ENGLISH FRIENDLY COURSES (EFC) 2021/2022 – CAMPUS OF GIPUZKOA


Coordinator: quimicas.internacional@ehu.eus

In addition to the general offer of courses taught in English, some Centers offer for incoming students English Friendly Courses (EFC): subjects taught in Spanish or Basque, in which the syllabus summary, lecturer tutoring, examinations and/or papers are available in English.

**English Friendly Courses taught in SPANISH:**

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<tr>
<th>COURSE</th>
<th>SEMESTER</th>
<th>CREDITS</th>
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1 SCHEDULE: Morning (M)/ Afternoon (A): begins at 13.30.
By clicking the subject’s name, its Syllabus will appear.
<table>
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COURSE GUIDE 2021/22

Faculty 215 - Faculty of Chemistry  
Degree GQUIMI20 - Bachelor's Degree in Chemistry  
Cycle Not Applicable  
Year Second year

COURSE

26113 - Organic Chemistry I  
Credits, ECTS: 9

COURSE DESCRIPTION

Basic concepts of Organic Chemistry, such as molecular structure and reactivity of the principal functional groups will be presented. This knowledge will be applied to the synthesis of structurally simple molecules.

COMPETENCIES/LEARNING RESULTS FOR THE SUBJECT

Basic structural features, and chemical and physical properties, of hydrocarbons and other families of organic compounds are covered along with an introduction to organic reactions mechanisms.

The aim is that students develop basic competences as specified in RD 1393/2007 that correspond to the sophomore level. Also, the following transversal competences (Fundamental Module M02) will be acquired:

- M02CM08: the ability to discern the appropriate instrumental technique, individual or combined, for the characterization of chemical substances.
- M02CM09: the ability to present, orally and on written, chemical processes and phenomena in a clear and understandable manner.

Likewise, taking this subject should allow students to acquire the following competences specific to Organic Chemistry:

- M02CM02: to know the structure, properties, preparation methods and main reactivity patterns of chemical elements and compounds derived thereof, either organic or inorganic.
- M02CM03: the ability to plan and carry out simple processes of synthesis and characterization of compounds. To carry out chemical experiments in a reliable manner, using appropriate techniques, and monitoring the relevant observations and their correct interpretation.
- M02CM05: To understand the relationships between chemical structure, properties and processing of the different types of materials and their aftermath classification according to the applications sought.

The coordination, both horizontal and vertical, of the subject within the Module and the Degree will be supervised by the Commission of Coordination of the Degree.

CONTENIDOS TEÓRICO-PRÁCTICOS


The carbonyl group and derivatives. Aldehydes and ketones. Structure, obtaining and reactivity.


TEACHING METHODS

All teaching resources regarding the subject will be available on the web of UPV/EHU at the outset of the fall. Lectures will be combined with as many as possible face-to-face sessions devoted to exercises. Additional exercises and problems will be also provided for personal training. Doubts and questions will be solved individually during tutorial hours. Efforts will be directed to get as much direct student-teacher interaction as possible.

TYPES OF TEACHING

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<th>Hours of face-to-face teaching</th>
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Legend:  
M: Lecture-based  
S: Seminar  
GL: Applied laboratory-based groups  
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TA: Workshop  
TI: Industrial workshop  
GCA: Applied fieldwork groups

Evaluation methods

- Continuous evaluation
- End-of-course evaluation

Evaluation tools and percentages of final mark

B) CONTINUOUS ASSESSMENT
Continuous assessment will be applied during the ordinary call only, with the following parts and percentages:

- 20% Two written exams covering parts of the subjects in progress.
- 80% Final written exam fully covering the subjects.

If someone does not make the exam, he or she will be rated cero. In case it is the Final exam, the ordinary call would get extinct.
To be eligible for averaging, a mark of 4.0 or higher must be obtained in the Final exam.
Students have the option to renounce a call by informing in writing the professor in charge of the subject. Requests need to be submitted before the fixed deadline, which will be not before one month in advance to the end of the lecturing period.
Should this action be taken the subject will be rated as NOT PRESENTED (thee call will not get extinct).

C) ASSESSMENT BY SINGLE FINAL EXAMINATION
Assessment by a single examination is feasible only if a renounce to the continuous assessment has been submitted by the student on time. Requests need to be submitted in writing to the professor in charge of the subject during the first 18 weeks of regular lecturing period.
The single Final examination will account for 100% of the grading.
If someone does not make the Final exam, the grading will be NOT PRESENTED and the call will not get extinct.

ORDINARY EXAMINATION PERIOD: GUIDELINES AND OPTING OUT

- Written test, open questions  80%
- Exercises, cases or problem sets  20%

EXTRAORDINARY EXAMINATION PERIOD: GUIDELINES AND OPTING OUT

Special call will consist of a single Final Examination which will account for 100% of the grading.
If someone does not make such a Final Exam, the grading will be NOT PRESENTED and the call will not get extinct.

MANDATORY MATERIALS
At least one book among the basic titles listed below is highly recommended. The professor in charge of the subject will give additional directions.

BIBLIOGRAFÍA

Basic bibliography

Detailed bibliography

Journals
Organic Letters: http://pubs.acs.org/journal/orlef7
Web sites of interest

Organic Resources Worldwide: http://www.organicworldwide.net/
Grupo especializado de química orgánica de la RSEQ: http://www.ucm.es/info/rsequim/geqo/
Chemical and Engineering News: http://www.ucm.es/info/rsequim/geqo/
Blog de Química: http://elblogdeuhogris.blogspot.com/

OBSERVATIONS
This subject deals with instrumental analysis concepts and contents, the basis of the instruments functioning and instrumental techniques classification. Students are trained in methods of standardization and univariate calibration. Finally, and more in detail, the following instrumental techniques are described: spectroscopic, chromatographic and electroanalytic techniques.

COMPETENCIES/LEARNING RESULTS FOR THE SUBJECT

The specific M02CM04 skill and cross-skills M02CM08, M02CM09 and M02CM10 are developing.

M02CM04 - Possess knowledge of the analytical process and the various stages involved and be able to plan, apply and process the most appropriate analytical methods in each specific case.

M02CM08 - Be able to select different simple or combined instrumental techniques for the characterisation of chemical substances.

