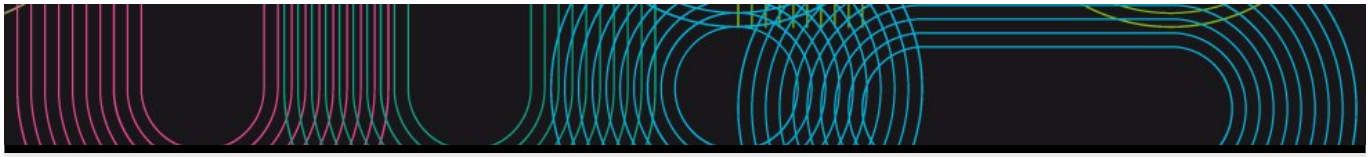

| IDENTIFYING DATA | | | | |
|---|---|---|---|---|
| **Industrial organic chemistry** | | | | |
| Subject | Industrial organic chemistry | | | |
| Code | V12G350V01923 | | | |
| Study programme | Grado en Ingeniería en Química Industrial | | | |
| Descriptors | ECTS Credits | Choose | Year | Quadmester |
| | 6 | Optional | 4th | 1st |
| Teaching language | #EnglishFriendly<br>Spanish | | | |
| Department | | | | |
| Coordinator | Longo González, María Asunción | | | |
| Lecturers | Longo González, María Asunción<br>Moure Varela, Andrés | | | |
| E-mail | mlongo@uvigo.es | | | |
| Web | | | | |
| General description | In this course, the fundamental aspects related to the structure of organic compounds and their reactions are presented. Particular attention will be paid to polymerization methods and techniques, and to the intermediate chemicals most frequently used on an industrial scale, as well as other sectors of interest in the organic chemical industry.<br><br>English Friendly subject: International students may request from the teachers: a) materials and bibliographic references in English, b) tutoring sessions in English, c) exams and assessments in English. | | | |

| Skills | |
|---|---|
| Code | |
| B3 | CG3 Knowledge in basic and technological subjects that will enable students to learn new methods and theories, and provide them the versatility to adapt to new situations. |
| B4 | CG4 Ability to solve problems with initiative, decision making, creativity, critical thinking and the ability to communicate and transmit knowledge and skills in the field of industrial engineering specializing in Industrial Chemistry. |
| C4 | CE4 Ability to understand and apply the basic knowledge of general chemistry, organic chemistry and inorganic chemistry, and their applications in engineering. |
| D2 | CT2 Problems resolution. |
| D9 | CT9 Apply knowledge. |
| D10 | CT10 Self learning and work. |
| D16 | CT16 Critical thinking. |
| D17 | CT17 Working as a team. |

| Learning outcomes | | | |
|---|---|---|---|
| Expected results from this subject | Training and Learning Results | | |
| (*) | B3 | C4 | D10<br>D16<br>D17 |
| New | B3<br>B4 | C4 | D2<br>D9<br>D10<br>D16<br>D17 |
| New | B3<br>B4 | C4 | D2<br>D9<br>D10<br>D16<br>D17 |

