COURSE DATA

Data Subject	
Code	44440
Name	Organic chemistry processes and products
Cycle	Master's degree
ECTS Credits	3.0
Academic year	2022 - 2023

Study (s)

Degree	Center	Acad. year	Period
2209 - M.D. in Chemical Engineering	School of Engineering	1	Second term

Subject-matter

Degree	Subject-matter	Character
2209 - M.D. in Chemical Engineering	12 - Optatividad	Optional

Coordination

Name	Department
STIRIBA LAKANI, SALAH-EDDINE	325 - Organic Chemistry

SUMMARY

The subject “Organic Chemistry Processes and Products” is an optative of 3 ECTS credits, which is taught in Spanish. The subject is of a high divulgative character. It is important for the student, as a candidate to develop his professional career in the industry, to know the main sectors of the chemical industry. Therefore, the chemical industry related to tensioactives, plaguicides, hydrocarbons, polymers and pharmaceutical derivatives would be introduced tu the student. Basic knowledge on chemicals sources, both renewable (oil, natural gas or coal) and non-renewable (biomass). In addition, the student would learn the increassing importance of environmental aspects in the organic chemical industry. Thus, the student would learn the reactivity of organic compounds in the environment, as well as the contribution of chemistry to sustainable development and the principles governing green chemistry.

PREVIOUS KNOWLEDGE

Relationship to other subjects of the same degree

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

Other requirements

Bonding and functional groups in organic compounds.
Naming and formulation of organic compounds.
Representation of the most habitual structures of organic compounds and relation with their physical and chemical properties.
Types of isomerism. Stereochemistry. Geometric isomerism. Cahn-Ingold-Prelog's rules. Chirality: concept of stereogenic center. Compounds with several stereogenic centerscarbon: diastereomers and meso compounds. Optical activity. Racemic mixtures.
Types of chemical reactions. Reacti

OUTCOMES

2209 - M.D. in Chemical Engineering

- Students should apply acquired knowledge to solve problems in unfamiliar contexts within their field of study, including multidisciplinary scenarios.
- Students should be able to integrate knowledge and address the complexity of making informed judgments based on incomplete or limited information, including reflections on the social and ethical responsibilities associated with the application of their knowledge and judgments.
- Students should demonstrate self-directed learning skills for continued academic growth.
- Be able to apply the scientific method and the principles of engineering and economics to formulate and solve complex problems in processes, equipment, facilities and services in which matter changes its composition, state or energy content, these changes being characteristic of the chemical industry and of other related sectors such as pharmacology, biotechnology, materials science, energy, food or the environment.
- Communicate and discuss proposals and conclusions in specialised and non-specialised multilingual forums, in a clear and unambiguous manner.
- Adapt to changes and be able to apply new and advanced technologies and other relevant developments with initiative and entrepreneurship.
- Be able to access information tools in different areas of knowledge and use them properly.
- Be able to assess the need to complete their technical, scientific, language, computer, literary, ethical, social and human education, and to organise their own learning with a high degree of autonomy.
- Be able to defend criteria with rigor and arguments and to present them properly and accurately.

- Be able to take responsibility for their own professional development and specialisation in one or more fields of study.
- Apply critical reasoning to their knowledge of mathematics, physics, chemistry, biology and other natural sciences, obtained through study, experience and practice, in order to establish economically viable solutions to technical problems.
- Be able to solve unfamiliar and ill-defined problems that have specifications in competition by considering all possible methods of solution, including the most innovative ones, and selecting the most appropriate, and correct implementation by evaluating the different design solutions.
- Direct and supervise all types of facilities, processes, systems and services in different industrial areas related to chemical engineering.

LEARNING OUTCOMES

To Provide an overview of organic products most widely applied in industry, and both their preparation processes and most important applications.

To know and classify, from the chemical point of view, organic products from renewable and perishable sources, the processes they are involved in, and their environmental implications.

To know the different types of polymers, their classification and characterization, as well as the principal polymerization processes.