M02CM09 - Be able to make verbal and written presentations of phenomena and processes related to chemistry and similar subjects in a comprehensible way.

M02CM10 - Be able to search for and select information in the field of chemistry and other sciences through the use of the literature and information technologies.

Vertical and horizontal coordination of the subject in the module and the Bachelor's Degree corresponds to the Bachelor's Degree coordination commission.

CONTENIDOS TEÓRICO-PRÁCTICOS

1. Instrumental data treatment
   OPTICAL METHODS
2. Fundamentals of optical methods
3. Spectrophotometry
4. Spectrofluorimetry
5. Turbidimetry and nephelometry
6. Atomic spectroscopy
   CHROMATOGRAPHIC AND ELECTROPHORETIC METHODS
7. Fundamentals of chromatography
8. Gas chromatography (GC).
9. Liquid chromatography (HPLC).
10. Capillary electrophoresis
   ELECTROCHEMICAL METHODS
11. Potentiometry
12. Methods based on electrochemistry

TEACHING METHODS

Lessons consist of:

a. Explanation of theory and exercises. In some cases, a computer is used.

b. Realization of exercises and works by students, in groups or individually. In some cases, a computer is used.

c. Oral presentation of a work.

TYPES OF TEACHING

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Evaluation methods

- Continuous evaluation
- End-of-course evaluation

Evaluation tools and percentages of final mark
- Written test, open questions  70%
- Otros  30%

ORDINARY EXAMINATION PERIOD: GUIDELINES AND OPTING OUT

CONTINUOUS EVALUATION:
It is necessary to participate in all parts in which the subject is divided.
It is mandatory to attend all the classes in the computers room.
Marks below 5.0 out of 10.0 can not be compensated.
It is necessary that the mark is compensated among the questions in theory and problems in order to pass the exam. A cut-off mark of 3.0 is applied.
Marks among first and second mid-term have to be compensated in order to pass the exam. A minimum mark of 5.0 is necessary in each part.
Students under continuous evaluation can refuse exam call at any time until a month before the ending of the classes by a writing addressed to the teacher. Otherwise, students are having a failing grade in the subject even though they are not attending the exam. These criteria are specified in chapter 2, article 12 of the EHU Bachelor's Degree students evaluation regulation.

FINAL EVALUATION:
A final proof able to evaluate of the skills to be acquired in the subject is given. All the individual parts of the proof should be passed.
To be evaluated by an unique final proof, students have a period of 18 weeks from the beginning of the course to ask for this option. Criteria to refuse to the continuous evaluation are stablished in chapter 2, article 12 of the EHU Bachelor's Degree students evaluation regulation.

EXTRAORDINARY EXAMINATION PERIOD: GUIDELINES AND OPTING OUT

The extraordinary call consists of a final proof. Anyway, positive partial results obtained in the ordinary call can be saved.

MANDATORY MATERIALS

Consult the student guide.

BIBLIOGRAFIA

Basic bibliography

Detailed bibliography

Journals
Web sites of interest

http://www.asdlib.org
http://www.chromacademy.com/
COURSE GUIDE 2021/22

Faculty 215 - Faculty of Chemistry
Degree GQUIMI20 - Bachelor's Degree in Chemistry

COURSE
26127 - Analytical Chemistry I

COURSE DESCRIPTION
As it is the first subject of the Analytical Chemistry area that the student will follow, its main goal is to introduce the analytical process from a global point of view, starting from the sampling design, following with the real sampling and the analysis and ending with the evaluation of the results. A special importance will be given to the sampling and sample treatment, separation methods (non chromatographic ones), and to the application of chemical analytic methods (volumetry and gravimetry). In addition, some lab practices have been included to help understanding the basic operations of this topic.

COMPETENCIES/LEARNING RESULTS FOR THE SUBJECT
M02CM04 - Possess knowledge of the analytical process and the various stages involved and be able to plan, apply and process the most appropriate analytical methods in each specific case.
M02CM08 - Be able to select different simple or combined instrumental techniques for the characterisation of chemical substances.
M02CM09 - Be able to make verbal and written presentations of phenomena and processes related to chemistry and similar subjects in a comprehensible way.
M02CM10 - Be able to search for and select information in the field of chemistry and other sciences through the use of the literature and information technologies.

CONTENIDOS TEÓRICO-PRÁCTICOS


Liquid-liquid extraction. Organic solvents. Equilibrium distribution and efficacy. Metallic chelants extraction.


TEACHING METHODS
The cronogram of the unit will be explained at the beginning of the course. The lectures hours and the data of the practical laboratory are available at the Faculty website.

TYPES OF TEACHING

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Evaluation methods
- Continuous evaluation
- End-of-course evaluation

Evaluation tools and percentages of final mark
- Written test, open questions 60%
- Exercises, cases or problem sets 20%
- Oral presentation of assigned tasks, Reading 10%
- Computer based practices and problems solving 10%

**ORDINARY EXAMINATION PERIOD: GUIDELINES AND OPTING OUT**

The ordinary evaluation will be divided in the terms presented in the table above.

**EXTRAORDINARY EXAMINATION PERIOD: GUIDELINES AND OPTING OUT**

Same criteria as in the ordinary evaluation.

**MANDATORY MATERIALS**


**BIBLIOGRAFÍA**

**Basic bibliography**


**Detailed bibliography**


**Journals**


**Web sites of interest**

http://www.asdl.org

**OBSERVATIONS**

Final evaluation system can be used by the students that cannot make the continuous modality. It will consist in the three tests that have been presented before, and they will produce 100% of the mark.
This is an applied subject and its main goal is to develop the student’s ability to investigate in literature on a specific analytical problem and to identify, evaluate and propose analytical solutions to the problem. During the first part of the course, the student will receive a global vision on the applications of analytical chemistry in Biosciences regarding needs of society, ways of approaching the sample, most common instrumental techniques and future challenges. The students will dedicate the second part of the course to solving a specific analytical problem through a bibliographic search. This searching process will be discussed and evaluated along the academic year in different seminars.

