COURSE DATA

DATA SUBJECT

Code: 44713
Name: Industrial organic chemistry
Cycle: Master's Degree
ECTS Credits: 3
Academic year: 2025-26

STUDY (S)

Degree	Center	Acad. year	Period
2226 - Master's degree in Organic Chemistry	Facultat de Química	1	Annual

SUBJECT-MATTER

Degree	Subject-matter	Character
2226 - Master's degree in Organic Chemistry	Industrial organic chemistry	COMPULSORY

COORDINATION

NAVARRO FUERTES ISMAEL

SUMMARY

In this subject it is intended that the student acquires a body of knowledge directly related to the world of chemical companies in general and agrocchemicals in particular. Nowadays, the training provided to the student during his university education cannot undertake a series of issues directly related to the industrial aspect of chemistry so this course aims to resolve this shortcoming.

The contents of the course are as follows:

- The organic chemical industry. The food industry.

- Industrial chemical processes and sustainability.

- Relative importance of organic products and important industrial sectors of organic chemistry.

- Origin of industrial products from raw materials to finished products: major transformation pathways of carbon.

- Major groups of pesticides and mechanisms of action

- Lead generation.

- Optimization of the lead: general aspects.

- Evaluation and development of the compound.

- Problematic of pesticide residues in the environment and food.

PREVIOUS KNOWLEDGE

RELATIONSHIP TO OTHER SUBJECTS OF THE SAME DEGREE

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

OTHER REQUIREMENTS

The study of this subject requires a good foundation in Organic Chemistry

COMPETENCES / LEARNING OUTCOMES

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Ahondar en el conocimiento de la industria química orgánica, en particular del sector agroquímico, farmacéutico y medioambiental.

Be able to access to information tools in other areas of knowledge and use them properly.

Competencias de gestión tales como la capacidad para la planificación y gestión de tiempo y recursos, así como para dirigir y tomar decisiones.

Poseer habilidades sociales, un buen nivel de comunicación oral y escrita, así como capacidad para trabajar en equipo y con personas de diferentes procedencias.

Profundizar en el conocimiento de las fuentes principales de productos químicos y su manipulación para su transformación posterior en materiales orgánicos de valor añadido.

Reconocer los valores de la química sostenible: utilización de fuentes renovables de materias primas, reducción de sustancias contaminantes y diseño de procesos sostenibles.

Saber participar en debates y discusiones, dirigirlos y coordinarlos y ser capaces de resumirlos y extraer de ellos las conclusiones más relevantes y aceptadas por la mayoría.

Ser capaces de valorar la necesidad de completar su formación científica, en lenguas, en informática, asistiendo a conferencias o cursos y/o realizando actividades complementarias, autoevaluando la aportación que la realización de estas actividades supone para su formación integral.

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 communicate conclusions and underlying knowledge clearly and unambiguously to both specialized and non-specialized audiences.

Students should demonstrate self-directed learning skills for continued academic growth.

Students should possess and understand foundational knowledge that enables original thinking and research in the field.

Use different presentation formats (oral, written, slide presentations, boards, etc.) to communicate knowledge, proposals and positions.

DESCRIPTION OF CONTENTS

1. The organic chemical industry: overview

General characteristics of the chemical industry in general and the organic chemical industry in particular. General classification of the types of products in the chemical industry. Differences between the basic organic chemical industry and the fine chemical industry. R+D+i in the chemical industry: Research as a decisive factor in the organic chemical industry.

2. Main organic products and alternatives to current petrochemicals

The origin of industrial organic carbon: Oil, natural gas, coal, natural products. The major processes of petrochemicals in relation to the organic chemical industry. Main basic organic products: Obtaining and main transformation routes. Possible alternatives to the current petrochemical system.

3. The fine organic chemistry industry.

From petrochemistry to fine chemistry. Transition from the laboratory to industry. Considerations during the scale-up process of a chemical process. Environmental aspects that condition the chemical industry. Regulations applicable to the chemical industry.

