

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

<b>Code</b>	42930
<b>Name</b>	Chromatography and related techniques. Coupling techniques
<b>Cycle</b>	Master's degree
<b>ECTS Credits</b>	4.0
<b>Academic year</b>	2021 - 2022

**Study (s)**

<b>Degree</b>	<b>Center</b>	<b>Acad. year</b>	<b>Period</b>
2109 - M.D. in Experimental Techniques in Chemistry	Faculty of Chemistry	1	First term

**Subject-matter**

<b>Degree</b>	<b>Subject-matter</b>	<b>Character</b>
2109 - M.D. in Experimental Techniques in Chemistry	1 - Advanced laboratory of experimental techniques in chemistry	Obligatory

**Coordination**

<b>Name</b>	<b>Department</b>
MEDINA HERNANDEZ, MARIA JOSE	310 - Analytical Chemistry
PASTOR GARCIA, AGUSTIN	310 - Analytical Chemistry

**SUMMARY**

Laboratory Subject dedicated to the learning of advanced work methodologies used in the chromatographic techniques and related and in the coupling of different analytical techniques.

**PREVIOUS KNOWLEDGE**



### Relationship to other subjects of the same degree

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

### Other requirements

Prior knowledge of chemistry and experimental work in the laboratory of chemistry taught in the degrees indicated in the recommended income profile for the student of the master's degree are required.

## OUTCOMES

### 2109 - M.D. in Experimental Techniques in Chemistry

- To acquire basic skills to develop laboratory work in biomedical research.
- Be able to access the information required (databases, scientific articles, etc.) and to interpret and use it sensibly.
- Ser capaces de seleccionar y optimizar las variables instrumentales para obtener los mejores parámetros analíticos en las técnicas experimentales estudiadas.
- Ser capaces de emplear las herramientas básicas para el tratamiento de datos experimentales en el laboratorio.
- Realizar estudios relacionados con el análisis y/o la caracterización de sustancias químicas tales como: control de calidad, diseño de protocolos de trabajo para laboratorios, diseño e implementación de procesos de acreditación y validación, diseño y desarrollo de proyectos I+D+I, emisión de informes, certificaciones y/o dictámenes, etc.
- Ser capaces de planificar y gestionar los recursos disponibles de un laboratorio químico, teniendo en cuenta los principios básicos de la calidad, prevención de riesgos, seguridad y sostenibilidad.
- Seleccionar la instrumentación química comercializada apropiada para el estudio a realizar y de aplicar sus conocimientos para utilizarla de manera correcta.
- To prepare a clear and concise memory of the results of your work and the conclusions obtained.

## LEARNING OUTCOMES

- 1.- Demonstrate theoretical and practical knowledge of the chromatographic techniques and electroseparacion, as well as most common techniques of sample preparation for chromatography and electroseparacion.
- 2.- Demonstrate theoretical and practical knowledge on the spectroscopic techniques and wipers, which are often attached to separation techniques.
- 3.- Demonstrate theoretical and practical knowledge on ICP-MS.
- 4.- Describe the coupled systems, demonstrating theoretical and practical knowledge in terms of both the individual components as a whole, with special emphasis in the interfaces, knowing explain the reasons for its design.
- 5.- Describe the advantages and disadvantages associated with a coupled system in relation to non-coupled techniques.
- 6.- Differentiate the types of interference and the ways to resolve them.



- 7.- Reasonably classify the coupled systems.
- 8.- Learn the working modes in detection by MS.
- 9.- Describe calibration systems used in coupled techniques.
- 10.- Demonstrate a theoretical and practical knowledge of the techniques of treatment of the data generated by coupled systems, and how to use computer applications for data processing in techniques coupled.
- 11.- See the fields of application of each technique, and know to evaluate their competitiveness in relation to other techniques.

## DESCRIPTION OF CONTENTS

### 1. Gas chromatography: advanced techniques and coupling with mass spectrometry

Identification of components in essential oils (fragrance) by GC-MS.

### 2. Liquid chromatography: advanced techniques and coupling with spectroscopic techniques

Liquid chromatography: advanced techniques and coupling with spectroscopic techniques  
Development of methods in reversed-phase liquid chromatography.

### 3. Electroseparacion techniques and its coupling with spectroscopic techniques.

Study of the influence of various factors (voltage and modifiers of the zeta potential) on the electroosmotico flow.  
Identification of nonylphenols in waters.

### 4. Coupled atomic techniques

Identification of lanthanides in soil.

**WORKLOAD**

ACTIVITY	Hours	% To be attended
Laboratory practices	40,00	100
Development of group work	8,00	0
Study and independent work	20,00	0
Readings supplementary material	8,00	0
Preparation of evaluation activities	8,00	0
Preparation of practical classes and problem	8,00	0
Resolution of case studies	8,00	0
<b>TOTAL</b>	<b>100,00</b>	

**TEACHING METHODOLOGY****Presential Activities**

Laboratory classes will begin with seminars in which Professor will perform a brief introduction of the objective, fundamentals and experimental practices methodology to perform.