COMPETENCIES/LEARNING RESULTS FOR THE SUBJECT

M03CM06 - Be able to understand the nature of an analytical problem, investigate it in the literature and identify, assess and present analytical solutions.
M03CM11 - Be able to design, programme and carry out experimental processes and use adequate instrumental techniques for different types of chemical problems.
M03CM12 - Possess knowledge of the network tools and services that enable searches for information in the field of chemistry and similar fields.
M03CM14 - Be able to use the information and knowledge gained from the module for training in existing or emerging fields related to chemistry.
M03CM16 - Employ advanced mathematical techniques to consider and resolve matters related to chemistry (data-processing, modelling, etc.).
M03CM17 - Demonstrate observation, analysis and synthesis skills with a capacity for criticism and self-criticism.
M03CM18 - Demonstrate a capacity for learning and for autonomous work for professional development.
M03CM19 - Be able to manage, organise and plan chemical processes, applying criteria of quality and environmental conservation.
M03CM20 - Relate chemistry with other disciplines and understand its impact on the industrial and technological society and the importance of the industrial chemical sector.

CONTENIDOS TEÓRICO-PRÁCTICOS

1. Introduction. The analytical process
2. Application fields of analytical chemistry
3. Food analysis
4. Pharmaceutical analysis
5. Clinical analysis
6. Forensic analysis
7. Environmental analysis
8. Applied chemometrics

TEACHING METHODS

Classroom time will be divided in:
> Master classes: lectures on advanced analytical techniques not explained in previous analytical chemistry courses like immunoassays, biosensors, LC-MS or Raman Spectroscopy.
> Computer classes: introduction to chemometrics. Hands on learning using the The Unscrambler (Camo) software for multivariate data analysis.
> Seminars: introduction will be given to general aspects of applied analysis in Biosciences fields like food analysis, forensic analysis or pharmaceutical analysis. Next, the teacher will propose specific analytical problems that students will solve in groups using scientific literature. Finally, a written report will be written and an oral presentation will be given in final seminar. The data for this final presentation will be decided depending on the number of students and groups.

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Evaluation methods

- Continuous evaluation
- End-of-course evaluation

Evaluation tools and percentages of final mark

- Written test, open questions  55%
- Exercises, cases or problem sets  25%
- Teamwork assignments (problem solving, Project design)  15%
- Oral presentation of assigned tasks, Reading  5%

ORDINARY EXAMINATION PERIOD: GUIDELINES AND OPTING OUT

1) To pass the course, a minimum grade of four will be required in the written exam.

2) Failure to make the report of the research work and/or the oral presentation (or to do it after the deadline) will suppose a zero in the corresponding sections.

3) In accordance with the regulations for the evaluation of undergraduate students of the UPV/EHU, students are entitled to be evaluated through the final evaluation system, regardless of whether or not they have participated in the continuous assessment system. To do this, students must send in writing to the teacher responsible for the subject, the waiver of continuous assessment before 18th week of the academic year, in accordance with the academic calendar of the center.

4) The resignation to the call will mean the qualification of "not presented". In the case of continuous evaluation, students can waive the call in a period that, at least, will be up to one month before the end date of the teaching period of the corresponding subject (week 26 in the teaching calendar). This waiver must be submitted in writing to the teacher responsible for the subject.

EXTRAORDINARY EXAMINATION PERIOD: GUIDELINES AND OPTING OUT

1) Students who do not pass the subject in the ordinary call, regardless of the evaluation system taken, will have the right to present themselves to the exams and evaluation activities that make up the final evaluation test of the extraordinary call.

2) The evaluation in the extraordinary call will be done exclusively through the final evaluation system. The final evaluation test of the extraordinary call will consist on as many exams and evaluation activities necessary to evaluate and measure the defined learning results, in a way comparable to how they were evaluated in the ordinary call. However, the positive marks obtained by students during continuous evaluation will be kept for the extraordinary call.

3) In the case of having obtained negative results in the continuous assessment carried out during the course, these results cannot be maintained for the extraordinary call. In these cases, the students will be able to obtain 100% of the grade through the final evaluation.

MANDATORY MATERIALS

Se indicará cada curso en la Guía Docente.

BIBLIOGRAFÍA

Basic bibliography


S. Bell, Forensic Chemistry. Pearson (New Jersey, 2006).


Detailed bibliography


R.A. Meyers (Editor), Encyclopedia of Analytical Chemistry. Wiley & Sons (Chichester, UK, 2000).

**Journals**


**Web sites of interest**

**OBSERVATIONS**
### COURSE GUIDE 2021/22

<table>
<thead>
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<th>Faculty</th>
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### COURSE

| 26114 - Organic Chemistry II | Credits, ECTS: 9 |

### COURSE DESCRIPTION

Organic Chemistry II  
Type: Compulsory.  
Titulación: Degree in Chemical Sciences.  
Degree: Second Cycle  
Departamento: Organic Chemistry I.  
Credits: 9

### COMPETENCIES/LEARNING RESULTS FOR THE SUBJECT

- Introduction to the course:

  In the first cycle of the Degree, students complete the basic course Organic Chemistry I, which is focused on the study of the basic characteristics and reactivity of the most frequent functional groups in organic compounds. In addition, the basic training is completed with the study of conjugated and aromatic systems along with the most important heterocycles. The course Organic Chemistry II is designed to delve into two main areas: stereochemistry and organic synthesis for which the students already know the fundamental principles. Most part of the first semester is focused on knowing in detail the structure, symmetry and stereochemistry of organic compounds. The reminder of the first and the second semester deals with modern methods in organic synthesis, through general reactions and their specific versions, and the knowledge of fundamental reaction mechanisms considering chemo- and stereoselectivity aspects. The final objective of this course is to acquire enough skills to become capable of proposing short syntheses of simple molecules.

- Previous knowledge and recommendations:

  It is recommended, although not a prerequisite, to have passed the course Organic Chemistry I.

### CONTENIDOS TEÓRICO-PRÁCTICOS

Objectives of the course:

1. Structure, symmetry and stereochemistry.  
   To provide an introduction to the shape of organic molecules and the basic principles and nomenclature of stereogenic elements in organic molecules.  
   - Diastereoselectivity.  
   - Stereoselective reactions.  
   - Enantiomers and chirality.  
   - Stereoisomers and constitutional isomers.  
   - Absolute and relative stereochemistry.  
   - Determination of stereochemistry by spectroscopic methods.