| | | | |
|---|---|---|---|
| New | B3<br>B4 | C4 | D10<br>D16<br>D17 |

| Contents | |
|---|---|
| Topic | |
| 1. The organic chemical industry. | 1.1. Introduction and general characteristics.<br>1.2. Raw materials<br>1.3. Petrochemistry<br>1.4. Intermediate products and final products. |
| 2. Fundamental concepts of organic chemistry. | 2.1. Bonds, hybridisation and geometry.<br>2.2. Hydrocarbons. Aromaticity. Resonant structures.<br>2.3. Functional groups.<br>2.4. Intermolecular interactions<br>2.5. Conformations and isomery. |
| 3. Reactivity of organic compounds. | 3.1. Kinetics and mechanisms of reaction.<br>3.2. Homogeneous and heterogeneous catalysis.<br>3.3. Reactivity of organic compounds.<br>3.3.1. Reactivity of substrates<br>3.3.2. Electronic structure of reagents.<br>3.3.3. Reaction intermediates<br>3.4. Types of organic reactions. |
| 4. Ethylene. Propylene. Intermediate and end-products. Polymerisation. | 4.1. Addition reactions.<br>4.2. Industrial products from ethylene.<br>4.3. Industrial products from propylene.<br>4.4. Polymeric materials. Classifications.<br>4.4.1.Polymerisation reactions. Additions and condensations.<br>4.4.2. Polyethylene and polypropylene. |
| 5. Fraction C4. Dienes and polyenes. Intermediate and end-products. Fibres and elastomers. | 5.1. Butenes.<br>5.2. Dienes, types and characteristics.<br>5.3. Synthesis of Diels Alder.<br>5.4. Elastomers.<br>5.4.1. Isoprene rubbers.<br>5.4.2. Isobutylene rubbers.<br>5.4.3. 1,3-butadiene rubbers.<br>5.5. Fibres<br>5.5.1. Acrylic, polyamides and polyesters. |
| 6. Fraction BTX. Intermediate and end-products. Resins. | 6.1. Reactivity of the arenos. Benceno.<br>6.2. Effect of substituentes. Activators and deactivators.<br>6.3. Industrial derivatives of toluene.<br>6.3.1. Production of phenol and its derivatives. Phenolic and epoxi resins<br>6.3.2. Polyesters. Styrene polymers. |
| 7. Other organic compounds of industrial interest. | 7.1. Nitrogen compounds.<br>7.1.1. Dyazonium salts . Dyes and pigments.<br>7.2. Halogenated compounds. Solvents and insecticides.<br>7.3. Oxygene compound. Organic acids, alcohols and ketones of industrial interest.<br>7.4. Tensoactive agents. Types and characteristics. |

| Planning | Class hours | Hours outside the classroom | Total hours |
|---|---|---|---|
| Problem solving | 9 | 27.5 | 36.5 |
| Laboratory practical | 18 | 18 | 36 |
| Mentored work | 1.5 | 14 | 15.5 |
| Lecturing | 16 | 40 | 56 |
| Problem and/or exercise solving | 2 | 0 | 2 |
| Presentation | 2 | 0 | 2 |
| Objective questions exam | 2 | 0 | 2 |

*The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.

| Methodologies | Description |
|---|---|
| Problem solving | Throughout the course, exercises will be solved, either in the classroom or autonomously by the students, and handed out for evaluation if needed. |

| | |
|---|---|
| Laboratory practical | Laboratory practices will be carried out, and they will include questions or exercises, which must be submitted for evaluation. This activity is mandatory to pass the course. |
| Mentored work | Topics related to the contents of the course will be proposed to the students, so that they prepare an<br>individual or group work on any of them. |
| Lecturing | It will consist of the exposition of the contents of the course, based on the proposed bibliography and the documentation provided on the FAITIC platform |

**Personalized assistance**

| Methodologies | Description |
|---|---|
| Lecturing | Personalized attention to students will be provided for all activities in the course, in the hours scheduled for tutorials. |
| Problem solving | Personalized attention to students will be provided for all activities in the course, in the hours scheduled for tutorials. |
| Laboratory practical | Personalized attention to students will be provided for all activities in the course, in the hours scheduled for tutorials. |
| Mentored work | Personalized attention to students will be provided for all activities in the course, in the hours scheduled for tutorials. |

**Assessment**

| | Description | Qualification | Training and Learning Results | | |
|---|---|---|---|---|---|
| Laboratory practical | Attitude, participation and quality of the work carried out in the laboratorywill be considered. In addition the student will respond to questions raised in each of the practices, and deliver the required lab reports. | 20 | B3<br>B4 | C4 | D9<br>D16<br>D17 |
| Problem and/or exercise solving | Partial tests will be carried out, which will include short answer questions and problems, for the evaluation of the skills acquired in relation to the contents of the course. | 30 | B3 | C4 | D9<br>D16 |
| Presentation | The quality of the contents of the delivered work will be evaluated, together<br>with the presentation and the answers to the questions. | 20 | B3<br>B4 | C4 | D10<br>D16<br>D17 |
| Objective questions exam | There will be a final exam, which will include short questions and problems, to evaluate the acquisition of the competences of the course. | 30 | B3<br>B4 | C4 | D2<br>D9<br>D16 |

