ENGLISH FRIENDLY COURSES (EFC) 2019-2020 – CAMPUS OF GIPUZKOA

https://www.ehu.eus/en/web/kimika-zientziak/home
Coordinator: quimicas.internacional@ehu.eus

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

FACULTY OF CHEMISTRY (215)		SEMESTER	CREDITS	SCHEDULE[1]
26113	Química Orgánica I	Annual	9	M
26128	Química Analítica II	Annual	9	M
26127	Química Analítica I	Annual	9	M / A
26140	Resolución de problemas analíticos en Biociencias	Annual	6	M
26114	Química Orgánica II	Annual	9	M / A
26126	Química Inorgánica II	Annual	9	M / A
25115	Ingeniería Química	Annual	6	M
26131	Proyectos en química industrial	Annual	6	M
26142	Catálisis y Bioorganometálicos	Annual	6	M / A
26117	Química Física I	Annual	9	M
26121	Ciencia de los materiales	Sep. 2019- Jan. 2020	6	M / A
26116	Caracterización Química y Física de Macromoléculas	Sep. 2019- Jan. 2020	6	M / A
26118	Materiales Macromoleculares I: Propiedades y Aplicaciones	Sep. 2019- Jan. 2020	6	M / A
26141	Síntesis Orgánica y Biomoléculas	Jan. 2020- May 2020	6	M
26139	Química y Tecnología Ambiental	Jan. 2020- May 2020	6	M
26119	Materiales Macromoleculares II: procesado	Jan. 2020- May 2020	6	M / A
26120	Procesos industriales de polimerización	Jan. 2020- May 2020	6	M / A
26133	Métodos matemáticos para la química	Jan. 2020- May 2020	6	M

[1] SCHEDULE: Morning (M)/ Afternoon (A): begins at 13.30.
By clicking the subject´s name, its Syllabus will appear.

TEACHING GUIDE 2018/19

Centre 215 - Faculty of Chemistry | **Cycle** Indiferente

Plan GQUIMI20 - Bachelor's Degree in Chemistry | **Year** Second year

SUBJECT

26113 - Organic Chemistry I | **ECTS Credits:** 9

DESCRIPTION & CONTEXTUALISATION OF THE SUBJECT

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.

THEORETICAL/PRACTICAL CONTENT

Hydrocarbons, alkanes and cycloalkanes. Alkenes and polyenes. Alkynes. Benzene and arenes. Structure, obtaining and reactivity.
Functional groups with a single carbon-heteroatom bond. Alkyl and aryl halides. Alcohols, glycols and phenols. Ethers and epoxides. Amines and nitrocompounds. Structure, obtaining and reactivity.
The carbonyl group and derivatives. Aldehydes and ketones. Structure, obtaining and reactivity.
The carboxylic group and derivatives. Carboxylic acids. Acyl halides. Ketenes. Anhydrides. Esters. Amides. Nitriles. Structure, obtaining and reactivity.

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

Type of teaching	M	S	GA	GL	GO	GCL	TA	TI	GCA
Classroom hours	50	20	20						
Hours of study outside the classroom	75	30	30						

Legend: M: Lecture | S: Seminario | GA: Pract.Class.Work | GL: Pract.Lab work | GO: Pract.computer wo | GCL: Clinical Practice | TA: Workshop | TI: Ind. workshop | GCA: Field workshop

ASSESSMENT SYSTEMS

- Continuous assessment system
- Final assessment system

TOOLS USED & GRADING PERCENTAGES

- Extended written exam 80%
- Practical work (exercises, case studies & problems set) 20%

ORDINARY EXAM CALL: GUIDELINES & DECLINING TO SIT

A) GENERAL RULE
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.

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.

EXTRAORDINARY EXAM CALL: GUIDELINES & DECLINING TO SIT

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.

COMPULSORY 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.

BIBLIOGRAPHY

Basic bibliography

1. T. W. G. Solomons, C. B. Fryhle, S. A. Snyder, ORGANIC CHEMISTRY, 12th Edition, Ed. Wiley, 2016.
2. D. R. Klein, ORGANIC CHEMISTRY, 3th Edition, Ed. Wiley, 2016.
3. L. G. Wade, Jr., QUÍMICA ORGÁNICA, 7ª Edición, Ed. Pearson Prentice Hall, Madrid, 2004.
4. P. Y. Bruice, , QUÍMICA ORGÁNICA, 5ª Edición, Ed. Pearson Prentice Hall, México, 2008.
5. F. A. Carey, QUÍMICA ORGÁNICA, 6ª Edición, Ed. McGraw-Hill, México, 2006.
6. R. T. Morrison, R. N. Boyd, QUÍMICA ORGÁNICA, 5ª Edición, Ed. Pearson Educación, México, 1998.
7. K. P. C. Vollhardt, N.E. Schore, QUÍMICA ORGÁNICA, 5ª ed., Omega, S.A., Barcelona, 2008.
8. K. P. C. Vollhardt, N.E. Schore KIMIKA ORGANIKOA, 1ª ed., UPV/EHU, Leioa, 2008.
9. J. E. McMurry, QUÍMICA ORGÁNICA, 5ª ed., International Thomson editores S.A, México, 2001.
10. F. García, J. A. Dobado, PROBLEMAS RESUELTOS DE QUÍMICA ORGÁNICA, Paraninfo, 2007.

In-depth bibliography

1. F. A. Carey, R. J. Sundberg, ADVANCED ORGANIC CHEMISTRY, Partes A y B, 5ª Edición, Springer, 2007.
2. M. B. Smith, J. March, MARCH'S ADVANCED ORGANIC CHEMISTRY: REACTIONS, MECHANISMS AND STRUCTURE, Wiley, 2007

Journals

The Journal of Organic Chemistry: http://pubs.acs.org/journal/joceah
Organic Letters: http://pubs.acs.org/journal/orlef7
European Journal of Organic Chemistry: http://www3.interscience.wiley.com/journal/27380/home
Tetrahedron: http://www.sciencedirect.com/science/journal/00404020
Tetrahedron Letters: http://www.sciencedirect.com/science/journal/00404039

Organic and Biomolecular Chemistry: http://www.rsc.org/Publishing/Journals/Ob/Index.asp
The Journal of Chemical Education: http://jchemed.chem.wisc.edu/

Useful websites

Organic Chemistry Portal: http://www.organic-chemistry.org/
Organic Resources Wordwide: 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://elblogdebuhogris.blogspot.com/

REMARKS

TEACHING GUIDE 2018/19

Centre 215 - Faculty of Chemistry **Cycle** Indiferente

Plan GQUIMI20 - Bachelor's Degree in Chemistry **Year** Third year

SUBJECT

26128 - Analytical Chemistry II **ECTS Credits:** 9

DESCRIPTION & CONTEXTUALISATION OF THE SUBJECT

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.

THEORETICAL/PRACTICAL CONTENT

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

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

Type of teaching	M	S	GA	GL	GO	GCL	TA	TI	GCA
Classroom hours	40	27	13		10				
Hours of study outside the classroom	60	44	19		12				

Legend: M: Lecture S: Seminario GA: Pract.Class.Work GL: Pract.Lab work GO: Pract.computer wo
GCL: Clinical Practice TA: Workshop TI: Ind. workshop GCA: Field workshop

ASSESSMENT SYSTEMS

- Final assessment system

TOOLS USED & GRADING PERCENTAGES

- Extended written exam 70%
- Practical work (exercises, case studies & problems set) 5%
- Team work (problem solving, project design) 15%
- Exposition of work, readings, etc. 10%

ORDINARY EXAM CALL: GUIDELINES & DECLINING TO SIT

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 EXAM CALL: GUIDELINES & DECLINING TO SIT

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

COMPULSORY MATERIALS

Consult the student guide.

BIBLIOGRAPHY

Basic bibliography

Daniel C. Harris, Quantitative Chemical Analysis, 7th edition. W.H. Freeman, 2007.

D.A. Skoog, F. J. Holler, S. R. Crouch, Principles of Instrumental Analysis, 7th edition. Cengage Learning, Boston, MA, 2017.

G.D. Christian, Analytical Chemistry 6th ed. Wiley (2004).

G. Schwedt, The Essential Guide to Analytical Chemistry. Wiley (Chichester, 1997).

J.C. Miller, J.N. Miller, Statistics and Chemometrics for Analytical Chemistry, 5th edition., Pearson, England, 2005.

In-depth bibliography

K.H. Esbensen. Multivariate data analysis-in practice, 5th ed. Camo AB, 2006.

J.M . Miller, Chromatography: concepts and contrasts 2nd ed. Wiley Interscience (2005).

S. R. Crouch, F.J. Holler, Applications of Microsoft Excel in Analytical Chemistry. (Thomson, 2004).

G. Currel, Analytical Instrumentation. Performance Characteristics and Quality. John Wiley & Sons (West Sussex, UK, 2000).

Journals

Journal of Chemical Education. Ed. American Chemical Society, Washington. http://jchemed.chem.wisc.edu/
Analytica Chimica Acta. Ed. Elsevier Scientific, Amsterdam. http://www.sciencedirect.com/
Talanta. Ed. Elsevier Scientific, Amsterdam. http://www.sciencedirect.com/
Analytical Chemistry. Ed. American Chemical Society,Washington. http://pubs.acs.org/journals/ancham/index.html

Analytical and Bioanalytical Chemistry. Ed. Springer Berlin / Heidelberg. www.springer.com
The Analyst. Ed. RSC Publishing, Cambridge. http://www.rsc.org/Publishing/Journals/an/index.asp

Useful websites

http://www.asdlib.org
http://www.chromacademy.com/

REMARKS

TEACHING GUIDE 2018/19

Centre 215 - Faculty of Chemistry

Cycle Indiferente

Plan GQUIMI20 - Bachelor's Degree in Chemistry

Year Second year

SUBJECT

26127 - Analytical Chemistry I

ECTS Credits: 9

DESCRIPTION & CONTEXTUALISATION OF THE SUBJECT

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.

THEORETICAL/PRACTICAL CONTENT

The analytical process. Chemical analysis and basic operations of the analytic process. Reactants types. Identification and determination. Sensibility. Traceability.

Introduction to statistics. Statistics of repeated measurements. Systematic and random errors. Significant figures. Error propagation. Significance criteria and results withdrawal. Precision, accuracy and detection limit.
Sampling and pretreatment. Statistic basics of sampling. Procedures. Storage and sample protection. General conditions and sample treatment requirements. Analytes recovery. Physical pretreatments.
Analytical methods for separation. Principles of analytic separation. Interference elimination and matrix simplification. Pre-concentration methods.
Liquid-liquid extraction. Organic solvents. Equilibrium distribution and efficacy. Metallic chelants extraction.
Ionic Exchange. Ionic exchangers. Exchange equilibrium: capacity and Exchange constant. Analytic applications of ionic exchange.
Applications of ionic exchange in solution. Introduction to volumetric analysis. Acid-base volumetries. Complex formation volumetries. Redox volumetries. Precipitation volumetries. Gravimetric determinations.
Basic operations in the analytic laboratory. Volumetric analysis. Gravimetric determinations. Extraction and ionic exchange techniques.