   - Acidity, basicity, and pKa.  

3. C=C bond formation:  
   - &61538; elimination reactions (E1, E2 and E1cB).  
   - Pyrolytic syn elimination.  
   - Fragmentation reactions.  
   - Alkenes from hydrazones, 1,2-diols or alquines.  
   - Controlling the geometry of double bonds (Wittig reaction and its variants, Julia and Peterson olefinations)  
   - Olefin Metathesis.

4. Functionalization of alkenes:  
   - Electrophilic addition to alkenes.  
   - Electrophilic alkenes.  
   - Nucleophilic conjugate addition to alkenes.
5. Oxidations:
- Oxidizing agents.
- Catalytic hydrogenation.

6. Reductions:
- Reduction of carbonyl groups (Hydride additions).
- Catalytic hydrogenation.

**TEACHING METHODS**

Teaching methods:

In the development of the subject, a mixed methodology based on cooperative learning and self-learning will be followed. The face-to-face activities of the subject are structured mainly on master classes with great content in theoretical aspects and the individual resolution of specific problems.

Classroom activities:

1. Theoretical classes: Approximately 45 hours.
   The main concepts and theoretical contents of the subject will be introduced in the theoretical classes. With the support of the blackboard and the Power-Point presentations, the teacher will present the objectives and contents of each topic and explain the basic and fundamental aspects of the subject. The student will have, in the days prior to its start, all the material presented necessary to monitor the classes in the Virtual Campus of the UPV / UHU.

2. Practical classes: Approximately 20 hours.
   Preferably, problems proposed by the teacher will be solved that will contribute in a decisive way to apply the knowledge acquired in the theoretical classes. Students must have previously worked on the problems that will be solved. For which, the proposed exercises and any other necessary material will be delivered well in advance of the seminar class.

**TYPES OF TEACHING**

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**Evaluation methods**

- Continuous evaluation
- End-of-course evaluation

**Evaluation tools and percentages of final mark**

- Written test, open questions 70%
- Exercises, cases or problem sets 30%

**ORDINARY EXAMINATION PERIOD: GUIDELINES AND OPTING OUT**

Evaluation methods and percentage in the final mark:

Mixed evaluation:

20% Partial written exam (does not eliminate subject).
50% Final written exam.
10% Seminars.
20% Laboratory practices.

1. To pass the course it is necessary to obtain a minimum mark of 4.0 in the final exam and to pass the laboratory practices.

2. The non-completion of the partial exam and seminars (or their presentation after the deadline) will imply a zero for said test. Failure to submit to the final written exam will suffice to be qualified NOT PRESENTED (no call is required).
regardless of whether the partial exam or seminars have been taken.

3- The mark obtained in the partial exam and the seminars is only valid for the first call. In case of failing the first call, the second call will only be evaluated as a single exam with 80% of the grade.

**EXTRAORDINARY EXAMINATION PERIOD: GUIDELINES AND OPTING OUT**

80% Final written exam.  
20% Laboratory practices.

1- To pass the subject it is necessary to obtain a minimum grade of 5.0 in the final exam and to pass the laboratory practices.  
2- Failure to submit to the final written exam will suffice to be qualified NOT PRESENTED (no call is required).

**MANDATORY MATERIALS**

El indicado por el profesor y al menos un texto de la bibliografía básica. Material personal de laboratorio, en especial bata, gafas de seguridad, espátula y guantes de látex.

**BIBLIOGRAFÍA**

**Basic bibliography**

Structure, symmetry and stereochemistry:


Organic reactions. Reactivity and mechanisms:

7. D. Klein, Química Orgánica, Ed. Panamericana, 2014

**Detailed bibliography**


**Journals**

Organic Syntheses: http://www.orgsyn.org/  
Organic Letters: http://pubs.acs.org/journal/orlef7  
Organic and Biomolecular Chemistry: http://www.rsc.org/Publishing/Journals/Ob/Index.asp  
The Journal of Chemical Education: http://jchemed.chem.wisc.edu/

**Web sites of interest**

Organic Resources Worldwide: http://www.organicworldwide.net/  

**OBSERVATIONS**
In this subject the knowledge in the area of Inorganic Chemistry is deepened through the Coordination Chemistry and the Organometallic Chemistry. Furthermore, the basics of Inorganic Solids Chemistry are introduced.

COMPETENCIES/LEARNING RESULTS FOR THE SUBJECT

Students will acquire the basic skills defined in RD 1393/2007 for Chemistry, and the general skills for the Fundamental Unit. Furthermore, the more specific skills related to Inorganic Chemistry such as the bonding in coordination and organometallics, structure and most important reactions, thermodynamic, kinetic and application aspects will be developed. The student will also be able to understand the structure, reactivity and properties of inorganic solids and to determine them by the use of instrumental characterization.

- M02CM02 - Possess knowledge of the structure, properties, preparation methods and the most important chemical reactions of the chemical elements and their organic and inorganic compounds.
- M02CM03 - Possess the capacity to plan and perform simple laboratory processes for the synthesis and characterisation of chemical compounds safely and using appropriate techniques, as well as to evaluate and interpret the data returned from experimental observations in the various fields of chemistry.
- M02CM04 - Possess knowledge of the analytical process and the various stages involved and be able to plan, apply and process the most appropriate analytical methods in each specific case.
- M02CM05 - Understand the relationships between the structure, properties and processing of the various types of materials and their selection according to each application.

The Degree Coordination Committee will guarantee horizontal and vertical coordination of the course both in the Unit and in the Degree.

CONTENIDOS TEÓRICO-PRÁCTICOS

Coordination compounds. Structure and bonding.


TEACHING METHODS

The evaluation will be done as follows:
- Written exam corresponding to the theoretical part (it can be divided in several parts): 70% of the final mark.
- Continuous evaluation of the laboratory work (notebook, reports, work, results, test type exam): 20% of the final mark.
- Directed academic activities (solving of questions, preparation of reports, dissertations): 10% of the final mark.

Remarks:
The minimum mark required in the exams is 4.0 (over 10)
The assistance to the laboratory is compulsory.

