COURSE DATA

Data Subject	
Code	33975
Name	Organic Chemistry
Cycle	Grade
ECTS Credits	6.0
Academic year	2020 - 2021

Study (s)

Degree	Center	Acad. year	Period
1103 - Degree in Food Science and Technology	Faculty of Pharmacy and Food Sciences	1	First term

Subject-matter

Degree	Subject-matter	Character
1103 - Degree in Food Science and Technology	3 - Chemistry	Basic Training

Coordination

Name	Department
ASENSIO MARTINEZ, AMPARO	325 - Organic Chemistry

SUMMARY

Organic Chemistry is taught in the first semester of first year of the degree in Food Science and Technology and it is a four-month basic training course. The curriculum consists of 6 ECTS credits in total.

This course is intended for students to improve the skills acquired in organic chemistry courses in high school and, in some respects, to complete them. These skills will

establish the essential foundations, so that the student can be subsequently addressed into the study of the various aspects of the Chemistry of food related to organic chemistry and basic compounds that form part of their field of study. Being the subject integrated in the degree of Food Science and Technology, the approach to chemical phenomena under study, should be specifically focused on the processes related to their specific training.

The course has a mixed character (theoretical and practical) and methodology is based on lectures, seminars, tutorials, and classes addressed to the resolution of questions and problems related with topics presented in lectures.

Basic guidelines contained in the program are articulated around the fundamental concepts in organic chemistry. In particular, it is intended that concepts of structure, bonding, functional groups, properties and basic reactivity of special significance organic molecules as components of food will be acquired by students.

PREVIOUS KNOWLEDGE

Relationship to other subjects of the same degree

There are no specified enrollment restrictions with other subjects of the curriculum.

Other requirements

Relationship to other subjects of the same degree
There are no specified enrollment restrictions with other subjects of the curriculum.
Other requirements
There are no other specified requirements.

OUTCOMES

1103 - Degree in Food Science and Technology

- Be able to name and formulate inorganic and organic chemical compounds.
- Be capable of explaining phenomena and processes related to basic aspects of chemistry in an understandable style.
- Capacidad para construir un texto escrito comprensible y organizado.
- Capacidad para trasmitir ideas, analizar problemas y resolverlos con espíritu crítico, adquiriendo habilidades de trabajo en equipo y asumiendo liderazgo cuando sea apropiado.
- Capacidad para interpretar, valorar y comunicar datos relevantes haciendo uso del lenguaje propio de la química orgánica y de las tecnologías de la información y la comunicación.
- Saber aplicar los conocimientos propios del área al mundo profesional.
- Capacidad para buscar y encontrar conocimientos relacionados con el área, siempre aplicando la capacidad crítica y autocrítica.

- Desarrollar habilidades para poder emprender estudios posteriores, especialmente en el ámbito de la investigación científica y el desarrollo tecnológico.
- Know how to apply the general rules of nomenclature for organic compounds, including stereochemistry.
- Know the different functional groups found in organic molecules and relate the presence of functional groups with the physico-chemical properties of organic molecules.
- Know the general reactivity of the most important functional groups found in organic molecules.
- Know the mechanisms of the most important chemical transformations.
- Know the methods most commonly used for obtaining the different types of compounds.
- Be able to relate the presence of functional groups in molecules with their reactivity against different processes (replacement, removal, addition, hydrolysis, oxidation, reduction, etc.).
- Understand and be able to predict the behaviour of organic compounds in different environments (chemical, biological, environmental).
- Develop the ability to estimate the risks associated with the use of chemicals and laboratory processes.

LEARNING OUTCOMES

- To acquire a solid basic knowledge, so that they can continue a successful learning in later courses.
- To improve or begin in the fundamentals of the discipline such as structure, bonding and properties of the most representative organic molecules,and some keys of their reactivity.
- To acquire the basic terminology of organic chemistry and the required know-how to use it, expressing ideas with the accuracy required in the scientific field and being able to establish relationships between the different concepts and chemical and biological phenomena, extracting the chemical keys from the inherent complexity of the latter.
- To develop the ability to create and solve problems in organic chemistry, as well as to interpret the results.
- To be able to search and select information in the field of chemistry applied to chemical and biochemical phenomena and also to present it properly.
- To enhance skills for teamwork.
- To acquire values and attitudes that should be inherent in scientific activity.

DESCRIPTION OF CONTENTS

1. STRUCTURE AND BONDING IN ORGANIC MOLECULES.LEWIS STRUCTURES

Study field of organic chemistry. Structure of the atom. Ionic and covalent bonds. Lewis structures. Resonance forms.