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

Type of teaching	M	S	GA	GL	GO	GCL	TA	TI	GCA
Classroom hours	24	8	15	30	13				
Hours of study outside the classroom	36	26	22	36	15				

Legend: M: Lecture S: Seminario GA: Pract.Class.Work GL: Pract.Lab work GO: Pract.computer wo
GCL: Clinical Practice TA: Workshop TI: Ind. workshop GCA: Field workshop

ASSESSMENT SYSTEMS

- Continuous assessment system
- Final assessment system

TOOLS USED & GRADING PERCENTAGES

- Extended written exam 60%
- Practical work (exercises, case studies & problems set) 20%
- Exposition of work, readings, etc. 10%
- Computer based practices and problems solving 10%

ORDINARY EXAM CALL: GUIDELINES & DECLINING TO SIT

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

EXTRAORDINARY EXAM CALL: GUIDELINES & DECLINING TO SIT

Same criteria as in the ordinary evaluation.

COMPULSORY MATERIALS

Labcoat. Security goggles. Spatula. pH paper.

BIBLIOGRAPHY

Basic bibliography

D.C. Harris, Análisis Química Cuantitativo 3ª ed. (6ª ed. Original). Editorial Reverté (Barcelona, 2007).

D.A. Skoog, D.M. West, F.J. Holler, S.R. Crouch, Fundamentos de Química Analítica, 8ª ed. Thomson (2004).

M. Silva, J. Barbosa, Equilibrios iónicos y sus aplicaciones analíticas. Editorial Síntesis (Madrid, 2004).

In-depth bibliography

J.C. Miller, J.N. Miller, Estadística y Quimiometría para Química Analítica 4º ed.. Ed. Pearson Education (Madrid, 2002).

S. R. Crouch, F.J. Holler, Applications of Microsoft Excel in Analytical Chemistry. (Thomson, 2004).
D. Cooper, C. Doran, Classical Methods-Volume 1. Analytical Chemistry by open learning. John Wiley & Sons (1987).

J. Mendham, D. Dodd, D. Cooper, Classical Methods-Volume 2. Analytical Chemistry by open learning. John Wiley & Sons (1987).

Journals

Journal of Chemical Education. Ed. American Chemical Society, Washington. http://jchemed.chem.wisc.edu/

Useful websites

http://www.asdlib.org

REMARKS

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.

TEACHING GUIDE 2018/19

Centre 215 - Faculty of Chemistry **Cycle** Indiferente

Plan GQUIMI20 - Bachelor's Degree in Chemistry **Year** Fourth year

SUBJECT

26140 - Analytical Problem Solving in Biosciences **ECTS Credits:** 6

DESCRIPTION & CONTEXTUALISATION OF THE SUBJECT

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.

THEORETICAL/PRACTICAL CONTENT

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

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.

TYPES OF TEACHING

Type of teaching	M	S	GA	GL	GO	GCL	TA	TI	GCA
Classroom hours	27	27			6				
Hours of study outside the classroom	40	43			7				

Legend: M: Lecture S: Seminario GA: Pract.Class.Work GL: Pract.Lab work GO: Pract.computer wo
GCL: Clinical Practice TA: Workshop TI: Ind. workshop GCA: Field workshop

ASSESSMENT SYSTEMS

- Continuous assessment system
- Final assessment system

TOOLS USED & GRADING PERCENTAGES

- Extended written exam 70%
- Practical work (exercises, case studies & problems set) 15%
- Team work (problem solving, project design) 10%
- Exposition of work, readings, etc. 5%

ORDINARY EXAM CALL: GUIDELINES & DECLINING TO SIT

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 EXAM CALL: GUIDELINES & DECLINING TO SIT

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.

COMPULSORY MATERIALS

Se indicará cada curso en la Guía Docente.

BIBLIOGRAPHY

Basic bibliography

D.C. Harris, Análisis Químico Cuantitativo 3ª ed. (6ª ed. Original). Editorial Reverté (Barcelona, 2007).

A. Manz, N. Pamm, C. Iossifidis, Bioanalytical Chemistry. Imperial College Press (London, 2004).

M.R. Smyth (editor), Chemical Analysis on Complex Matrices. Ellis Horwood (Chichester, 1992).

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

F.W. Fifield, P.J. Haines, Environmental Analytical Chemistry 2nd ed. Blackwell Science (2000).

K.H. Esbensen. Multivariate data analysis-in practice, 5th ed. Camo AB Oslo, 2006.

In-depth bibliography

R.G. Brereton, Applied Chemometrics for Scientists. John Wiley & sons (West Sussex, 2007).

E. W. Ciurzek, J.K. Drenen III, Pharmaceutical and Medical Applications of Near-Infrared Spectroscopy. Marcel Dekker (2002).

A. Townshend (Editor), Encyclopedia of Analytical Science. Academic Press (London, 1995).

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

Journals

Analytica Chimica Acta. Ed. Elsevier Scientific, Amsterdam. http://www.sciencedirect.com/

Talanta. Ed. Elsevier Scientific, Amsterdam. http://www.sciencedirect.com/

Analytical Chemistry. Ed. American Chemical Society,Washington. http://pubs.acs.org/journals/ancham/index.html

Analytical and Bioanalytical Chemistry. Ed. Springer Berlin / Heidelberg. www.springer.com

The Analyst. Ed. RSC Publishing, Cambridge. http://www.rsc.org/Publishing/Journals/an/index.asp

Useful websites

REMARKS

TEACHING GUIDE 2018/19

Centre 215 - Faculty of Chemistry **Cycle** Indiferente

Plan GQUIMI20 - Bachelor's Degree in Chemistry **Year** Third year

SUBJECT

26114 - Organic Chemistry II **ECTS Credits:** 9

DESCRIPTION & CONTEXTUALISATION OF THE SUBJECT

Organic Chemistry II
Type: Compulsory.
Titulación: Degree in Chemical Sciences.
Degree: Second Cycle
Departarment: Organic Chemistry I.
Credits: 6.5.

Lecturer:
Dr. Aitor Landa Álvarez Credits: 3.25
Dra. Rosa López Álvarez Credits: 3.25

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.

THEORETICAL/PRACTICAL CONTENT

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.

2. Organic reactions. Reactivity and mechanisms.
- Acidity, basicity, and pKa.
- C-C bond formation. Formation and reactions of enols and enolates. Alkylation of enolates and enamines. Conjugated additions of enolates and enamines (Michael reaction). Aldol reaction and its variants. Asymmetric methodology with enolates and enamines.

3. C=C bond formation:
- -elimination reactions (E1, E2 and E1cB).
- Pyrolytic syn elimination.
- Fragmentation reactions.
- Alkenes fron 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.

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

Type of teaching	M	S	GA	GL	GO	GCL	TA	TI	GCA
Classroom hours	40	10	15	25					
Hours of study outside the classroom	60	22,5	15	37,5					

Legend: M: Lecture S: Seminario GA: Pract.Class.Work GL: Pract.Lab work GO: Pract.computer wo
GCL: Clinical Practice TA: Workshop TI: Ind. workshop GCA: Field workshop

ASSESSMENT SYSTEMS

- Final assessment system

TOOLS USED & GRADING PERCENTAGES

- Extended written exam 80%
- Practical work (exercises, case studies & problems set) 20%

ORDINARY EXAM CALL: GUIDELINES & DECLINING TO SIT

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/final exam and seminars (or their presentation after the deadline) will imply a zero for said test.

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 EXAM CALL: GUIDELINES & DECLINING TO SIT

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).

COMPULSORY MATERIALS

BIBLIOGRAPHY

Basic bibliography

Structure, symmetry and stereochemistry:

1. E. Juaristi, Introduction to Stereochemistry and Conformational Analisis, John Wiley, New York.
2. A. Bassindale, The Third Dimension in Organic Chemistry, Ed. John Wiley & Sons, New York, 1991.
3. E. Eliel, S. H. Wilen, Stereochemistry of Organic Compounds, Ed. John Wiley & Sons, New York, 1994.
4. D. Nasipuru, Stereochemistry of Organic Compounds: Principles and Applications, John Wiley & Sons, New York, 1991.

Organic reactions. Reactivity and mechanisms:

5. F. A. Carey, Advanced Organic Chemistry, Kluver Academic, New York, 2001.
6. J. Clayden, N. Greeves, S. Warren, Organic Chemistry, Oxford University Press, 2012.
7. D. Klein, Química Orgánica, Ed. Panamericana, 2014

In-depth bibliography

Journals

Organic Syntheses: http://www.orgsyn.org/
The Journal of Organic Chemistry: http://pubs.acs.org/journal/joceah
Organic Letters: http://pubs.acs.org/journal/orlef7
European Journal of Organic Chemistry: http://www3.interscience.wiley.com/journal/27380/home
Tetrahedron: http://www.sciencedirect.com/science/journal/00404020
Organic and Biomolecular Chemistry: http://www.rsc.org/Publishing/Journals/Ob/Index.asp
The Journal of Chemical Education: http://jchemed.chem.wisc.edu/

Useful websites

Organic Chemistry Portal: http://www.organic-chemistry.org/
Organic Resources Wordwide: http://www.organicworldwide.net/
Bases de datos de compuestos orgánicos: http://pubchem.ncbi.nlm.nih.gov/ , http://www.chemspider.com/

REMARKS

TEACHING GUIDE 2018/19

Centre 215 - Faculty of Chemistry

Cycle Indiferente

Plan GQUIMI20 - Bachelor's Degree in Chemistry

Year Third year

SUBJECT

26126 - Inorganic Chemistry II

ECTS Credits: 9

DESCRIPTION & CONTEXTUALISATION OF THE SUBJECT

In this subject the knowledge in the area of Inorganic Chemistry is depeen through the Coordination Chemistry and the Organometallic Chemistry. Furthermore the basics of Inorganic Solics 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.

THEORETICAL/PRACTICAL CONTENT

Coordination compounds. Structure and bonding.
Coordination compounds. Structure and bonding. Classification of molecules based on their symmetry. Representations and Characters Table. Spectroscopic and magnetic properties. Stability constants. Substitution reactions: kinetic and mechanisms. Electron transfer reactions. Outer and inner sphere mechanisms. Photochemical reactions. Introduction to Bioinorganic Chemistry.
Organometallic compounds. Classification of organometallic compounds: Bonding and ligand types. Effective atomic number rule. Pi acceptor and donor ligands. Organometallic compounds with sigma metal-carbon bonds. Reactivity. Applications in catalysis. Ligand types. Nomenclature. Coordination indexes and stereochemistry. Bonding theory.
Inorganic solids: Structural characteristics. Classifications. Bonding models. Structure predictions based on the type of bonding. Crystalline state and defects. Non-stoichiometric solids. Transition elements oxides. Calcogenides, silicates, phosphates, borides, carbides and metallic nitrides.
Experimental Inorganic Chemistry laboratory. Synthesis of coordination compounds and organometallics. Preparation of inorganic solids. Characterization by spectroscopic and magnetic techniques. Thermogravimetry and X ray diffraction.