TYPES OF TEACHING

<table>
<thead>
<tr>
<th>Types of teaching</th>
<th>M</th>
<th>S</th>
<th>GA</th>
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- TA: Workshop
- TI: Industrial workshop
- GCA: Applied fieldwork groups
Evaluation methods
- Continuous evaluation
- End-of-course evaluation

Evaluation tools and percentages of final mark
- Written test, open questions 70%
- Exercises, cases or problem sets 10%
- Prácticas de laboratorio 20%

ORDINARY EXAMINATION PERIOD: GUIDELINES AND OPTING OUT
The evaluation will be done as follows:
- Written exam corresponding to the theoretical part (it can be divided in several parts): 70% of the final mark.
- Continuous evaluation of the laboratory work (notebook, reports, work, results, test type exam): 20% of the final mark.
- Directed academic activities (solving of questions, preparation of reports, dissertations): 10% of the final mark.
Remarks:
The minimum mark required in the exams is 4.0 (over 10)
The assistance to the laboratory is compulsory.

EXTRAORDINARY EXAMINATION PERIOD: GUIDELINES AND OPTING OUT
The evaluation will be done as follows:
- Written exam corresponding to the theoretical part: 80% of the final mark. (A minimum of 4.0 is required in this field)
- Evaluation of the laboratory work (notebook, reports, work, results, test type exam): 20% of the final mark. (A minimum of 4.0 is required in this field)
Remarks:
The assistance to the laboratory is compulsory.
The mark "non presented" will be given to those students non taking the final exam.

MANDATORY MATERIALS

BIBLIOGRAFÍA
Basic bibliography

Detailed bibliography

Journals
Inorganic Chemistry, ACS Publications
Dalton Transactions, The Royal Society of Chemistry
European Journal of Inorganic Chemistry, Wiley
Inorganica Chimica Acta, Elsevier
Polyhedron, Elsevier
Inorganic Syntheses, Wiley
The Journal of Chemical Education, ACS Publications
Web sites of interest
It will be indicated each year.
COURSE 2021/22

Faculty 215 - Faculty of Chemistry
Degree GQUIM20 - Bachelor's Degree in Chemistry

COURSE DESCRIPTION
This subject introduces the students to the industrial aspects of Chemistry and it gives them the basic knowledge and skills to analyze, design and operate basic equipment in the chemical industry. Contents include concepts such as basic operation, property balances and the mathematical modeling of chemical reactors.

COMPETENCIES/LEARNING RESULTS FOR THE SUBJECT
The competences the student must acquire are:
- Capacity to apply the basic principles of Chemistry in the study of industrial chemical processes.
- Ability to present subjects in the chemical engineering area, in a comprehensible way.
- Capacity to search and select relevant information in the chemical and scientific fields, employing paper and electronic bibliography.
- Ability to relate the chemistry knowledge with other scientific fields and evaluate the impact of chemistry and the chemical industry in the modern world.

The Grade Coordination Commission will guarantee the coordination of this subject with the other ones within the Grade in Chemistry.

CONTENIDOS TEÓRICO-PRACTICOS
1.-Introduction: Chemical engineering. Processes and operations in the chemical industry.

TEACHING METHODS
The subject includes on-site classes with the teacher and seminars where the student must solve and discuss problems on chemical engineering. In the first semester, Problem Based Learning will be implemented.

TYPES OF TEACHING

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Evaluation methods
- Continuous evaluation
- End-of-course evaluation

Evaluation tools and percentages of final mark
- Written test, open questions  50%
- Exercises, cases or problem sets  45%
- Teamwork assignments (problem solving, Project design)  5%

ORDINARY EXAMINATION PERIOD: GUIDELINES AND OPTING OUT
The evaluation of the subject will be done by written exams (70%) and by resolution of exercises carried out in groups (30%).
At the end of the first semester, a partial exam can be written. This exam will have a theoretical (50%) and a practical (50%) part. In order to make the average, a minimum mark of 3 should be obtained in each part. If this partial exam is passed, the subjects corresponding to this part will no be evaluated again in the final exam.
The final mark will be the average of the marks obtained in each semester, if a minimum of 4 has been obtained in the exam of each of them.
In order to obtain a "non-presented" mark, it is enough not to assist to the final exam. If the student wants to write a final exam with a value of 100% of the mark, it will have to be asked to the teacher before the 18th week of the course.

**EXTRAORDINARY EXAMINATION PERIOD: GUIDELINES AND OPTING OUT**

Written exam with a value of 100%. This exam will have a theoretical (50%) and a practical (50%) part. In order to make the average, a minimum mark of 3 should be obtained in each part. If a student does not appear to this exam, a "non-presented" mark will be given.

**MANDATORY MATERIALS**

It will be said at the beginning of the course.

**BIBLIOGRAFÍA**

**Basic bibliography**
- G. Calleja (Ed.): "Nueva introducción a la Ingeniería Química" (2 vol.). Ed. Síntesis (Madrid, 2016).

**Detailed bibliography**
- J.M. Coulson y J.F. Richardson: "Ingeniería Química (varios volúmenes)". Ed. Reverté.

**Journals**
- Chemical Engineering Journal: https://www.journals.elsevier.com/chemical-engineering-journal
- Education for Chemical Engineers: https://www.journals.elsevier.com/education-for-chemical-engineers
- Chemical Engineering Educators: http://journals.fcla.edu/cee

**Web sites of interest**
- https://www.industriaquimica.es/
- http://www.chemengonline.com/

**OBSERVATIONS**
COURSE GUIDE 2021/22

Faculty 215 - Faculty of Chemistry
Degree GQUIM20 - Bachelor's Degree in Chemistry
Cycle Not Applicable
Year Fourth year

COURSE
26131 - Projects in Industrial Chemistry

Credits, ECTS: 6

COURSE DESCRIPTION
This subject in an introduction to the Chemical Industry and presents the concepts and tools employed in this sector to the student. The content includes a description of the steps for the design, management and development of chemical engineering industrial projects and a survey of the chemical industry. Finally, an introduction to the principles of chemical process safety is given.

