

**COURSE DATA****Data Subject**

Code	44440
Name	Organic chemistry processes and products
Cycle	Master's degree
ECTS Credits	3.0
Academic year	2019 - 2020

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 to 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 increasing 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 centers: carbon: diastereomers and meso compounds. Optical activity. Racemic mixtures.

Types of chemical reactions. React

OUTCOMES

2209 - M.D. in Chemical Engineering

- 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

Mainly:

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

And specifically:



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.

To chemically classify and compare agrochemicals and pharmaceuticals, knowing the processes involved in their discovery and design. To study the relationship of chirality with the activity of organic agrochemicals and pharmaceuticals.

To chemically classify the different types of adhesives and coatings of industrial interest.

To describe, from the chemical point of view, the most important organic materials of technological interest.

DESCRIPTION OF CONTENTS

1. Industrial organic processes and products

Organic compounds of industrial interest: Classification. Organic compounds from non renewable sources: Oil and derivatives. 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. Conducting individual evaluation questionnaires.

Practical activities. Learning through problem solving exercises and case studies through which skills about different aspects of the subject are acquired.

EVALUATION



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

- A test consisting of a writing exam featuring theoretical and practical questions as well as problems (65%). The student must obtain a minimum of 4.5 / 10 in such a test, so it can be added to the rest of evaluable items.
- Evaluation of further activities such as the preparation of papers / reports and / or oral presentations of activities related with the thematic issues developed . (25 %).
- Continuous assessment based on the participation and the 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 (10 %).

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 Síntesis, 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



ADDENDUM COVID-19

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

1. Contenidos

Se mantienen los contenidos inicialmente recogidos en la guía docente.

2. Volumen de trabajo y planificación temporal de la docencia

-No se mantienen los horarios, se ha dado al estudiante libertad para realizar las actividades programadas y expuestas en metodología, de acuerdo con su propia programación.

3. Metodología docente

- Subida de material al aula virtual
- Documentos explicativos y detallados de las diapositivas de los temas del contenido
- Preguntas con opciones múltiples (POM) para trabajar cada tema
- Ejercicios finales sobre todo el temario
- Tutorías electrónicas
- Desarrollo de proyectos bibliográficos

4. Evaluación

- Evaluación mediante la realización de trabajos académicos (20%).
- Examen escrito distribuido en el aula virtual (80%).

5. Bibliografía

1. Primo Yúfera, E. Química Orgánica básica y aplicada. De la molécula a la industria, Editorial Reverté, Barcelona, 2007
2. Wittcoff, H.A. y Reuben, B.G. Productos Químicos Orgánicos Industriales, Editorial Limusa, México, 19962.



3. Artículos didácticos seleccionados por el profesor sobre cada tema.