4. Agrochemicals. Major groups of pesticides and Mechanisms of Action

Introduction to the modes of action of pesticides. Animal and plant cell. Mechanisms of action of insecticides. Synapse as the molecular target. Acetylcholinesterase inhibitors. Insecticides acting on the

acetylcholine receptor. Modulators of the sodium channel. Antagonists chloride channel associated with GABA. Rianodine receptors.
Main modes of action of herbicides. Photosynthesis inhibitors. Herbicides affecting pigment synthesis. Inhibitors of fatty acid synthesis. Main mechanisms of action of fungicides. Sterol synthesis route. Inhibitors methionine synthesis. Fungicides acting on the electron transport chain. Mitotic inhibitors and cell division. Fungicides non-specific.

5. The agrochemical industry and development of new pesticides

Characteristics of the agrochemical industry. Need for the development of our pesticides. The research and development process. Assajos: In vitro *vs in vivo. The ideal product. Close to series caps. Sources of substances with biological activity: Garbellats d'alt rendiment. * Serendipity. Garbellat croat. Combinatorial Chemistry Chemistry *innovative. Disseny * biorational.
Natural products. Patents of competitors. Optimization of the cap de sèrie: general aspects. Design of new molecules. chemical approaches. Design strategies. * Agrokinetic properties. Natural products. Biorational control methods: the case of sexual pheromones and their application to integrated pest management. physical properties. Selected examples of optimization of series caps (insecticides, fungicides and herbicides). Compost evaluation and development. Assajos biologicals in the camp. Formulations for agrochemical products. What are patents? toxicological studies.

6. The problem of pesticide residues in the environment and food

Socio-economic importance of pesticides. Pesticide residues in food. Maximum residue limits. EFSA and AESAN. Surveillance and control programs. Methods of Analysis of agrochemicals. Immunoanalitics approaches to the analysis of waste. Development and validation of immunoassays.

WORKLOAD

PRESENCIAL ACTIVITIES

Activity	Hours
Theory	16,00
Seminar	14,00
Total hours	**30,00**

NON PRESENCIAL ACTIVITIES

Activity	Hours
Attendance at other activities	0,00
Individual or group project	0,00
Independent study and work	37,00
Preparation of lessons	0,00
Preparation for assessment activities	8,00
Resolution of case studies	0,00

Total hours	**45,00**

TEACHING METHODOLOGY

The subject is raised so that the student is the protagonist of their own learning. Since the beginning of the course students will have all the necessary teaching materials and teaching is structured as follows:

• Lectures (plesential).- In these classes the basic concepts of the subject will be introduced. the active participation of students will be encouraged by raising issues related to the application of concepts and knowledge previously acquired by students.

• Seminars.- This educational activity will be devoted to solving problems and issues with active student participation.

• Works.- In addition, when the teacher deems appropriate, any work related to the program and described in a scientific publication will be proposed.

EVALUATION

The evaluation of the subject will be carried out continuously by the teachers throughout the course and will consist of the following sections.

- Continuous evaluation. 30% of the grade will come from direct assessment of the teachers in theoretical and problem classes and tutorials. In this assessment various aspects are taken into account, among which include:

- Assistance and reasoned and clear participation in the discussions raised.

- Progress in the use of language of the subject.

- Troubleshooting and raising doubts.

- Critical spirit.

- Delivery of exercises.

- Exams and written tests. 70% of the mark will be obtained from the results of the written tests.

- Traditional in-person exams on both theoretical and problem questions, and content related to the subject. These questions and problems will be of such a nature that they force the student to relate different aspects that appear in different topics of the subject or also, if the teachers consider it appropriate, in different subjects of the subject.

- Non in-person exams in which the teachers deliver directly, or send by email, a series of questions that must be resolved by the students, either individually or in groups, at the discretion of the teachers. The student/group must send the answers to the teachers through the same channel mentioned above and within the period established by them.

To pass the subject, a total grade equal to or greater than 5 out of 10 must be obtained. In addition, it will be necessary that in each of the subject exams a minimum grade of 5 out of 10 is achieved and in each of the sections considered in the evaluation a 4.5 out of 10 of the total of the corresponding section is reached.

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