2. CHARACTERISTICS OF ORGANIC COMPOUNDS

Valence Bond Theory. Hybrid orbitals. Polar covalent bonds. Molecular orbitals. Functional groups and classes of compounds.

3. INTERMOLECULAR FORCES

Van der Waals forces. Polar interactions. Hydrogen bonds. Intermolecular interactions and physical properties

4. ACIDITY AND BASICITY IN ORGANIC COMPOUNDS

Acidic and basic organic compounds. Parameters influencing the acidity and basicity of organic molecules

5. ALKANES AND CYCLOALKANES

Definition and classification. Nomenclature. Physical Properties. Conformational analysis. Ring strain. Cyclohexane. Substituted cyclohexanes.

6. CHEMICAL REACTIONS AND MECHANISMS. ALKANES REACTIVITY.

Reaction thermodynamics and kinetics. Reaction mechanisms and intermediates. Bond dissociation energy. Pyrolysis, combustion and halogenation of alkanes: radical reactions.

7. ISOMERISM AND ESTEREOISOMERISM

Concept and types of isomerism. Stereoisomerism: diastereomers and enantiomers. Chiral molecules. Physical properties of the enantiomers. Optical activity. Racemates. Stereogenic centers. Nomenclature: Rule R and S. Fischer Projections. Meso compounds. Resolution.

8. Halogenated Organic Compounds, Alcohols, Amines, Ethers, Thiols and Sulphides.

Structure. Nomenclature. Physical Properties. Acidity and basicity. Polar reactions. Nucleophiles and electrophiles. Substitution and elimination reactions.

9. Alkenes, alkynes, conjugated dienes and aromatic compounds

Structure and nomenclature. Stereoisomerism: Convention E / Z. Physical Properties. Relative stabilities. Conjugated double bonds. Aromaticity. Addition reactions and electrophilic aromatic substitution.

10. THE CARBONYLGROUP: ALDEHYDES AND KETONES

Structure of the carbonyl group. Nomenclature and physical properties of aldehydes and ketones. Nucleophilic addition to the carbonyl group. Addition of water and alcohols. Acetals and hemiacetals. Addition of amines and related compounds. Oxidation reactions. Reduction reactions.

11. CARBOXYLIC ACIDS AND DERIVATIVES

Structure. Nomenclature. Physical Properties. Acidity and basicity. Derivatives of carboxylic acids. Reactivity of the carboxylic group. Transformations of carboxylic acids into their derivatives. Reactions of acid derivatives.

12. CARBOHYDRATES.

Classification and structure. Monosaccharides. Sugars cyclic structure. Disaccharides. Polysaccharides. Sugar derivatives.

13. AMINES AND OTHER NITROGEN COMPOUNDS

Structure and function of nucleic acids. Structure of aminoacids. Acid-base properties. Peptides and proteins: the peptide bond. Structure of peptides and proteins.

14. LIPIDS

Structure and properties of the fatty acids. Lipids of biological interest.

WORKLOAD

ACTIVITY	Hours	% To be attended
Theory classes	45,00	100
Seminars	10,00	100
Tutorials	2,00	100
Development of group work	10,00	0
Study and independent work	8,00	0
Preparation of evaluation activities	12,00	0
Preparing lectures	50,00	0
Preparation of practical classes and problem	10,00	0
TOTAL	**147,00**	

TEACHING METHODOLOGY

The development of the course is structured around different activities: lectures in the theory sessions,tutorials, problem resolution sessions and coordinated seminars.

In **lectures**, an overview of the topic will be given to the students, focusing on those most interesting key concepts for a better understanding. The most recommended resources for further preparation of each issue will also be included.

Concerning **tutorials**, they are one-hour sessions supervised by the teacher, with a small number of students (20 max.) mainly devoted to work on problems, with a total of 2 sessions. Teacher will guide the students on all elements of the learning process, both in terms of global approaches as to specific issues.

The seminar sessions will be basically addressed to the **resolution of problems** and will be developed following two different strategies. In some sessions the teacher will explain a number of selected problems through which students can learn to identify the essential elements of the approach and theresolution of the problems of this topic. Teacher will be the most active agent in this case. In other sessions, the role will entirely fall in the student, who will have to face similar and more complex problems and will expose them to other students.

There will be two seminar sessions coordinated with the other subjects of the first semester, known as **Coordinated seminars** and devoted to oral presentation of works carried out by teams (3-4 students):

- Every student in a team (3-4 students) must prepare a coordinated seminar for semester and course (not all the students will expose works in all the subjects). The participation in this kind of seminars is compulsory to pass Organic Chemistry.