COMPETENCIES/LEARNING RESULTS FOR THE SUBJECT
The competences the student must acquire are:
M02CM07- Possess the ability to apply the basic principles of chemistry to industrial chemical operations and carry out chemical installation projects.
M02CM09- Be able to make verbal and written presentations of phenomena and processes related to chemistry and similar subjects in a comprehensible way.
M02CM10- Be able to search for and select information in the field of chemistry and other sciences through the use of the literature and information technologies.
M02CM11- Be able to relate chemistry with other disciplines and understand its impact on today's society and the importance of the industrial chemical sector.
The Grade Coordination Commission will guarantee the coordination of this and other subjects within the Grade in Chemistry.

CONTENIDOS TEÓRICO-PRACTICOS
The Chemical Industry: Inorganic compounds. Oil refining. Organic commodities and their derivatives. Sectors in the chemical industry: Polymers, coatings, agrochemicals, fertilizers, drugs & # 8230;
Chemical Process Safety: Accidents, Toxicology, Fire and Explosions.

TEACHING METHODS
The subject combines on-site classes with seminars where the student must solve and discuss problems and perform the several tasks proposed during the course.

TYPES OF TEACHING

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Evaluation methods
- Continuous evaluation
- End-of-course evaluation

Evaluation tools and percentages of final mark
- Written test, open questions  55%
- Exercises, cases or problem sets  45%

ORDINARY EXAMINATION PERIOD: GUIDELINES AND OPTING OUT
The subject will be evaluated through written exams (55%) and assignments (45%).
The written exams, in which the skills M02CM07 and M02CM011 will be assessed, will be divided into a midterm exam and a final exam. They will be written tests related to the concepts developed in the whole of the subject. The midterm exam will take place at the end of the first semester and passing it will mean the elimination of the corresponding subject for the final exam. To be able to take an average between the partial exams, you must obtain at least 4 in the final exam.
The work carried out during the course will be evaluated through written controls or online questionnaires, evaluating the competencies M02CM09, M02CM10 and M02CM11. In the case of online questionnaires, the subject being evaluated may be released from the final exam if a score higher than 7 is achieved in them.
Students have the right to be evaluated through the final evaluation system (single test), regardless of whether or not they have participated in the continuous assessment system. To do this, students must submit, within a period of 9 weeks from the beginning of the course, a letter to the teacher responsible for the subject, declining the continuous assessment. It will be enough for the student not to take the exam to be evaluated as "not presented".

EXTRAORDINARY EXAMINATION PERIOD: GUIDELINES AND OPTING OUT

Written exam: 100%
It will be enough for the student not to take the exam to be evaluated as "not presented".

MANDATORY MATERIALS

Se indicará cada curso en la Guía Docente.

BIBLIOGRAFÍA

Basic bibliography
"Diseño en Ingeniería Química", Ray Sinnott, Gavin Towler, Ed. Reverté, Barcelona (2012)
"El pronóstico económico en Química Industrial" A. Vian, Alhambra, Madrid (1990)

Detailed bibliography
"Dirección y gestión de proyectos” Gómez-Senent, E., Chiner, M., Capuz, S., Universidad Politécnica de Valencia, Valencia (1994).

Journals
A list will be distributed every course.

Web sites of interest
http://www.essentialchemicalindustry.org/chemicals.html

OBSERVATIONS
COURSE GUIDE 2021/22

Faculty 215 - Faculty of Chemistry
Degree GQUIMI20 - Bachelor's Degree in Chemistry

COURSE

26133 - Mathematical Methods for Chemistry

COURSE DESCRIPTION
The aim of this subject is to provide the students with the mathematical tools needed to model, formulate and solve problems of interest in the field of the Chemistry. This subject presents an expansion of the basic mathematical concepts studied in the previous subjects "Matemáticas I" and "Matemáticas II y Estadística".

COMPETENCIES/LEARNING RESULTS FOR THE SUBJECT
In addition to the Basic (CBB1-CB5) and General (G0001-G0005) Skills, the student should develop the following specific skills:

M01CM04 - Understand and know how to use basic mathematical tools and data analysis processes in a scientific environment.

(SS) M03CM16 - Employ advanced mathematical techniques to consider and resolve matters related to chemistry (data-processing, modelling, etc.).

CONTENIDOS TEÓRICO-PRÁCTICOS
Integral calculus with functions of several variables. Line and surface integrals.
Vector calculus. Basic concepts and applications. Differential operators.
Differential equations. Solving methods and applications.

TEACHING METHODS
The student is encouraged to actively participate on both theoretical and practical lectures, by posing questions, problems and so on.

Theoretical lectures will be given with the help of powerpoints files (in spanish), which can be freely accessed by the student.

TYPES OF TEACHING

<table>
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Evaluation methods
- End-of-course evaluation

Evaluation tools and percentages of final mark
- Written test, open questions 100%

ORDINARY EXAMINATION PERIOD: GUIDELINES AND OPTING OUT
Final exam: 100%

EXTRAORDINARY EXAMINATION PERIOD: GUIDELINES AND OPTING OUT
Final exam: 100%

MANDATORY MATERIALS
No specific material is needed.
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<tr>
<td><strong>Basic bibliography</strong></td>
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<tr>
<td>Vector calculus, J.E. Marsden &amp; A. J. Tromba</td>
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<tr>
<td>Differential equations, Ross.S.L.</td>
</tr>
<tr>
<td><strong>Detailed bibliography</strong></td>
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<td>No further source is required.</td>
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<td><strong>Web sites of interest</strong></td>
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<td>In internet there are plenty of courses and pages about these topics.</td>
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## COURSE GUIDE 2021/22

<table>
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<th>Cycle</th>
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<tr>
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<td>GQUIM20 - Bachelor's Degree in Chemistry</td>
<td>Year</td>
<td>Fourth year</td>
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### COURSE

<table>
<thead>
<tr>
<th>26141 - Organic Synthesis and Biomolecules</th>
<th>Credits, ECTS: 6</th>
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### COURSE DESCRIPTION

The goal is to complement basic concepts of Organic Chemistry acquired during the previous courses with a focus on synthesis, also correlating its significance during the development of new pharmacologically and biologically active compounds.

A selection of modern synthetic strategies and methods will be presented, focusing on heterocyclic compounds. The principles of bioactivity at the molecular level will also be introduced using some relevant examples. The subject will be complemented with aspects of structural elucidation of bioactive compounds and stereochemical concepts.