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

Type of teaching	M	S	GA	GL	GO	GCL	TA	TI	GCA
Classroom hours	45	12	3	30					
Hours of study outside the classroom	67	30	4	34					

Legend: M: Lecture S: Seminario GA: Pract.Class.Work GL: Pract.Lab work GO: Pract.computer wo
GCL: Clinical Practice TA: Workshop TI: Ind. workshop GCA: Field workshop

ASSESSMENT SYSTEMS

- Continuous assessment system
- Final assessment system

TOOLS USED & GRADING PERCENTAGES

- Extended written exam 70%
- Practical work (exercises, case studies & problems set) 10%
- Prácticas de laboratorio 20%

ORDINARY EXAM CALL: GUIDELINES & DECLINING TO SIT

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 EXAM CALL: GUIDELINES & DECLINING TO SIT

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.

COMPULSORY MATERIALS

Labcoat. Security goggles. Laboratory gloves. Espatule.

BIBLIOGRAPHY

Basic bibliography

J. Ribas, Química de la Coordinación. Ediciones Omega, S.A., Barcelona (2000).
L. Smart y E. Moore, Solid State Chemistry: an introduction. 3ª Ed., CRC Taylor & Francis (2005).

In-depth bibliography

- D.M. Adams, Sólidos inorgánicos. Editorial Alhambra, Madrid (1986).
- D. Astruc, Química Organometálica. Reverté, Barcelona (2003).
- P. Atkins, T. Overton, J. Rourke, M. Weller y F. Armstrong. Shriver & Atkins: Química Inorgánica. 4ª ed., Mc Graw-Hill, México (2008).
- F.A. Cotton, G. Wilkinson, C.A. Murillo y M. Bochmann, Advanced Inorganic Chemistry. 6ª ed., Wiley & Sons, New York (1999). Traducción de la 4ª ed. en Castellano, Limusa-Wiley, México (1986).
- G.S. Girolami, T.B. Rauchfuss, R.J. Angelici, Synthesis and Tecnique in Inorganic Chemistry. 3ª Ed., University Science Books (1999).
- N.N. Greenwood y A. Earnshaw, The Chemistry of the Elements. 2ª ed., Butterworth Heinemann, Oxford (1997).
- J.E. Huheey, E.A. Keiter, R.L. Keiter, Inorganic Chemistry: Principles of Structure and Reactivity. 4ª ed., Harper Collins Publishers, New York (1997).
- J. Ribas Gispert, Coordination Chemistry. Verlag Chemie, Weinheim (2008).
- Z. Szafran, R. M. Pike, M. M. Singh. Microscale Inorganic Chemistry: A Comprensive Laboratory Experience. Wiley & Sons, New York,1991.
- J. Tanaka y S.L. Suib, Experimental Methods in Inorganic Chemistry. Prentice Hall (1999).
- A.R. West, Solid State Chemistry and its Applications. Wiley (1990).
- J.D. Woollins, Inorganic experiments. 2ª ed., VCH Publishers: Nueva York (2003).

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

Useful websites

It will be indicated each year.

REMARKS

TEACHING GUIDE

Centre 215 - Faculty of Chemistry

Cycle Indiferente

Plan GQUIMI20 - Bachelor's Degree in Chemistry

Year Third year

SUBJECT

25115 - Chemical Engineering

ECTS Credits: 6

DESCRIPTION & CONTEXTUALISATION OF THE SUBJECT

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.

THEORETICAL/PRACTICAL CONTENT

1.-Introduction: Chemical engineering. Processes and operations in the chemical industry.
2.-Material balances: Mass transfer mechanisms. Phase equilibrium. Binary and flash distillation. Multistage rectification.
3.-Energy balances: Enthalpy and energy balances. Heat transfer by conduction and convection. Heat exchangers.
4.-Non compressible fluids flow: Viscosity and flow regime. Friction and energy loss. Fluid flow in pipes.
5.-Chemical reactors: Chemical kinetics. Ideal reactor design. Batch and continuous-flow reactors. Reactor combinations.

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

Type of teaching	M	S	GA	GL	GO	GCL	TA	TI	GCA
Classroom hours	40	5	15						
Hours of study outside the classroom	60	15	15						

Legend: M: Lecture S: Seminario GA: Pract.Class.Work GL: Pract.Lab work GO: Pract.computer wo
GCL: Clinical Practice TA: Workshop TI: Ind. workshop GCA: Field workshop

ASSESSMENT SYSTEMS

- Continuous assessment system
- Final assessment system

TOOLS USED & GRADING PERCENTAGES

- Extended written exam 70%
- Practical work (exercises, case studies & problems set) 25%
- Team work (problem solving, project design) 5%

ORDINARY EXAM CALL: GUIDELINES & DECLINING TO SIT

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, the student should ask for it at least 1 month before 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 EXAM CALL: GUIDELINES & DECLINING TO SIT

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.

COMPULSORY MATERIALS

It will be said at the beginning of the course.

BIBLIOGRAPHY

Basic bibliography

G. Calleja (Ed.): "Nueva introducción a la Ingeniería Química" (2 vol.). Ed. Síntesis (Madrid, 2016).
J.M. Santamaría y cols.: "Ingeniería de los reactores". Ed. Síntesis (Madrid, 1999).
O. Levenspiel. "Ingeniería de las reacciones químicas". Ed. Reverté. 2000.
O. Levenspiel: "Flujo de Fluidos e intercambio de calor". Ed. Reverté (Barcelona, 1998).

In-depth bibliography

J.M. Coulson y J.F. Richardson: "Ingeniería Química (varios volúmenes)". Ed. Reverté.
R.B. Bird. "Fenómenos de transporte". Ed. Reverté. 1976.
W.L. McCabe, J.C. Smith. "Operaciones básicas de la Ingeniería Química". Ed. Reverté. 2007.
R. Perry. "Manual del Ingeniero Químico" 8ª Edición, 2008.

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

Useful websites

https://www.industriaquimica.es/
http://www.chemengonline.com/

REMARKS

TEACHING GUIDE 2018/19

Centre 215 - Faculty of Chemistry

Cycle Indiferente

Plan GQUIMI20 - Bachelor's Degree in Chemistry

Year Fourth year

SUBJECT

26131 - Projects in Industrial Chemistry

ECTS Credits: 6

DESCRIPTION & CONTEXTUALISATION OF THE SUBJECT

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.

THEORETICAL/PRACTICAL CONTENT

The Chemical Project: Structure and organization. Scope of a project. Chemical process design, economics and engineering. Environmental impact. Chemical plants operation.

The Chemical Industry: Inorganic compounds. Oil refining. Organic commodities and their derivatives. Sectors in the chemical industry: Polymers, coatings, agrochemicals, fertilizers, drugs…

Chemical Process Satety: Accidents, Toxicology, Fire and Explosions.

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

Type of teaching	M	S	GA	GL	GO	GCL	TA	TI	GCA
Classroom hours	45	5	10						
Hours of study outside the classroom	67,5	7,5	15						

Legend: M: Lecture S: Seminario GA: Pract.Class.Work GL: Pract.Lab work GO: Pract.computer wo
GCL: Clinical Practice TA: Workshop TI: Ind. workshop GCA: Field workshop

ASSESSMENT SYSTEMS

- Continuous assessment system
- Final assessment system

TOOLS USED & GRADING PERCENTAGES

- Extended written exam 85%
- Practical work (exercises, case studies & problems set) 15%

ORDINARY EXAM CALL: GUIDELINES & DECLINING TO SIT

-Continuous evaluation system (Practical activities plus written test)

Evaluation guidelines:
*Written test: 85%
*Other activities: 15%

There will be a mid-term exam that allows the student to pass this part of the subject.

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 EXAM CALL: GUIDELINES & DECLINING TO SIT

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

COMPULSORY MATERIALS

Se indicará cada curso en la Guía Docente.

BIBLIOGRAPHY

Basic bibliography

“Diseño en Ingeniería Química”, Ray Sinnott, Gavin Towler, Ed. Reverté , Barcelona (2012)
“Metodologías de diseño aplicado y gestión de proyectos para ingenieros químicos”, Luis Cabra, Antonio de Lucas, Fernando Ruiz, Mª Jesús Ramos, Colección Ciencia y Técnica, 58, Ediciones de la Universidad de Castilla-La Mancha, Cuenca (2010).
“El pronóstico económico en Química Industrial” A. Vian, Alhambra, Madrid (1990)
“Survey of Industrial Chemistry” 3ª edición, Philip J. Chenier, Kluwer Academic/Plenum Publishers, New York (2002)
“Chemical Process Safety: Fundmentals with Applications” 2ª edición, Daniel A. Crowl, Joseph F. Louvar, Prentice Hall, New Jersey (2002).

In-depth bibliography

“Kent and Riegel's HANDBOOK OF INDUSTRIAL CHEMISTRY AND BIOTECHNOLOGY”, 11th Ed. Edited by James A. Kent, Ph.D., Springer (2007).
“Seguridad industrial en plantas químicas y energéticas. Fundamentos, evaluación de riesgos y diseño” 2ª edición, J. Mª. Storch de Gracia, T. García Martín, Ed. Díaz de Santos, Madrid (2008)
“Preparación y evaluación de proyectos”, Nassir Sapag, Reinaldo Sapag, McGraw-Hill, Mexico (1989).
“Teoría General de Proyectos: Dirección de Proyectos” De Cos Castillo, Manuel. Editorial Síntesis S.A. 1996.
“Teoría General de Proyectos: Ingeniería de Proyectos” De Cos Castillo, Manuel. Editorial Síntesis S.A. 1997.
"Dirección y gestión de proyectos" Gómez-Senent, E., Chiner, M., Capuz, S., Universidad Politécnica de Valencia, Valencia (1994).
"El proyecto, diseño en ingeniería", Gómez-Senent, E., Universidad Politécnica de Valencia, Valencia (1997).

Journals

A list will be distributed every course.

Useful websites

http://www.essentialchemicalindustry.org/chemicals.html

REMARKS

TEACHING GUIDE 2018/19

Centre 215 - Faculty of Chemistry **Cycle** Indiferente

Plan GQUIMI20 - Bachelor's Degree in Chemistry **Year** Fourth year

SUBJECT

26142 - Catalysis and Bioorganometallics **ECTS Credits:** 6

DESCRIPTION & CONTEXTUALISATION OF 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.

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.

THEORETICAL/PRACTICAL CONTENT

Introduction. Basic concepts. The catalytic cycle. Fundamental reactions in homogeneous catalysis.
Homogeneous hydrogenation. The activation of molecular hydrogen. Important catalysts. Olefin asymmetric hydrogenation.
Other homogeneous transformations of olefins. Oxidation. Asymmetric epoxidation. Metathesis.
Carbonylation reactions. Methanol carbonylation. Hydroformylation. Asymmetric hydroformylation.
Bioorganometallic chemistry and biomedical applications. Enzymatic catalysis. Anticancer agents. Diagnosis.