**Other comments on the Evaluation**

**Partial tests.** During the course there will be a partial eliminatory test, which will include short answer-questions and problems or exercises with a weight in the final grade of 30%

The attendance to laboratory sessions and / or to the partial test will imply a qualification different from Not Presented.

***Final exam 1st edition:*** *It will include the contents not evaluated in the partial test, with a relative weight of 30%. Each student can repeat the evaluation of the contents not passed in the partial test.*

***1st Edition of the qualification record:*** *The final grade will be the weighted sum of those obtained in all the tests carried out (laboratory practices, work presentation and written exams), provided that they have been passed with a grade equal to higher than 5.0. In case of failing or failing to appear to one or both of the written exams, the score of Not passed will be reflected in the qualification record, with a numerical value obtained from the weighted sum of the scores of the lab practices and work presentation. The passed activities (laboratory and work presentation), will be reserved for the second edition of the qualification record.*

***2nd Edition of the qualification record:*** *The grade will be calculated by adding, with the established weighting, the one reflected in the first edition of the qualification record and the one obtained in the extraordinary final exam, only if a mark equal of higher than 5.0 is obtained in the latter. Otherwise, a final qualification of Not passed will be awarded, with a numerical mark equals to that indicated in the first edition of the qualification record.*

**Ethical commitment:**

The student is expected to exhibit adequate ethical behavior. In the case of detecting unethical behavior (copying, plagiarism, unauthorized use of electronic devices, and others) it will be considered that the student does not meet the necessary requirements to pass the course. In this case, the overall grade in the current academic year will be Not passed (0.0). The use of any electronic device during the evaluation tests will not be allowed unless expressly authorized. The fact of introducing an electronic device not authorized in the exam room will be considered a reason for not passing the subject

in this academic year and the overall rating will be Not passed (0.0).

## Sources of information

### Basic Bibliography


Primo Yúfera, E., **Química orgánica básica y aplicada. Tomo I y II.**, Reverté,

Harold, A. Wittcoff, **Productos químicos orgáncios industriales. Vol 1. Materias primas y fabricación.**, Limusa,

Philip S. Baley, **Química orgánica. Conceptos y aplicaciones**, Pearson,

Mª José Climent Olmedo, et al., **Química orgánica. Principales aplicaciones industriales.**, Univ. Politécnica de Valencia,

Harold A. Wittcoff, **Productos químicos orgánicos industriales. Vol 2. Tecnología, formulaciones y usos.**, Limusa,


### Complementary Bibliography


Green, Mark M., **Organic chemistry principles and industrial practice.**, Wiley -VCH,

McMurry, **Química orgánica.**, Cengage,

Harold A. Wittcoff, **Industrial Organic Chemicals**, Wiley,

Issa Katime Amashta, et al., **Introducción a la ciencia de los materiales poliméricos. Síntesis y caracterización.**, Univ. País Vasco.,


## Recommendations

### Subjects that are recommended to be taken simultaneously

Bioelectrochemistry/V12G350V01921
Biotechnological processes and products/V12G350V01922

### Subjects that it is recommended to have taken before

Chemistry: Chemistry/V12G350V01205
Experimentation in industrial chemistry 1/V12G350V01505
Experimentation in industrial chemistry 2/V12G350V01602
Chemical engineering 2/V12G350V01503
Industrial chemistry/V12G350V01504

### Other comments

To enroll in this course it is necessary to have passed or be enrolled in all the subjects of the courses lower than the course in which this subject is scheduled.

In case of discrepancies, the Spanish version of this guide will prevail.