### COMPETENCIES/LEARNING RESULTS FOR THE SUBJECT

The subject should help in gaining the following competences:

- [M3.10] The ability to interpret structural analysis and apply principles of organic reactivity to the synthesis of pharmacologically and biologically interesting molecules.
- [M3.11] The capacity for designing, planning and carrying out experimental work, as well as to use instrumental techniques for solving problems of chemical nature.
- [M3.12] The ability for data searching using network services in the chemistry and related areas.
- [M3.13] The ability to present orally chemical concepts and processes; also to write properly technical reports in the chemistry area using either Basque, Spanish or English languages.

The following transversal competences of the Module will also be acquired:

- [M3.T2] The ability of learning and autonomous work.
- [M3.T3] To be able to manage, organize and plan chemical processes based on quality criteria and environmental concerns.
- [M3.T4] To be able to translate chemical concepts to other disciplines; to realize of their impact in industry and technology development of our society.

The coordination, both horizontal and vertical, of the subject within the Module and the Degree will be supervised by the Commission of Coordination of the Degree.

### CONTENTS TEÓRICO-PRÁCTICOS

- Advanced NMR 1H, 13C and other nuclei spectroscopy. NOE and two-dimensional spectroscopy.
- Drugs and chirality. General strategies for the synthesis of enantiomerically pure drugs. The Chiral Pool approach.
- Catalytic methods: Enzymes, organometallic compounds, organocatalysis.

### TEACHING METHODS

- M: The main concepts and additional learning orientations will be presented during lectures.
- S: Seminars consist of exercises, including relevant examples; complementary examples will be posted on Moodle.
- GA: Classroom practices consists of some training in the use of Organic Chemistry related software and presentation of a report by each student.
TYPES OF TEACHING

<table>
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Evaluation methods
- Continuous evaluation
- End-of-course evaluation

Evaluation tools and percentages of final mark
- Written test, open questions  60%
- Exercises, cases or problem sets  20%
- Individual assignments  20%

ORDINARY EXAMINATION PERIOD: GUIDELINES AND OPTING OUT

General Regulations adopted by UPV/EHU (BOPV of March, 2017) concerning the assessment of students' achievement in the Degrees given by UPV/EHU will be applicable. For more information, see section 2 of such Regulations, articles 8, 9 and 12.

A) CONTINUOUS ASSESSMENT

Continuous assessment will be applied during the ordinary call only, with the following parts and percentages:
1. Exercises, case studies and problems carried out during the semester: 20%
2. Written individual report and its viva voice presentation: 20%
3. Written exam: 60%

If someone does not make/present any of the items (1) to (3) above, the item will be rated cero.

Students have the option to renounce a call by informing in writing the professor in charge of the subject. Requests need to be submitted one month in advance to the end of the lecturing period. Should this action be taken the subject will be rated as NOT PRESENTED (thee call will not get extinct).

B) ASSESSMENT BY SINGLE FINAL EXAMINATION

Assessment by a single examination is feasible only if the student submits on time a renounce to the continuous assessment. Requests need to be submitted in writing to the professor in charge of the subject during the first 9 weeks of the semester.

The single Final examination will account for 100% of the grading.

If someone does not make the Final exam, the grading will be NOT PRESENTED and the call will not get extinct.

EXTRAORDINARY EXAMINATION PERIOD: GUIDELINES AND OPTING OUT

Special call will consist of a single Final Examination which will account for 100% of the grading, unless the student makes explicit he or she wants to keep ratings of parts (1) (20%) and (2) (20%) for averaging (only if averaging upgrades).

If someone does not make such Final exam, the grading will be NOT PRESENTED and the call will not get extinct.

MANDATORY MATERIALS

At least one book among the basic titles listed below is highly recommended. The professor in charge of the subject will give additional directions.
BIBLIOGRAFÍA

Basic bibliography

Detailed bibliography

Journals
Organic Letters: http://pubs.acs.org/journal/orle7
Organic and Biomolecular Chemistry: http://www.rsc.org/Publishing/Journals/Ob/Index.asp
The Journal of Chemical Education: http://jchemed.chem.wisc.edu/
The Journal of Medicinal Chemistry: http://pubs.acs.org/journal/jmcmar

Web sites of interest
Organic Resources Wordwide: http://www.organicworldwide.net/
Chemical and Engineering News: http://www.chemspider.com/
In this subject the student must apply his knowledge of Chemistry to the understanding of the environment, its processes and the fate and effects of chemical compound releases. In addition, the student will employ Chemical Engineering principles for the selection and design of waste treatment plants.

The competences the student must acquire are:

- **M03CM08**: Know how to integrate their knowledge of chemistry and chemical engineering to evaluate the impact and evolution of pollutants in the environment and implement the different means of purification.
- **M03CM12**: Possess knowledge of the network tools and services that enable searches for information in the field of chemistry and similar fields.
- **M03CM13**: Transmit phenomena and processes related to chemistry and similar fields in verbal presentations and/or written reports and in a comprehensible way in either of the two official languages of the Autonomous Community of the Basque Country or in English.
- **M03CM17**: Demonstrate observation, analysis and synthesis skills with a capacity for criticism and self-criticism.
- **M03CM18**: Demonstrate a capacity for learning and for autonomous work for professional development.
- **M03CM19**: Be able to manage, organise and plan chemical processes, applying criteria of quality and environmental conservation.
- **M03CM20**: Relate chemistry with other disciplines and understand its impact on the industrial and technological society and the importance of the industrial chemical sector.

At the end of the course, the student is expected to be able to:
- Explain the characteristics of the environment and environmental processes using chemical arguments.
- Analyze environmental quality data
- Describe the evolution and effects of pollutants in the environment
- Reason and suggest treatment systems for waste streams.

The subject includes on-site classes with the teacher and seminars where the student must
a) solve and discuss problems on pollutant dispersion
b) prepare and make a presentation on a subject related with the environment.

**CONTENIDOS TEORICO-PRÁCTICOS**

I/Natural Environment: Atmosphere, Hydrosphere and Pedosphere
II/Environmental chemistry: Soil formation and properties. Continental and marine waters. Atmospheric chemistry
III/Soil and water pollution. Atmospheric pollution.