METHODS

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

TYPES OF TEACHING

Type of teaching	M	S	GA	GL	GO	GCL	TA	TI	GCA
Classroom hours	40	5		15					
Hours of study outside the classroom	60	7,5		22,5					

Legend: M: Lecture S: Seminario GA: Pract.Class.Work GL: Pract.Lab work GO: Pract.computer wo
GCL: Clinical Practice TA: Workshop TI: Ind. workshop GCA: Field workshop

ASSESSMENT SYSTEMS

- Final assessment system

TOOLS USED & GRADING PERCENTAGES

- Extended written exam 75%

- Laboratory work 25%

ORDINARY EXAM CALL: GUIDELINES & DECLINING TO SIT

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

EXTRAORDINARY EXAM CALL: GUIDELINES & DECLINING TO SIT

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

COMPULSORY MATERIALS

BIBLIOGRAPHY

Basic bibliography

D. Astruc, ORGANOMETALLIC CHEMISTRY AND CATALYSIS, Springer, 2007
G. Jaouen (Ed.), BIOORGANOMETALLICS, Wiley-VCH, 2006

In-depth bibliography

R. H. Crabtree, THE ORGANOMETALLIC CHEMISTRY OF THE TRANSITION METALS, Wiley, 2005
R. J. Errington, ABVANCED PRACTICAL INORGANIC AND METALLORGANIC CHEMISTRY, Chapman&Hall, 1997.

Journals

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

Useful websites

REMARKS

TEACHING GUIDE 2018/19

Centre 215 - Faculty of Chemistry **Cycle** Indiferente

Plan GQUIMI20 - Bachelor's Degree in Chemistry **Year** Second year

SUBJECT

26117 - Physical Chemistry I **ECTS Credits:** 9

DESCRIPTION & CONTEXTUALISATION OF THE SUBJECT

Physical Chemistry I provides the students the necessary knowledge to analyze the macroscopic behaviour of matter in terms of Thermochemistry, Kinetics or Electrochemistry. Furthermore, it will allow them to understand the fundamentals and applications of transport and surface phenomena, and complex systems as macromolecules and colloids. Overall, the contents of the subject will reveal the importance of physical chemistry in all the different areas of Chemistry, as well as its impact in the industry and technology-based society we live in.

The course is part of the Fundamental Module of the Chemistry Degree, and it is very closely related to the experimental course Experimental Physical Chemistry. The coordination of this course within the Physical Chemistry Module corresponds to the Chemistry Degree Coordination Comission, designated by the Faculty Council.

COMPETENCIES/LEARNING RESULTS FOR THE SUBJECT

Physical Chemistry I, as part of the Fundamental Module, shares the cross skills [M02CM09], [M02CM10] and [M02CM011] with the other courses of the same module. Besides, this course will also develop the specific skill [M02CM01].

M02CM01-Understand and know how to apply the principles of physical chemistry and how they affect chemical processes.

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.

THEORETICAL/PRACTICAL CONTENT

Thermochemistry. Thermodynamic laws. Maxwell’s equations. Enthalpy, entropy, and Gibbs energy: use of thermodynamic tables. Chemical potential. Equilibrium conditions.
Real and ideal solutions. Fugacity of real gas mixtures. Partial molar magnitudes. Activity coefficients. Henry’s law.
Phase equilibria. Pure substance phase diagrams: Clapeyron and Clausius-Clapeyron equations. Multicomponent systems. Liquid-liquid diagrams, liquid-vapor diagrams: azeotropes. Solid-liquid diagrams: eutectics.
Chemical equilibria. Progress of a reaction, free energy and chemical equilibrium in real gas reactions. Equilibrium constants. Heterogeneous equilibria. Equilibria in non-ionic solutions.
Electrochemical equilibria. Ionic solutions. Mean ionic activity. Debye–Hückel limiting law. Electrochemical systems. Electrochemical potential. Electrochemical cells. Standard electrode potential. Determination of thermodynamic magnitudes. Batteries and combustion cells.
Surface phenomena. Surface tension. Capillarity. Adsorption: chemisorption and physisorption. Adsorption isotherms.
Transport phenomena. Kinetic model of gases and transport properties. Thermal conductivity. Viscosity. Diffusion. Electrical conductivity on ionic solutions.
Macromolecules and colloids. Polymers and polymerisation. Average molar mass and determination methods. Conformation and configuration. Colloids: classification and preparation. Structure and stability. Micelle formation. Double electric layer.
Chemical and electrochemical kinetics. Formal kinetics. Reaction mechanisms. Reversible, branched and consecutive reactions. Chain reactions. Explosions. Collision theory. Reactions in solution. Homogeneous, heterogeneous, and enzymatic catalysis.

METHODS

The content has been classified in four different modules, which will be evaluated in separate written tests.
1. Chemical thermodynamics.
2. Solutions, phase equilibria and chemical equilibria.
3. Electrochemical equilibria, surface phenomena, transport phenomena, macromolecules and colloids.
4. Kinetics.

Lectures will typically consist of an explanation about the theoretical contents by the professor. Practical classes, will

generally be employed for the students to analyse and solve practical problems presented by the profesor. Finally, in the seminar activities, the students will have a leading role and will present a subject related to the contents of the course and previously agreed with the professor.

TYPES OF TEACHING

Type of teaching	M	S	GA	GL	GO	GCL	TA	TI	GCA
Classroom hours	45	5	40						
Hours of study outside the classroom	67,5	7,5	60						

Legend: M: Lecture S: Seminario GA: Pract.Class.Work GL: Pract.Lab work GO: Pract.computer wo
GCL: Clinical Practice TA: Workshop TI: Ind. workshop GCA: Field workshop

ASSESSMENT SYSTEMS

- Continuous assessment system
- Final assessment system

TOOLS USED & GRADING PERCENTAGES

- Extended written exam 70%
- Practical work (exercises, case studies & problems set) 15%
- Exposition of work, readings, etc. 15%

ORDINARY EXAM CALL: GUIDELINES & DECLINING TO SIT

The student will have to participate in all the following activities in order to pass the course, with the continuous assessment system: 4 written tests, seminars, practical class work.

The first three written tests will be carried out approximately in October, January and March. The student who passes a written examen will not have to take it again. Those who do not pass the first written test, will have another opportunity in January. The fourth written test, together with the 2nd and 3rd (for those who have to repeat any of them), will take place at the ordinary call in June. This test will evaluate the specific skill [M02CM01].

The 30 % of the final mark will be the average of the results obtained in the following activities:
1. Seminars 15%.
2. Practical class work 15%

The skills assessed will be: [M02CM01], [M02CM09], [M02CM10] and [M02CM011] in Seminars; [M02CM01], [M02CM09], [M02CM10] y [M02CM011] in practical classes. This is applicable to both the ordinary and extraordinary calls.

Given the continuous assessment system, the student who does not participate in the compulsory activities will fail the course. The evaluation of the ordinary call will be “not presented” only in these cases:

The student has carried out none of the compulsory activities.
The student has previously required the final assessment system and has not taken the exam. The final assessment system will have to be required one month before the last compulsory activity is carried out.

In the case of the extraordinary call, it will be enough for the student not to take the exam to be evaluated as “not presented”.

EXTRAORDINARY EXAM CALL: GUIDELINES & DECLINING TO SIT

For those students who have chosen the final assessment system, the test will comprise the contents of the whole course (70%), a presentation of one of the exercises analyzed in practicas de aula, and of one of the subjects discussed in seminar classes (30%). The skills assessed will be [M02CM01], [M02CM09], [M02CM10] y [M02CM011].

COMPULSORY MATERIALS

BIBLIOGRAPHY

Basic bibliography

Robert A. Alberty, Robert J. Silbey: Physical Chemistry, 2nd edn., Wiley, New York, 1997,
Ira R. Levine. Physical Chemistry, 6th ed. Ed. McGraw-Hill,New York, 2009.
P. Atkins, J. de Paula. Physical Chemistry Oxford University Press, 10th ed, 2014.

In-depth bibliography

Journals

Journal of Physical Chemistry
Journal of Chemical Physics
Journal of Chemical Education

Useful websites

http://riodb01.ibase.aist.go.jp/sdbs/cgi-bin/cre_index.cgi
http://webbook.nist.gov/chemistry

REMARKS

TEACHING GUIDE 2018/19

Centre 215 - Faculty of Chemistry **Cycle** Indiferente

Plan GQUIMI20 - Bachelor's Degree in Chemistry **Year** Fourth year

SUBJECT

26121 - Materials Science **ECTS Credits:** 6

DESCRIPTION & CONTEXTUALISATION OF THE SUBJECT

The basic objective of the subject is to provide the students with the theoretical-practical knowledge that allows them to understand the relationship between the structure and the properties of the different materials, taking into account the influence of the processing. Specifically, it is about that the students know the different types of materials, understand their general behavior, their characteristic properties and their potentialities, and recognize the effects of the environment and the conditions of service on their behavior. This understanding is necessary to be able to select the ideal material to participate in the design of reliable and economical components, systems and processes that use the wide spectrum of materials currently available.

COMPETENCIES/LEARNING RESULTS FOR THE SUBJECT

The subject is framed within the Fundamental Complements of Chemistry, located in the Fundamental Module of the Degree and, as such, shares the competences assigned to that Module. Among them, the following specific competence will be treated and evaluated:
- [M02CM05]: "Understanding of the relationships between structure, properties and processing of the various types of materials and their selection according to the intended applications".
Likewise, the 4 transversal competences will be worked on, with a special emphasis on the last of them:
- [M02CM08]: "Ability to select different instrumental techniques, simple or combined, for the characterization of chemical substances". - [M02CM09]: "To be able to present, orally and in writing, in a comprehensible manner, phenomena and processes related to Chemistry and related subjects".
- [M02CM10]: "Ability to search and select information in the field of Chemistry and other scientific fields making use of the bibliography and information and communication technologies".
- [M02CM011]: "Be able to relate Chemistry with other disciplines, as well as understand its impact on current society and the importance of the industrial chemical sector."
The coordination of this subject with the rest of the Module corresponds to the Coordination Commission of the Degree.

THEORETICAL/PRACTICAL CONTENT

THEORETICAL CONTENTS
PART 1
1.- Introduction: (1 hour). Historical perspective. Classification of materials. Advanced materials. New material requirements
2.- Structure of the polymers: (3.5 hours). Monomer, polymer, polymerization reactions, degree of polymerization. Molecular weight. Molecular structure. Thermoplastic and thermostable. Molecular configurations. Copolymers. Polymeric crystals. Solid state.
3.- Structures of metals and ceramics: (0.5 hours: Review of concepts).
4.- Imperfections in solids: (2 hours). Impurities in solids. Point defects in polymers. Linear defects. Interfacial defects. Optical and electronic microscopy.
5.- Diffusion: (1 hour). Factors that innfluence diffusion. Diffusion and processing. Diffusion in ionic and polymeric materials.
6.- Mechanical properties (6 hours). Concepts of stress and strain. Elastic deformation Mechanical behavior of metals. Mechanical behavior of ceramics. Mechanical behavior of polymers. Hardness and other mechanical properties.