To know and classify the different types of chemical derivatives that act as detergents and surfactants, their composition and environmental behavior.

To know and classify, from the chemical point of view, the dyes, pigments and food additives. Studying the chemical basis for colour.

DESCRIPTION OF CONTENTS

1. Industrial organic processes and products

Organic compounds of industrial interest: Classification. Organic compounds from renewable sources: biomass. Introduction to green chemistry.

2. Polimers and polimerization processes

Classification and characterization of polymers: Degree of polymerization, molecular weight and functionalization. Types and methods of polymerization: Polymerization by addition and condensation. Physical properties of polymers and relationship with their structure. Representative polymers. Environmental implications. Biodegradable polymers.

3. Surfactants and detergents

Mechanisms of detergency. Classification of surfactants. Cationic surfactants. Anionic surfactants. Non-ionic surfactants. Amphoteric surfactants. Estructure and synthesis. Detergent compositions. Environmental behaviour.

4. Dyes, pigments and food additives

Chemical bases of color: chromophores and auxochromes. Introduction and classification of dyes and pigments. Azoic dyes. Anthraquinonoid dyes. Stilbene-derived dyes. Indigo dyes. Manufacture of dye intermediates and dyes. Food additives.

5. Agrochemicals and pharmaceuticals

Classification of agrochemicals. Classification of pharmaceuticals. Discovery and design of biologically and pharmaceutically active compounds. Chirality and activity.

6. Adhesives, coatings and technological materials

The process of adherence. Forms of adhesives. Hot melt adhesives. Thermoset adhesives. Elastomeric adhesives. Natural products. Coatings: Paints and resins. Materials with properties of technological interest.

WORKLOAD

ACTIVITY	Hours	% To be attended
Theory classes	20,00	100
Classroom practices	10,00	100
Study and independent work	15,00	0
Readings supplementary material	5,00	0
Preparation of evaluation activities	15,00	0
Preparation of practical classes and problem	10,00	0
TOTAL	**75,00**	

TEACHING METHODOLOGY

Theoretical activities. Participative magisterial class. Exhibition development of matter with student participation in resolving specific issues.

Practical activities. Learning through problem solving exercises and published scientific reports through which skills about different aspects of the subject are acquired.

EVALUATION

For every call, the assessment will carry out by means of:

- Objective test consisting on an exam featuring theoretical and practical questions as well as problemes (80%). The student must obtain a minimum of 4.5 / 10 so that it can add to the rest of evaluable items.

- Evaluation of practices from the preparation of papers / reports and / or oral presentations activities. (15 %).

- Continuous assessment based on participation and degree of involvement of the student in the teaching-learning process, taking into account regular attendance to onsite activities and resolution of questions and problems proposed (5 %).

REFERENCES

Basic

- Primo Yúfera, E. Química Orgánica básica y aplicada. De la molécula a la industria, Editorial Reverté, Barcelona, 2007
- Wittcoff, H.A. y Reuben, B.G. Productos Químicos Orgánicos Industriales, Editorial Limusa, México, 1996
- ChemBioOffice Ultra, PerkinElmer (CambridgeSoft). Amplia selección de aplicaciones y funcionalidades que permite estudiar, dibujar, formular, modelar y editar estructuras moleculares químicas y biológicas

Additional

- Sierra,M.A y Gallego, M.G. Principios de Química Medioambiental.Editorial Sintesis, Madrid, 2007
- Anastas, P.T. and Williamson, T.C. Green Chemistry: Frontiers in Benign Chemical Syntheses and Processes, Oxford University Press, Oxford, 1998.
- Xavier Doménech, Química Ambiental: El impacto ambiental de los residuos, Miraguano Ediciones, Madrid 2000.
- René P. Schwarzenbach, Philip M. Gschwend, Dieter M. Imboden, Environmental Organic Chemistry: Illustrative Examples, Problems, and Case Studies J. Wiley & Sons, Inc., 2003