- The coordinator of the first year facilitates the subject for the coordinated seminar to every student, and any incident must be communicated to him.

- Teachers will guide students in the preparation of their reports and oral presentation of the

corresponding topics.

- Students involved in several courses in an academic year will prepare a number of seminars proportional to the number of matters enrolled. In September, these students must contact the coordinators of these different courses.

- Erasmus students must contact with the degree coordinator in the first fifteen days after joining the University of Valencia because he will assign them the corresponding seminars.

- The order of presentation of the different components of each team will be communicated 24 hours before the oral presentation’s time.

- Instructions to elaborate the report and to prepare the oral communication, and also some aspects of the evaluation of these seminars, will be accessible for students in “aula virtual”.

EVALUATION

The assessment of the student learning will take place in three stages:

1- A written test to ensure the level of knowledge and understanding of the subject contents presented in lectures. This section will contribute to the final grade with a percentage of 80%. To pass the course the student must score at least 4.5 (out of 10) in the written test.

2-Participation in lectures, tutorials and seminars not coordinated: This section will contribute to the final grade with a percentage of 10%. It is compulsory to attend tutorials.

3- Coordinated Seminar: Presentation and discussion of a topic related to the contents explained in class. The assesment wiil include subject understanding and skills for presentation and discussion. The contribution to the final grade for this section will be a percentatge of 10%.

- Evaluation (note) of students in a coordinated a seminar will be assumed for other subjects of the same year and term.

- The implementation of the coordinated seminar is mandatory.

The evaluation criteria are unique and public. Evaluation will consider the written essay, the presentation and defense of the work as well as fullfillment of time schedule and the review of other students (after the template in the virtual classroom).

Students that have not passed the subject and need to be re-evaluated will keep the seminar marks during two academic years. After this period, students should present again the coordinated seminar. Students must attend all seminars or adequately justify the reasons for not attending.

- When a student has not performed the written test (item 1) but has passed participation and seminar stages (items 2 and 3), the final assement will be NOT PRESENTED

REFERENCES

Basic

- P. Yurkanis-Bruice, Fundamentos de Química Orgánica (4ª Edición), Ed. Pearson, 2015.
  S.V.Luis, M.I. Burguete, B. Altava, Introducción a la Química Orgánica, Ed. Publicaciones UJI, Castellón, 1997
  http://www.sinorg.uji.es/docencia.htm
  Temario y problemas de Química Orgánica en formato PDF (castellano).
  J. Sales y J. Vilarrasa, Introducción a la nomenclatura química, EDUNSA, Barcelona , 1994 (4ª Edición).
  http://www.chemtube3d.com/
  Estructuras y animaciones 3D interactivas con información complementaria sobre los temas de mayor relevancia en la Quiímica Orgánica de Grado.
  ChemBioOffice Ultra, PerkinElmer (CambridgeSoft)
  Amplia selección de aplicaciones y funcionalidades que permite a químicos y biólogos dibujar, formular, modelar y editar estructuras moleculares químicas y biológicas.

- W.R. Peterson, Nomenclatura de las sustancias químicas (4ª Edición), REVERTE, 2016.

Additional

- D. Klein, Química Orgànica, Ed. Medica Panamericana, 2012.
  -L.J. Wade Jr. Química Orgànica, Ed. Prentice Hall, Pearson Education, 2011 (7ª Edición).
  -K.P.C. Vollhart y N.E. Schore, Química Orgánica, Ediciones Omega, 2007 (5ª Edicion).
  -http://www.cem.msu.edu/~reusch/VirtualText/intro1.htm#contnt
  Contenidos, esquemas y una considerable colección de problemas interactivos de Química Orgánica con videos y gráficos (inglés).
  -P.M. Dewick, Essentials of Organic Chemistry, Ed. Wiley, 2006.

ADDENDUM COVID-19

This addendum will only be activated if the health situation requires so and with the prior agreement of the Governing Council

Volume of work and temporary planning of teaching

The volume of work and temporal planning that appear in the teaching guide is maintained.

Teaching methodology

A hybrid teaching model will be carried out, combining face-to-face and non-face-to-face activities.

Upload to the virtual classroom of the materials for the theoretical classes (slides and notes).

Upload of materials to the virtual classroom.

Proposal of activities for virtual classroom

For non-presencials activities including tutorials and seminars we will use BBC videoconferences.

Evaluation

The evaluation system established in the teaching guide is maintained, maintaining the specific weight of the different sections.