PART 2
7.- Deformation and strengthening mechanisms (5 hours). Deformation mechanisms for metals. Mechanisms of strengthening in metals. Recovery, recrystallization and grain growth. Deformation mechanisms for ceramic materials. Mechanisms of deformation and for strengthening of polymers.
8.- Failure (2 hours). Fundamentals of fracture. Ductile fracture. Brittle fracture. Fracture toughness testing. Fatigue and creep
9.-Phase diagrams (2 hours + PO). Equilibrium phase diagrams. Binary isomorphous systems. Binary eutectic systems. Equilibrium diagrams having intermediate phases or compounds. Eutectoid and peritectic reactions.
10.- Steel phase diagram and phase transformations (6 hours). Iron-carbon system phase diagram. Phase transformations in metals. Microstructural changes in steel. Precipitation hardening.
PART 3
11.- Types and applications of materials (4 hours). Metal alloys. Processing of metals. Types of ceramics and their processing. Types of polymers and their processing.
12.- Composites: (4 hours). Particle-reinforced. Fiber-reinforced. Structural composites.
13.- Corrosion and degradation of materials: (2.5 hours). Corrosion rates. Prediction of corrosion rates. Passivity. Forms of corrosion. Corrosion prevention. Oxidation. Degradation of polymers.
14.- Electrical properties: (0.5 hours). Semiconductivity. Semiconductor devices. Electrical conduction in ionic ceramics

and in polymers. Dielectric behavior. Ferroelectricity and piezoelectricity.

PRACTICAL CONTENTS
1. Phase diagrams (computer practices).

EXPERIMENTAL CONTENTS
1. Scanning electron microscopy (laboratory practices).
2. Hardness (laboratory practices).
3. Stress-strain test (laboratory practices).

METHODS

In the case of the Theoretical Programme, the methodology will consist of the presentation of the subject through lectures in which computers will be used intensively for the projection of the content. In seminars, students (either individually or in groups) will make presentations on the proposed themes, and will be given sufficient notice to prepare them. Practical laboratory work will be carried out in 3-4-hour sessions in the afternoons, coinciding with the period of theoretical classes on the calendar. Practical work will be done in groups of 3-4. After an explanation of the activities to be carried out and of the handling of the equipment, the students will perform the experiments, compiling incidents and the experimental data obtained. Finally, an analysis and discussion of the results will be carried out. Each part of practical work will be reflected in a report, which must be drawn up and handed in by the group so that it can be marked. Practical work with computers will be done individually, with students working on an in-depth analysis of phase diagrams of different binary systems.

TYPES OF TEACHING

Type of teaching	M	S	GA	GL	GO	GCL	TA	TI	GCA
Classroom hours	40	7		10	3				
Hours of study outside the classroom	60	18		10	2				

Legend: M: Lecture S: Seminario GA: Pract.Class.Work GL: Pract.Lab work GO: Pract.computer wo
GCL: Clinical Practice TA: Workshop TI: Ind. workshop GCA: Field workshop

ASSESSMENT SYSTEMS

- Final assessment system

TOOLS USED & GRADING PERCENTAGES

- Extended written exam 70%
- Individual work 5%
- Team work (problem solving, project design) 15%
- Exposition of work, readings, etc. 5%
- Computer practices 5%

ORDINARY EXAM CALL: GUIDELINES & DECLINING TO SIT

- Ordinary Evaluation: continuous evaluation of theoretical-practical (TP) and experimental (EX) activities. Final mark: average of TP (85%) and EX (15%) scores.

- Evaluation of the TP part: 3 partial exams on each of the three parts contained in the syllabus, plus a final exam on all the subjects. Partial exams will have a pass mark of 7. Each partial exam will represent 10% of the final mark, and the final exam 40%. Written tests will represent 70% of the final mark. Assessment of seminars and work proposed: each student will make an oral presentation on a theme proposed by the seminars. The oral presentation will represent 5% of the final mark. The backup documentation will represent another 5%. Evaluation of practical work with computers: done through the solving of a series of problems proposed: 5%; skills assessed: M02CM05, M02CM09, M02CM10 and M02CM011.

- Marking of the EX part: quality of the results obtained, reports presented, exercise book and group work (10% of the final grade). Final oral or written test to be performed on the last day of the practical work period, or on the day of the final exam: performance of practical work and/or answers to questions related to the practical work (5% of the final mark). Attendance at practical work is compulsory. Skills evaluated: M02CM08 and M02CM10.

No-show: Only applicable to students who do not attend any continuous evaluation test (no exam, seminar or practical work session), or who OPT OUT in the set period.
Opt-out (waiver): a student who chooses continuous evaluation may opt out of the system within a minimum of 1 month before the end of the teaching period, in writing to the professor in question. Therefore, it will be understood that any student that does not do this will be considered as having failed, even though he/she does not present him/herself for the final exam, as established in chapter 2, article 12 of the Regulations governing student evaluation in undergraduate degrees of the UPV/EHU.
A request for evaluation, through a single test or a final evaluation, will be sent to the teaching staff within 9 weeks of the

start of the term or course, in accordance with the content of chapter 2, article 8 of the Regulations governing student evaluation in undergraduate degrees of the UPV/EHU. This will consist of an examination on all the theoretical-practical content of the subject and the performance of a practical laboratory exam.

EXTRAORDINARY EXAM CALL: GUIDELINES & DECLINING TO SIT

Extraordinary Evaluation: One exam (100% mark) on the failed parts(TP and/or EX).

COMPULSORY MATERIALS

The teacher will indicate the necessary material at the beginning of the course.

BIBLIOGRAPHY

Basic bibliography

W. D. Callister, Jr. Materials Science and Engineering. An Introduction (7th Edition). Wiley, 2007.
W. D. Callister, Jr. Introducción a la Ciencia e Ingeniería de los Materiales. Ed. Reverté, 1995.
D.R. Askeland, P.P. Phulé, The Science and Engineering of Materials. (5th Edition). Cengage-Engineering (2005).
D. R. Askeland. Ciencia e Ingeniería de los Materiales. Thomson Editors, 2001.
W. F. Smith, J. Hashemi. Foundations of Materials Science and Engineering (4th Edition). McGraw-Hill, 2006.

In-depth bibliography

W. D. Callister, Jr. Fundamentals of Materials Science and Engineering. Wiley, 2007.
P.L. Magonon. Ciencia de Materiales: Selección y Diseño. Prentice Hall, 2001.
M. F. Ashby. Materials Selection in Mechanical Design. Butterworth-Heinemann, 1999.
M. F. Ashby, D. R. H. Jones. Engineering Materials 1: An Introduction to their Properties and Applications. Pergamon Press, 1980.
M. F. Ashby, D. R. H. Jones. Engineering Materials 2: An Introduction to Microstructures, Processing and Design. Pergamon Press, 1988.
D. R. H. Jones Engineering Materials 3: Materials Failure Analysis. Pergamon Press, 1993.
L. Smart, E. Moore, Solid State Chemistry: an introduction (3th Edition). CRC Taylor & Francis (2005).

Journals

Progress in Materials Science
Materials Science and Engineering R-Reports
Materials Chemistry and Physics
Journal of Materials Research
Journal of Materials Science
Materials Letters
Nature Materials
Chemistry of Materials

Useful websites

http://www.wiley.com/college/callister
http://www.matter.org.uk/
http://www.matweb.com/
http://www.msm.cam.ac.uk/doitpoms/
http://www.soton.ac.uk/~pasr1/
http://www-g.eng.cam.ac.uk/mmg/teaching/phasediagrams/index4.html
http://matse1.mse.uiuc.edu/~tw/

REMARKS

TEACHING GUIDE 2018/19

Centre 215 - Faculty of Chemistry **Cycle** Indiferente

Plan GQUIMI20 - Bachelor's Degree in Chemistry **Year** Fourth year

SUBJECT

26116 - Chemical & Physical Characterisation of Macro-molecules **ECTS Credits:** 6

DESCRIPTION & CONTEXTUALISATION OF THE SUBJECT

The subject macromolecular chemical and physical characterization belongs to the fourth year of the Chemistry degree and is included in the advanced modulus of this degree. The subject is part of the Macromolecular Materials Curricular line is optative and presents theoretical/practical character. Both, the lectures and the laboratory practices are held in the first quarter.

The subject gives to the student the ability for macromolecular materials chemical (Infrared spectroscopy, Nuclear Magnetic Resonance) and physical (molecular weight and its distribution, thermal transitions and morphology)characterization.

To understand this subject it is very convenient to have passed in the third course the subject organic compounds espectrophotometrical identification and to be enrolled in the subject Materials science. This subject is complemented with the other subjects of the macromolecular materials curricular line, especially with the subjects Macromolecular chemistry and Macromolecular materials I.

COMPETENCIES/LEARNING RESULTS FOR THE SUBJECT

The subject is included in the Macromolecules line, and forms part of the advanced modulus and thus, it shares its cross-skills. Specifically the skills [M03CM03] [M03CM11] [M03CM12] [M03CM13] [M03CM17] and [M03CM018].

M03CM03: Possess the ability to understand and use the experimental methods of analysis and characterisation of the most representative properties of macromolecular substances and interpret the results returned in terms of the relationship between structure and properties.
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.
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.

The coordination of this subject with the others of the line corresponds to the Chemistry Degree Commission that will be elected by the Faculty board.

THEORETICAL/PRACTICAL CONTENT

Theoretical part

Identification and analysis methods. General concepts for the macromolecular analysis.
Use of the spectroscopic techniques in the polymer analysis. Infrared spectroscopy (FTIR) and 1H and 13 C Nuclear Magnetic Resonance (NMR)
Molecular weight and dispersity. Macromolecules in solution. Experimental methods to determine the molecular weight.
Thermal properties and its characterization. Amorphous and crystalline polymers. Glass transition. Melting and crystallization. Thermal analysis methods.
Characterization of micro and nanostructures. Electron microscopy.

Practical part
Analysis of commercial samples by FTIR spectroscopy
Molecular weight calculation
Measurements of the thermal properties

METHODS

The course is constituted by the following activities
- Lectures, focus on providing basic knowledge of the subject.
- Practical Classroom Work hours, are directed to the application of the acquired theoretical knowledge to solve problems posed by the professor.

- Individual assignments will be part of the self-study hours of the students, and consist of the resolution of problem sets.
- Practical Lab Work is held in group. In the Lab, commercial polymeric samples will be analyzed applying the concepts obtained in the previous activities.

TYPES OF TEACHING

Type of teaching	M	S	GA	GL	GO	GCL	TA	TI	GCA
Classroom hours	40		5	15					
Hours of study outside the classroom	60		10	20					

Legend: M: Lecture S: Seminario GA: Pract.Class.Work GL: Pract.Lab work GO: Pract.computer wo
GCL: Clinical Practice TA: Workshop TI: Ind. workshop GCA: Field workshop

ASSESSMENT SYSTEMS

- Continuous assessment system
- Final assessment system

TOOLS USED & GRADING PERCENTAGES

- Extended written exam 55%
- Practical work (exercises, case studies & problems set) 25%
- Individual work 20%

ORDINARY EXAM CALL: GUIDELINES & DECLINING TO SIT

The written exam will account for 55 % of the final mark, and will contain theoretical and practical questions. By means of this part skills M03CM03, M03CM11 and M03CM17 will be evaluated. A continuous evaluation based on the participation in the classroom activities and the resolution of the individual assignments will be used. This evaluation will account for 20% of the final mark. By means of this part skills M03CM03, M03CM12, M03CM13 and M03CM17 will be evaluated. Practical Lab Work is mandatory in the continuous evaluation and will be evaluated based on the progress of the student in the lab and the submitted final report. This evaluation will account for 25% of the final mark. By means of this part skills M03CM03, M03CM11, M03CM12, M03CM13, M03CM17 and M03CM18 will be evaluated.
The student must obtain a minimum mark of 5.0 in each part (written exam, individual assignments, practical Lab Work).

