure and physical properties. Procurement processes. Aromatic substitution reactions. Effect of substituents. Oxidation and combustion. Arens.

Full-or-part-time: 6h

Theory classes: 3h

Self study : 3h

6. HALOGENATED

Description:

Features and halogenated structure. alkyl halides. Physical and chemical properties. Nucleophilic substitution reactions. Elimination reactions. Organo-metallic compounds.

Full-or-part-time: 8h

Theory classes: 4h

Self study : 4h

7. ALCOHOLS, PHENOLS AND ETHERS

Description:

Nomenclature, structure and physical properties. natural products and procurement processes. chemical reactions of hydroxylated compounds. Dehydration of Alcohols. Acid-base characteristics. Ethers. Ethanol and phenol.

Full-or-part-time: 10h

Theory classes: 4h

Guided activities: 2h

Self study : 4h

8. COMPOUNDS CARBONYL. ALDEHYDES AND KETONES

Description:

Structural characteristics of carbonyl compounds. Physical properties. Formation of acetals and hemiacetals. Keto-enol tautomerism. Aldol condensation. Redox reactions.

Full-or-part-time: 10h

Theory classes: 4h

Guided activities: 2h

Self study : 4h

9. CARBOXYLIC ACIDS AND DERIVATIVES

Description:

Acidity. Physical properties. Carboxylic acid chlorides, acid anhydrides, esters, amides. Reactivity of esters. Saponification and hydrolysis reactions. Reactivity of amides. Reduction, formation of nitriles. Lipids: fatty acids. Amino acids and proteins.

Full-or-part-time: 10h

Theory classes: 4h

Guided activities: 2h

Self study : 4h

10. AMINES AND RELATED NITROGEN COMPOUNDS

Description:

Features and structure. Physical properties. Acid-base, redox, peroxide formation. Type amines. Features and structure. Physical properties. Acid-base characteristics.

Nucleic acids: nitrogenous bases.

Full-or-part-time: 10h

Theory classes: 4h

Guided activities: 2h

Self study : 4h

11. SPECTROSCOPY AND STRUCTURAL DETERMINATION

Description:

Structural determination by spectroscopic techniques. Fundamentals of spectroscopy: Electromagnetic spectrum. Infrared spectroscopy. Nuclear magnetic resonance spectroscopy.

Full-or-part-time: 22h

Theory classes: 12h

Guided activities: 2h

Self study : 8h

GRADING SYSTEM

Qualification will include a final exam (EF) and continuous evaluation including a mid-semester exam (EP) and the participation of the student in seminar classes (P). The final qualification will be calculated as follows: $\max\{EF, 0.65*EF + 0.30*EP + 0.05*P\}$

BIBLIOGRAPHY

Basic:

- Vollhardt, K.P.C. Química orgánica. 5a ed. Barcelona: Omega, 2008. ISBN 9788428214315.
- Solomons, T.W.G. Fundamentos de química orgánica. 2a ed. México: Limusa, 1995. ISBN 9789681850074.
- Nelson, D.L. Lehninger principios de bioquímica. 6a ed. Barcelona: Omega, 2015. ISBN 9788428216036.