**TEACHING METHODS**

- Continuous evaluation
- End-of-course evaluation
- Written test, open questions 60%
- Individual assignments 20%

**types of teaching**

- Lecture-based
- Seminar
- Applied classroom-based groups
- Applied laboratory-based groups
- Workshop
- Industrial workshop
- Applied computer-based groups
- Applied clinical-based groups
- Applied fieldwork groups

- M: Lecture-based
- S: Seminar
- G: Applied laboratory-based groups
- GA: Applied classroom-based groups
- GL: Applied computer-based groups
- GO: Applied clinical-based groups
- TA: Workshop
- TI: Industrial workshop
- GCA: Applied fieldwork groups
- Teamwork assignments (problem solving, Project design)  20%

**ORDINARY EXAMINATION PERIOD: GUIDELINES AND OPTING OUT**

- Continuous evaluation system (Practical activities plus written test)
- Final evaluation

Evaluation guidelines:
- Written test: 80%
- Other activities: 20%

Students have the right to be evaluated through the final evaluation system (single test), regardless of whether or not they have participated in the continuous assessment system. To do this, students must submit, within a period of 9 weeks from the beginning of the course, a letter to the teacher responsible for the subject, declining the continuous assessment. It will be enough for the student not to take the exam to be evaluated as "not presented".

**EXTRAORDINARY EXAMINATION PERIOD: GUIDELINES AND OPTING OUT**

Written exam: 100%
It will be enough for the student not to take the exam to be evaluated as "not presented".

**MANDATORY MATERIALS**

Se indicará cada curso en la Guía Docente.

**BIBLIOGRAFÍA**

**Basic bibliography**

**Detailed bibliography**

**Journals**
- Journals of Environmental Chemistry and Technology.

**Web sites of interest**
- http://www.euskadi.eus/temas/-/medio-ambiente-y-meteorologia/

**OBSERVATIONS**
COURSE GUIDE 2021/22

Faculty 215 - Faculty of Chemistry
Degree GQUIM20 - Bachelor's Degree in Chemistry
Cycle Not Applicable
Year Fourth year

COURSE
26142 - Catalysis and Bioorganometallics

Credits, ECTS: 6

COURSE DESCRIPTION
In this course studies on catalytic reactions useful for the transformation of organic compounds under homogeneous reaction conditions will be developed. Organometallic complexes will be used as catalysts and examples of asymmetric catalytic reactions of interest in the preparation of medicals will be included. The student will acquire knowledge on the importance of organometallic complexes on biological systems and on medical treatments.

COMPETENCIES/LEARNING RESULTS FOR THE SUBJECT
In this course studies on catalytic reactions useful for the transformation of organic compounds under homogeneous reaction conditions will be developed. Organometallic complexes will be used as catalysts and examples of asymmetric catalytic reactions of interest in the preparation of medicals will be included. The student will acquire knowledge on the importance of organometallic complexes on biological systems and on medical treatments.

Students will acquire cross-skills corresponding to the Advanced Unit: Demonstrate observation, analysis and synthesis skills with a capacity for criticism and self-criticism; demonstrate a capacity for learning and for autonomous work for professional development; be able to manage, organise and plan chemical processes, applying criteria of quality and environmental conservation; relate chemistry with other disciplines and understand its impact on the industrial and technological society and the importance of the industrial chemical sector ([M03.CM17] to [M03.CM20]). Students will also reach more specific skills related to the knowledge of the main reactions that organometallic complexes may undergo, in special those involved in catalytic processes. Special interest will be devoted to industrial applications related to health, both from theoretical and experimental points of view. [M03.CM07], [M03.CM12] to [M03.CM14] (Understand the functioning and importance of homogeneous catalytic processes and their role in obtaining drugs and the biomedical applications of organometallic compounds. Possess knowledge of the network tools and services that enable searches for information in the field of chemistry and similar fields. Transmit phenomena and processes related to chemistry and similar fields in verbal presentations and/or written reports and in a comprehensible way in either of the two official languages of the Autonomous Community of the Basque Country or in English. Be able to use the information and knowledge gained from the module for training in existing or emerging fields related to chemistry)

The Degree Coordination Committee will guarantee horizontal and vertical coordination of the course both in the Unit and in the Degree.

CONTENIDOS TEÓRICO-PRÁCTICOS

TEACHING METHODS
The methodology includes conferences, seminars and laboratory work. Personalized tutorials will also be available.

TYPES OF TEACHING

<table>
<thead>
<tr>
<th>Types of teaching</th>
<th>M</th>
<th>S</th>
<th>GA</th>
<th>GL</th>
<th>GO</th>
<th>GCL</th>
<th>TA</th>
<th>TI</th>
<th>GCA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hours of face-to-face teaching</td>
<td>40</td>
<td>5</td>
<td>15</td>
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<tr>
<td>Horas de Actividad No Presencial del Alumno/a</td>
<td>60</td>
<td>7.5</td>
<td>22.5</td>
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</tbody>
</table>

Legend: M: Lecture-based | S: Seminar | GA: Applied classroom-based groups
TA: Workshop | TI: Industrial workshop | GCA: Applied fieldwork groups

Evaluation methods
- Continuous evaluation
- End-of-course evaluation

Evaluation tools and percentages of final mark
- Escritura, preguntas abiertas 75%
- Laboratorio 25%

**ORDINARIO EXAMEN PERIÓDICO: GUÍAS Y OPTANDO OUT**

- Theory 75%. Minimum required 40%.
- Laboratory 25%. Minimum required 40%

**EXTRAORDINARIO EXAMEN PERIÓDICO: GUÍAS Y OPTANDO OUT**

- Theory 75%. Minimum required 40%.
- Laboratory 25%. Minimum required 40%

**MATERIALES MANDATORIOS**

Se indicará cada curso en la Guía Docente.

**BIBLIOGRAFÍA**

**Bibliografía básica**

**Bibliografía detallada**

**Revistas**
- Applied Organometallic Chemistry, Wiley
- Journal of Molecular Catalysis A: Chemical, Elsevier
- Journal of Molecular Catalysis B: Enzymatic, Elsevier
- Journal of Organometallic Chemistry, Elsevier
- Organometallics, ACS Publications

**Sitios de interés**

Se indicará cada curso en la Guía Docente.

**OBSERVACIONES**