Criteria for continuous assessment waiver are those established in Chapter 2, Articles 8 and 12 of the Student Assessment Regulation for Bachelors Degrees of the UPV/EHU.
Criteria for final evaluation request are those established in Chapter 2, Article 8 of the Student Assessment Regulation for Bachelors Degrees of the UPV/EHU. In that case, the final evaluation will contain theoretical and practical questions and a laboratory practice. By means of this exam skills M03CM03, M03CM11, M03CM12, M03CM13, M03CM17 and M03CM18 will be evaluated.
-No presentado- grade is given either if the student gets the continuous assessment waiver within the indicated deadline, or if the student has requested to hold final assessment system but does not take part in the final exam, as established in Chapter 2, Article 12 of the Student Assessment Regulation for Bachelor’s Degrees of the UPV/EHU.

EXTRAORDINARY EXAM CALL: GUIDELINES & DECLINING TO SIT

In the 2nd convocation (July) the student will be evaluated exclusively by means of the mark obtained in a written exam.

COMPULSORY MATERIALS

They will be described each year in the student's guide.

BIBLIOGRAPHY

Basic bibliography

1. Polímeros. J. Areizaga, M. Cortázar, J.M. Elorza, J. J. Iruin. Editorial Síntesis, 2002.
2. Plastics Analysis Guide: Chemical and Instrumental Methods.
A. Krause, A. Lange. M. Ezrin. Hanser Publishers, 1983.
3. Introduction to Polymer Analysis
T. R. Crompton. Smithers, 2009.
4. Thermal Characterization of Polymeric Materials (Vols 1,2). E. A. Turi. Academic Press, 1997.

In-depth bibliography

M. Chanda, Introduction to Polymer Science and Chemistry: A problem solving approach. CRC Press, 2006.
Seymour/Carraher's Polymer Chemistry. C.E. Carraher, Jr. CRC Press, 2008.
F.A. Bovey and J. Jelinski, Chain Structure and Conformation of Macromolecules. Academic Press, 1982.
F.A. Bovey and P.A. Mirau, NMR of Polymers. Academic Press, 1996.

C. Randall, Polymer Sequence Determination. 13C-NMR Method. Academic Press, 1977.

Journals

Macromolecules
Polymer
Polymer Degradation and Stabilization
Vibrational Spectroscopy

Useful websites

Macrogalleria: http://pslc.ws/spanish/index.htm
http://macro.lsu.edu/corecourses/msweb4/VirtualBook/Ch7_Morphology/Ch7_MorophologyMicroscopyScattering_mm.ppt

REMARKS

The student must obtain a minimum mark of 5.0 in each part (written exam, individual assignments, practical Lab Work).

TEACHING GUIDE 2018/19

Centre 215 - Faculty of Chemistry **Cycle** Indiferente

Plan GQUIMI20 - Bachelor's Degree in Chemistry **Year** Fourth year

SUBJECT

26118 - Macromolecular Materials I: Properties and Applications **ECTS Credits:** 6

DESCRIPTION & CONTEXTUALISATION OF THE SUBJECT

This subject aims to introduce students to the main families of industrial polymers for general purpose, as well as those employed in adhesive and coating technologies. The main objective is to learn the main characteristics of each of them and especially to understand the relationship between its structure, its properties and its applications. The subject includes, in addition to a general description of the polymeric materials, the introduction to the main methods for characterization and testing of polymeric materials. Also, concepts about the effect that polymeric materials can have on the environment, will be studied.

COMPETENCIES/LEARNING RESULTS FOR THE SUBJECT

The subject is part of the specialty of Macromolecules; it is classified inside the Advanced Module, thus sharing the cross-competencies assigned to it. Among them, the following competencies will be treated and evaluated:

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.

M03CM20: Relate chemistry with other disciplines and understand its impact on the industrial and technological society and the importance of the industrial chemical sector.

The specific competencies evaluated are:

M03CM03: Possess the ability to understand and use the experimental methods of analysis and characterisation of the most representative properties of macromolecular substances and interpret the results returned in terms of the relationship between structure and properties.

M03CM04: Possess adequate knowledge of the main families of industrial polymers, their production, properties and most typical applications.

M03CM11: Be able to design, programme and carry out experimental processes and use adequate instrumental techniques for different types of chemical problems.

THEORETICAL/PRACTICAL CONTENT

The subject is comprised by three different parts, of different extension:

- Description of polymeric materials (15 master hours)
  - Amorphous and crystalline polymers.
  - Elastomers
  - Thermosetting polymers
  - Adhesives
  - Coatings/Paints
  - Aditives for polymers
  - Polymer blends and composites

- Properties of macromolecular materials (20 master hours)
  - Mechanical properties: tensile tests, impact test, other
  - Electrical properties
  - Thermal properties

- Macromolecular materials and environment (5 master hours)
  - Environmental problems of polymers
  - Types of recycling
  - Biodegradable polymers

The following laboratory practices will be carried out:

1) Tensile tests: Structure-Mechanical Properties relationship for different polymeric materials,
2) Impact tests, and
3) Measuring thermal properties of polymers: MFI and Vicat softenig temperature determination.

METHODS

Theoretical-practical (TP) activities and experimental (EX) works will be the main activities of the subject.

The theoretical-practical activities will consist of lectures in which the teacher will explain each of the topics that make up the subject, relying on Power Point presentations, which will be previously available to students. There will also be a series of seminars, in which the work of the students will be prominent, and in which some of the topics seen in the lectures will be deepened, especially those studied in the first two parts of the course. Another activity to be developed in the seminars will consist in the preparation by the students, divided into groups of three or four people, of a topic of "Macromolecular materials and environment", and that they will have to present to the rest of the students during the last days of the course.

On the other hand, the experimental activities will consist of three sessions of laboratory practices to be performed at the laboratory premisses in the afternoon.

The attendance to the Seminars and Laboratory Sessions is compulsory and inexcusable.

TYPES OF TEACHING

Type of teaching	M	S	GA	GL	GO	GCL	TA	TI	GCA
Classroom hours	40	10		10					
Hours of study outside the classroom	60	20		10					

Legend: M: Lecture S: Seminario GA: Pract.Class.Work GL: Pract.Lab work GO: Pract.computer wo
GCL: Clinical Practice TA: Workshop TI: Ind. workshop GCA: Field workshop

ASSESSMENT SYSTEMS

- Continuous assessment system
- Final assessment system

TOOLS USED & GRADING PERCENTAGES

- Extended written exam 40%
- Practical work (exercises, case studies & problems set) 15%
- Exposition of work, readings, etc. 15%
- Three written partial exams distributed along the year: one of "Descriptive of Polymeric Materials" (12.6%), another of "Mechanical Properties" (12.0%), and one last of "Electrical and Thermal Properties" (5.4%) 30%

ORDINARY EXAM CALL: GUIDELINES & DECLINING TO SIT

Evaluation methodology: Continuous assessment, to evaluate the theoretical-practical (TP) and experimental (EX) activities. The final grade will be obtained by averaging the grades obtained in the TP (85%) and EX (15%) parts.

a) Assessment of TP part: On the one hand, the knowledge of the theoric contents will be assessed by means of 3 partial exams with a total value of 30% of the total score, and a final exam of the total of the subject that is worth 40%.

The activities carried out during the seminars (compulsory attendance) will also be scored. Each student will make an oral presentation of a topic previously worked in the seminars. The participation in activities carried out in the seminars and the exposed work will be worth a total of 15% of the total score. The competencies M03CM03, M03CM04, M03CM18 and M03CM20 will be evaluated.

b) Evaluation of the EX part: In laboratory work, the following items will be evaluated: the quality of the results obtained, the reports presented, the laboratory notebook and the work within the group. Attendance at laboratory practices is compulsory. The competencies M03CM11 and M03CM17 will be evaluated

In the ordinary evaluation , the grade "No-show" will only be given o students who do not attend any continuous assessment test (no exam, seminar, or laboratory practice session).

Those parts (theory, seminars and/or laboratory practices) with an score lower than 4.0, or those parts scored equal to or higher than 4.0 but lower than 5.0, but beeing the average of all of them lower than 5.0, will be reassessed in the extraordinary assessment.

Students who have chosen continuous assessment, may waive the call (opt-out) within a period of up to 4 weeks before the ending of the teaching period of the subject. This resignation must be submitted by writing a letter to the teacher responsible for the subject. On approval of the application, the student will be qualified as "No-show".

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.

The application will declare the way in which the knowledge and competences inherent to the subject will be achieved, especially the practical skills.

In both calls (ordinary and extraordinary) the single test will be made of several parts: 1) a written examination of all the theoretical-practical content of the subject, 2) the realization of a practical laboratory exam (realization of a laboratory practice sorted out among those contemplated in the program, and writing the corresponding report), and 3) an oral dissertation with the help of multimedia resources of a topic chosen among those developed in the seminars, selected by the examiners at least 10 days before the examination, followed by a discussion with the examiners. Competencies M03CM03, M03CM04, M03CM11, M03CM17, M03CM18 y M03CM20 will be assessed.

Students who had opted by the evaluation through a single test, but not shown to the exam, will be granted "No-show ", which means the automatic waiver of the call.

EXTRAORDINARY EXAM CALL: GUIDELINES & DECLINING TO SIT

Evaluation methodology: A single test in which the parts graded no-pass/failed in the ordinary call (theoretical part, seminars and/or laboratory practices) will be assessed, according to the aforementioned final evaluation system (single test).

There will be a written exam for the assessment of the theoretical content, an oral examination consisting of the presentation of a subject among those treated in the seminars, for those students who have failed this activity, and an experimental exam of laboratory practices for those who failed the laboratory work. The written laboratory reports of all the practices will also be required.

The score of the extraordinary call will be the weighted average of the mark gotten in the exam, and of the marks gotten in the parts granted pass saved in the ordinary call.

"No-show" in the extraordinary call will be granted to anyone not attending the exam, which means the automatic waiver of the call.

COMPULSORY MATERIALS

There is no compulsory material.

BIBLIOGRAPHY

Basic bibliography

1) J.A. Brydson. Plastics Materials (7th Edition), Butterworth-Heinemann, 1999.
2) J.A. Brydson. Materiales Plásticos. instituto de Plásticos y Caucho, 1975.
3) Z. W. Wicks Jr., F. N. Jones, S. P. Peppas. Organic Coatings: Science and Technology. Wiley Interscience, 1999.
4) W.Brockmann. Adhesive bonding: Materials, Applications and Technology. Wiley-VCH, 2008
5) L.E. Nielsen and R.F. Landel. Mechanical Properties of Polymer and Composites: Second Edition. Marcel Dekker, 1994.
6) V. Shah. Handbook of Plastics Testing and Failure Analysis: Third Edition. John Wiley & Sons, Inc., 2007.

In-depth bibliography

1) J. Royo. Manual de Tecnología del Caucho. Ed. Consorcio Nacional de Industriales del Caucho, 1989.
2) J. Areizaga, M. Cortázar, J. M. Elorza, J. Iruin. Polímeros. Editorial Síntesis, 2002
3) A.A.Tracton. Coatings Technology: Fundamentals, Testing, and Processing Techniques. CRC Press, 2007.
4) A.A.Tracton. Coatings Materials and Surface Coatings. CRC Press, 2007.
5) R. Brown. Physical Testing of Rubber, 3rd edition. Chapman & Hall, 1996.
6) R. Blythe. Electrical Properties of Polymers. Cambridge University Press, 1979.
7) D. Hull. An introduction to Composite Materials. Cambridge University Press, 1981.

Journals

Macromolecules
Polymer
Polymer Engineering and Science
Journal of Applied Polymer Science
Composites Science and Technology
Polymer Testing

Revista de Plásticos Modernos

Useful websites

http://pslc.ws/spanish/index.htm
http://www.plastics.com
http://www.plastunivers.es
http://www.matweb.com

REMARKS

If the student gets a final grade of "no pass/failed", the parts graded as "pass" (TP or EX) will not be saved for the following course, and will be examined again.

SÍNTESIS ORGÁNICA Y BIOMOLÉCULAS/ ORGANIC SYNTHESIS AND BIOMOLECULES

Context and description of the subject
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.

Competences/Results associated with 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.T1] The skills of observation, analysis and synthesis with a critical perspective.
[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 (theory and experiments)
Advanced NMR ^{1}H, ^{13}C and other nuclei spectroscopy. NOE and two-dimensional spectroscopy.
Synthesis of molecules of therapeutic interest. Aliphatic and carbocyclic systems. Aromatic and (partially) saturated heterocycles. Mono- and polycyclic heterocycles. Principles of combinatorial synthesis.
Drugs and chirality. General strategies for the synthesis of enantiomerically pure drugs. The Chiral Pool approach.
Catalytic methods: Enzymes, organometallic compounds, organocatalysis.
Drugs related to Natural Products: Nucleosides and analogs. Esteroids. β-Lactam antibiotics. Peptides and peptidomimetics. Prostaglandins.

Methodology
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.

Examination systems
- Continuous assessment system

- Final assessment system
- Tools and percentages for rating:
    - Written exam (%): 60
    - Practical (exercises, case studies or problems) (%): 20
    - Individual report (%): 20

Ordinary call: directions and how to resign
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.

Special Call: Directions and How to Resign
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.

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.

Literature
Basic literature
1. A. Delgado, C. Minguillón, J. Juglar, INTRODUCCIÓN A LA SÍNTESIS DE FÁRMACOS, Ed. Síntesis, 2002.
2. S. Warren, P. Wyatt, ORGANIC SYNTHESIS: THE DISCONNECTION APPROACH, 2nd Edition, Ed. Wiley, 2009.

3. P. Cardá, E. Falomir, SÍNTESIS TOTALES: RETROSÍNTESIS Y MECANISMOS, Universidad Jaime I, 2008.
4. R. M. Silverstein, F. X. Webster, D. Kiemle, SPECTROSCOPIC IDENTIFICATION OF ORGANIC COMPOUNDS, John Wiley & Sons, 2005.
5. J. Clayden, N. Greeves, S. Warren, ORGANIC CHEMISTRY, 2nd edition, Ed. Oxford, 2012.

Advanced literature

1. E. Francotte, W. Lindner (Eds.), CHIRALITY IN DRUG RESEARCH, Ed. Wiley-VCH, 2006.
2. F. A. Carey, R. J. Sundberg, ADVANCED ORGANIC CHEMISTRY, PART B: REACTIONS AND SYNTHESIS, Ed. Springer, 2007.
3. J. Fischer, C.R. Ganellin (Eds.), ANALOGUE-BASED DRUG DISCOVERY, Ed. Wiley-VCH, 2006.
4. E.J. Corey, B. Czakó, L. Kürti, MOLECULES AND MEDICINE, Ed. Wiley, 2007.
5. H. Friebolin, BASIC ONE- AND TWO-DIMENSIONAL NMR SPECTROSCOPY, Ed. VCH, 1991.

Revistas

The Journal of Organic Chemistry: http://pubs.acs.org/journal/joceah
Organic Letters: http://pubs.acs.org/journal/orlef7
European Journal of Organic Chemistry: http://www3.interscience.wiley.com/journal/27380/home
Tetrahedron: http://www.sciencedirect.com/science/journal/00404020
Tetrahedron Letters: http://www.sciencedirect.com/science/journal/00404039
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
ChemMedChem: http://www.wiley-vch.de/publish/dt/journals/newJournals/2452/

Web sites

Organic Chemistry Portal: http://www.organic-chemistry.org/
Organic Resources Wordwide: http://www.organicworldwide.net/
Chemical and Engineering News: http://www.ucm.es/info/rsequim/geqo/
Bases de datos de compuestos orgánicos: http://pubchem.ncbi.nlm.nih.gov/ , http://www.chemspider.com/

TEACHING GUIDE 2018/19

Centre 215 - Faculty of Chemistry

Cycle Indiferente

Plan GQUIMI20 - Bachelor's Degree in Chemistry

Year Fourth year

SUBJECT

26139 - Environmental Technology & Chemistry

ECTS Credits: 6

DESCRIPTION & CONTEXTUALISATION OF THE SUBJECT

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.

COMPETENCIES/LEARNING RESULTS FOR THE SUBJECT

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.

THEORETICAL/PRACTICAL CONTENT

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.
IV/Waste treatment: Water treatment. Soil recuperation. Gas streams treatment.

METHODS

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.

TYPES OF TEACHING

Type of teaching	M	S	GA	GL	GO	GCL	TA	TI	GCA
Classroom hours	40	10	10						
Hours of study outside the classroom	60	15	15						

Legend: M: Lecture S: Seminario GA: Pract.Class.Work GL: Pract.Lab work GO: Pract.computer wo
GCL: Clinical Practice TA: Workshop TI: Ind. workshop GCA: Field workshop

ASSESSMENT SYSTEMS

- Continuous assessment system
- Final assessment system

TOOLS USED & GRADING PERCENTAGES

- Extended written exam 80%
- Exposition of work, readings, etc. 20%

ORDINARY EXAM CALL: GUIDELINES & DECLINING TO SIT

-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 EXAM CALL: GUIDELINES & DECLINING TO SIT

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

COMPULSORY MATERIALS

BIBLIOGRAPHY

Basic bibliography

Metcalf-Eddy: "Ingeniería de aguas residuales". McGraw-Hill, 1998 (Barcelona)
C. Orozco y cols. "Contaminación ambiental". Thompson, 2003 (Madrid).
J.H. Seinfeld y S.N. Pandis: "Atmospheric Chemistry and Physics". J. Wiley, 2006 (Nueva York).

In-depth bibliography

J.E. Figueruelo y M.N. Dávila: "QuímicaFísica del ambiente y de los procesos naturales". Ed. Reverte (Madrid, 2000).
D.L. Sparks: "Environmental Chemistry of Soils". Academic Press, 2003.
Davis, W.T. (Ed.): "Air Pollution Engineering Manual", 2nd Edition, John Wiley and Sons, 2000.

Journals

Journals of Environmental Chemistry and Technology.

Useful websites

http://www.euskadi.eus/temas/-/medio-ambiente-y-meteorologia/

REMARKS

TEACHING GUIDE 2018/19

Centre 215 - Faculty of Chemistry

Cycle Indiferente

Plan GQUIMI20 - Bachelor's Degree in Chemistry

Year Fourth year

SUBJECT

26119 - Macromolecular Materials II: Processing

ECTS Credits: 6

DESCRIPTION & CONTEXTUALISATION OF THE SUBJECT

The subject begins with an introduction to Rheology, locating the particular features of macromolecular materials and their behaviour between elastic solids and Newtonian liquids. Rheological knowledge is the basis for the later study of methods to process or convert these materials into useful products. The objectives are: provide students with the theoretical knowledge and practical experience needed to understand the behaviour of polymer flows, and use the main industrial techniques for processing these materials in the context of correlations between structure, rheology, processing and properties.

COMPETENCIES/LEARNING RESULTS FOR THE SUBJECT

This subject is included in the minor called "Macromolecules", located in the Advanced Module of the Degree and so, its transversal competencies will be evaluated. Among them, the following will be worked:

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.

M03CM20: Relate chemistry with other disciplines and understand its impact on the industrial and technological society and the importance of the industrial chemical sector.

The specific competencies of this subject are:

M03CM05: Acquire knowledge and develop skills to use the main methods for transforming macromolecular materials into useful products. Possess basic knowledge of the rheological foundations on which said transformations are based.

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.

The coordination of this subject with the others included in the same module is up to the Undergraduate Degree Coordination Comission.

THEORETICAL/PRACTICAL CONTENT

Introduction. Basic definitions and concepts. Non-newtonian liquids. Viscoelastic response. Rheology and processing. Flow in polymeric liquids. Simple continuous flow: pseudoplastic or sher thinning behaviour. Oscillatory flow: dynamic viscoelasticity. The influence of temperature and molecular parameters.
Rheological techniques. Measurement of the effect of shear rate on the viscosity. Measurement of the viscoelasticity. Capillary rheometry. Torsion rheometers.
Operations before processing: Drying of polymers and blending in macromolecular materials (mixing and additive addition).
Continous processing techniques: Extrusion. Calendering. Applications.
Cyclic processing techniques: Injection molding. Blow molding. Thermoforming. Molding of thermoset materials. Other cyclic processing techniques. Applications.

METHODS

The methodology for teaching the subject consists (in the case of the Theoretical Programme) of lectures in which computers will be used extensively to project the content. Students also participate in seminars where they present the results and conclusions obtained in practical work in the laboratory or specific themes proposed by the professor.
The laboratory practical work will be done in 3-hour sessions in the afternoons, linking in with the timetable for the period of theoretical classes. During the practical sessions, the processes and the functioning of machines will be explained, together with the experimental conditions to be applied. In groups of 3-4, students will then perform experiments, noting down any incidents and the data obtained. Finally, an analysis and discussion of the results will be carried out. For each practical work exercise, this will be reflected in a report that will be prepared by the group and presented for grading.

TYPES OF TEACHING

Type of teaching	M	S	GA	GL	GO	GCL	TA	TI	GCA
Classroom hours	40	5		15					
Hours of study outside the classroom	60	10		20					

Legend: M: Lecture S: Seminario GA: Pract.Class.Work GL: Pract.Lab work GO: Pract.computer wo
GCL: Clinical Practice TA: Workshop TI: Ind. workshop GCA: Field workshop

ASSESSMENT SYSTEMS

- Final assessment system

TOOLS USED & GRADING PERCENTAGES

- Extended written exam 55%
- Practical work (exercises, case studies & problems set) 25%
- Team work (problem solving, project design) 10%
- Exposition of work, readings, etc. 10%

ORDINARY EXAM CALL: GUIDELINES & DECLINING TO SIT

1) In the ordinary evaluation, a final written exam will be held that may contain questions of a theoretical and practical nature; it will represent 55% of the final mark. During lectures, at the end of each theme, tests will be set through the use of interactive response controls. This evaluation may partially replace the final exam.

2) Continuous evaluation of students based on participation in interaction activities in class (controls, projects, explanations...) and/or the performance/resolution of exercises. This modality will account for 20% of the final mark and is compulsory for students who opt for continuous evaluation.

3) An evaluation of practical laboratory work will be made based on the attitude and progress observed, and on documents/reports on the work done. This evaluation will represent 25%. Attendance at practical laboratory work will be essential to pass the subject.

The criteria for opting for evaluation in a final exam are those stated in chapter 2, article 8 of the Regulations governing student evaluation in undergraduate degrees of the UPV/EHU.

If a student opts for evaluation in a final exam, not presenting him/herself for that exam will mean that he/she withdraws from the evaluation and will be considered “Not Present”.

The criteria for opting out of continuous evaluation are those stated in chapter 2, article 8 of the Regulations governing student evaluation in undergraduate degrees of the UPV/EHU.

EXTRAORDINARY EXAM CALL: GUIDELINES & DECLINING TO SIT

In the extraordinary evaluation, a student may request that his/her marks are calculated in the percentages referred to in sections 2) and 3) of the ordinary evaluation rules (only if they have passed them). In this case, the student may only do the written exam in section 1), with its corresponding percentage value (55%).

If a student opts for evaluation through a single exam, or has not passed section 2) and 3) of the ordinary evaluation, he/she will take a single exam of a theoretical-practical nature, representing 100% of the final mark. This exam will be used to evaluate all the competences of the subject.

COMPULSORY MATERIALS

There is no compulsary material.

BIBLIOGRAPHY

Basic bibliography

J. M. Dealy. Rheometers for Molten Plastics. Van Nostrand Reinhold, 1982.
J. Ferguson, Z. Kembloswsky. Applied Fluid Rheology. Elsevier Applied Science, 1991.
A. A.Collier. Thechniques in Rheological Measurements. Chapman and Hall, 1993.
G. Schramm. A Practical Approach to Rheology and Rheometry. Haake, 1994.
C. D. Han. Rheology in Polymer Processing. Academic Press, 1976.
J. M. Dealy, K. F. Wissbrun. Melt Rheology and its Role in Plastics Processing: Theory and Applications. Van Nostrand Reinhold, 1990.
A. Santamaría, M. E. Muñoz. Curso de Reología Aplicada. UPV/EHU, 2009.
A. Santamaria, E.Unzueta. Erreologia: Teoria eta Praktika. UEU, 1994.

M. L. Berins, Editor. Plastics Engineering Handbook. Van Nostrand Reinhold, 1991.
W. Michaeli. Plastics Processing, An Introduction. Hanser, 1995.
T. L. Richardson. Industrial Plastics. Delmar Publishers Inc., 1989.
J. M. Charrier. Polymeric Materials and Processing. Hanser, 1991.
W. Michaeli, H. Kaufmann, H. Greif. F. J. Vosseburger. Training in Plastics Technology. Hanser, 1995.
A. W. Birley, B. Hawort, J. Batchelor. Physics of Plastics. Processing, Properties and Materials Engineering. Hanser Publishers, 1991.

In-depth bibliography

J. D. Ferry. Viscoelastic Properties of Polymers. Wiley, 1980.
W. W. Graessley. Polymeric Liquids and Networks: Dynamics and Rheology. Garland Science, 2008.
I. I. Rubin (ed.). Handbook of Plastics Materials and Technology. Wiley Interscience, 1990.
C. A. Harper (ed.). Handbook of Plastic Processes. Wiley, 2006.

Journals

Polymer
Journal of Rheology
Rheologica Acta
Applied Rheology
Macromolecular Materials and Engineering
Polymer Engineering and Science
International Polymer Processing
European Polymer Journal
Journal of Applied Polymer Science

Useful websites

http://www.rheology.org/
http://www.bsr.org.uk
http://rrc.engr.wisc.edu/
http://www.strictly-extrusion.com
http://www.ferris.edu/htmls/academics/course.offerings/hillm
http://www.polymer-age.co.uk
http://www.matweb.com
http://www.plastics.com
http://www.empirewest.com/academy/index.html
http://www.mdacomposites.org
http://www.plastunivers.es
http://www.mixers.com
http://www.apme.org

REMARKS

TEACHING GUIDE 2018/19

Centre: 215 - Faculty of Chemistry

Plan: GQUIMI20 - Bachelor's Degree in Chemistry

Cycle: Indiferent

Year: Fourth year

SUBJECT

26120 – Industrial Polymerization Processes

ECTS Credits: 6

DESCRIPTION & CONTEXTUALISATION OF THE SUBJECT

The main objective of the subject is that the student acquires knolwledge of the polymerization reaction engineering, so that he/she can understand the production processes of main commercial polymer families (polyolefins, PVC, styrene/acrylic copolymers, vynil/acrylic copolymers or PET amongst others). For that purpose, the polymerization kinetics, polymerization techniques, different kinds of processes and reactors used and the properties of the polymers and copolymers produced will be discussed.

COMPETENCIES/LEARNING RESULTS FOR THE SUBJECT

The following cross skills will be developed:
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.
Together with the following specific skills:
M03CM02 - Possess basic knowledge of the most common industrial technologies in the production of polymers and the engineering of the reactors used in the production process.
M03CM04 - Possess adequate knowledge of the large families of industrial polymers, their production, properties and most typical applications.
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.
M03CM14 - Be able to use the information and knowledge gained from the module for training in existing or emerging fields related to chemistry.

THEORETICAL/PRACTICAL CONTENT

1.- Introduction to Polymerization Processes

2.- Ideal reactors. Chemical reactions engineering

3.- Coordination polymerization engineering

4.- Free radical (co)polymerization engineering in homogeneous systems

5.- Polymerization in dispersed phase. Suspension and emulsion polymerization

6.- Step-growth polymerization

METHODS

In the on site lectures, theoretical and practical (exercises, expositions…) concepts will be developed, which will be evaluated by a written exam which will give 60% if the final mark.
In the computer based lectures, the student will learn how to simulate polymerization processes with at commercial software (Predici). In this activity, the student will have to seek for the necessary information in the literature, will have to develop a mathematical model for the process and will solve it numerically by the simulation: finally he/she will write a report and present it in front of the rest of the class.

In the experimental part of the subject, the student will study a polymerization reaction, following its kinetics and the microstructure of the obtained polymer.

ASSESSMENT SYSTEMS

- Continuous assesment system

TOOLS USED & GRADING PERCENTAGES

Extended written exam: 60 %
Practical work (exercises, case studies & problems set): 10 %
Predici simulation (written report and individual presentation): 30 %

ORDINARY EXAM CALL: GUIDELINES & DECLINING TO SIT

As explained in the table above, the written exam will be 60% of the final mark. The simulation report and presentation will be 30% of the mark, and the experimental laboratory work will be 10% of the mark.
As the written exam is 60% of the mark, in order to get a “Non-presented”, the student will have to inform the lecturer one month in advance of the exam.

EXTRAORDINARY EXAM CALL: GUIDELINES & DECLINING TO SIT

In the extraordinary evaluation the written exam can be repeated, but the mark obtained in the other two activities will be maintained.

As the written exam is 60% of the mark, in order to get a “Non-presented”, the student will have to inform the lecturer one month in advance of the exam.

BIBLIOGRAPHY

Basic bibliography

1.- “Polymer Reaction Engineering”, J.M. Asua Ed. Blackwell 2007.
2. “Handbook of Polymer Reaction Engineering”, T. Meyer, J. Keurentjes, Willey, 2005.
3.-"Principles of Polymerization Engineering". J. A. Biesenberger eta D. H. Sebastian. J. Wiley. N.Y., 1983

In-depth bibliography

1.-"Reaction Engineering of Step Growth Polymerization".S. K. Gupta y A. Kumar. Plenum Chem. Eng. Series. Plenum Press, N.Y., 1987.
2.-"Emulsion Polymerization". I. Piirma. Academic Press. N.Y., 1982.
3.-"Emultsio-Polimerizaziorako erreaktoreen Injineritza".J. Asúa, M. J. Barandiaran. Zubize, 1985.
4.-"Principles of Polymerization". Third Edition. George Odian. J. Wiley. N.Y., 1991
5.- “Emulsion Polymerization and Emulsion Polymers” P.A. Lowell eta M.S. El-Aasser, Wiley 1997
6.-“Emulsion Polymerization: A Mechanistic Approach” B. Gilbert, Academic Press 1995
7.- “ Polymeric dispersions: Principles and applications” J.M. Asua, Kluwer 1997
8.- “Polymerization Process Modelling” N.A. Dotson, R.G. Galvan, R.l. Lawrence, M. Tirrell, VCH (1996).
9.- “Les Latex Synthetiques:Elaborations, propietes, aplications”, C. Pichot, J.C. Bernard, Lavoisier, 2006

Journals

Macromolecular Reaction Engineering
Macromolecules
Industrial and Engineering Chemistry Research
Polymer

Websites

Macrogaleria: http://pslc.ws/spanish/index.htm
Working Party on Polymer Reaction Engineering: http://www.wppre.com/

TEACHING GUIDE 2018/19

Centre 215 - Faculty of Chemistry **Cycle** Indiferente

Plan GQUIMI20 - Bachelor's Degree in Chemistry **Year** Third year

SUBJECT

26133 - Mathematical Methods for Chemistry **ECTS Credits:** 6

DESCRIPTION & CONTEXTUALISATION OF THE SUBJECT

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 expansión 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.).

THEORETICAL/PRACTICAL CONTENT

Integral calculus with functions of several variables. Line and surface integrals
Vector calculus. Basic conceps and application. Differential operators.
Differential equations. Solving methods and applications.

METHODS

The student is encouraged to actively participate on both thoretical 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

Type of teaching	M	S	GA	GL	GO	GCL	TA	TI	GCA
Classroom hours	45	15							
Hours of study outside the classroom	67,5	22,5							

Legend: M: Lecture S: Seminario GA: Pract.Class.Work GL: Pract.Lab work GO: Pract.computer wo
GCL: Clinical Practice TA: Workshop TI: Ind. workshop GCA: Field workshop

ASSESSMENT SYSTEMS

- Final assessment system

TOOLS USED & GRADING PERCENTAGES

- Extended written exam 100%

ORDINARY EXAM CALL: GUIDELINES & DECLINING TO SIT

Final exam: 100%

EXTRAORDINARY EXAM CALL: GUIDELINES & DECLINING TO SIT

Final exam: 100%

COMPULSORY MATERIALS

No specific material is needed.

BIBLIOGRAPHY

Basic bibliography

Vector calculus, J.E. Marsden & A. J. Tromba
Differential equations, Ross.S.L.

In-depth bibliography

No further source is required.

Journals

As above.

Useful websites

In internet there are plenty of courses and pages about these topics.
Students are encouraged to find futher approaches in the web.

REMARKS

No one