The teacher will held in the laboratory the necessary explanations on operation of the instruments to be used in each practice prior to their use by students and will supervise its use during practices, to enhance knowledge on the techniques used.

Students will carry out the practice following the corresponding protocols or manual of practices.

Classroom activities performed in the laboratory, presentations and exhibitions of works will be part of the ongoing evaluation of the student (formative activities AF2 of verifica and teaching methodology MD1 of verifica)

Written examinations of the subject will be carried out on the date specified in the programming of the assessment tests (formative activities AF4 of verifica and teaching methodology MD1 of verifica).

The competences to acquire from the presential activities will be:

- Generals: CG1 and CG3
- Specific: CE2, CE3, CE4, CE5 y CE6

**Non-presential activities**

Students will conduct the non-presential activities requested by the teacher (memoirs, reports of practices, etc.) and they will deliver them on the specified date.



The competences to acquire from the presential activities will be:

- Specific: CE7

## EVALUATION

1. -Continuous evaluation of the student in classes and seminars (participatory assistance, material handling and equipment, organization of work, understanding and use of the screenplay of practices, performing calculations, team work, etc. )

Along the sessions, focus in the resolution of practical assays, the assistance and participation of the students will be evaluated individually (by oral answers or by writing questions planned by the professor, by planning questions which its answer will be relevant for all the group). Also, these questions will include the design of working protocols, the selection of variables and the tools for the data treatment (verifica competences CE2, CE3, CE5 and CE6). The competences to evaluate: specifics: CE2, CE3, CE4, CE5 and CE6

### WEIGHT 40

2.- An assessment of non-classroom-based activities (memories and/or reports of practices delivered)

The reports performed by the students will include the main conclusions extracted from the laboratory work (working protocols, variable selection and data treatment; verifica competences CE2, CE5, CE6 and CE7) and it will be done by couples to improve the group working (consensus decision making: verifica competences CG1 and CE7)

### WEIGHT 30

3. -Written examinations (Based on the results of learning the content and on the specific objectives of each subject)

The exam will consist in the resolution of questions and practical examples related to the studied techniques (verifica competences: CE2, CE4, CE5 and CE6).

### WEIGHT 30





## REFERENCES

### Basic

- TAYLOR H.E., Inductively Coupled Plasma-Mass Spectrometry. Practices and Techniques, Academic Press, San Diego, 2001
  - MONTASER A., Inductively Coupled Plasma Mass Spectrometry, Wiley-VCH, New York, 1997.
  - SKOOG D.A., HOLLER F.J., NIEMAN T.A., Principios de Análisis Instrumental, 5ª Edición, McGraw-Hill, Madrid, 2001
  - HARVEY D., Química Analítica Moderna. McGraw-Hill, Madrid, 2002.
  - HARRIS D.C. Análisis Químico Cuantitativo, 3ª Edición, Reverté, Barcelona, 2007.
  - KELLNER R., MERMET J.M., OTTO M., VALCARCEL M. Y WIDNER H.M., Analytical Chemistry 2ª Edición. Wiley-VCH, 2004.
- Cualquier otro texto de análisis instrumental, o monografías especializadas, o enciclopedias de química analítica, preferiblemente publicadas en los últimos 10 años, además de material fiable de internet.

## ADDENDUM COVID-19

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

### Contents

*The contents initially indicated in the teaching guide are maintained.*

### Workload and temporary teaching planning

Regarding the workload:

*The different activities described in the Teaching Guide are maintained with the intended dedication.*

Regarding the temporary teaching planning:

No variation with respect to what was initially planned in the teaching guide has been considered.

### Teaching Methodology



With regard to laboratory courses, the maximum face-to-face teaching will be lying in compliance with the rules of distance and occupation of spaces fixed by the academic authorities. In this sense, the teaching type "L" will be 100% face-to-face, and the teaching type "U" will be non-face-to-face and will be taught through the tools offered by the virtual classroom. [Indicate if there is any variation with respect to the teaching guide (individual work ...)]

The methodology used for non-face-to-face classes shall be:

1. Synchronously using virtual classroom tools (Teams, Blackboard ...)
2. Asynchronously using locut power-point presentations or other virtual classroom tools
3. Resolution of exercises and questionnaires

*If there is a closure of the facilities for health reasons that totally or partially affects the classes of the course, they will be replaced by non-face-to-face sessions following the established schedules and using the tools of the virtual classroom.*

### **Evaluation**

*The evaluation system described in the Teaching Guide of the subject in which the various evaluable activities have been specified as well as their contribution to the final grade of the subject is maintained.*

*If there is a closure of the facilities for health reasons affecting the development of any face-to-face evaluable activity of the subject, it will be replaced by a test of a similar nature that will be carried out in virtual mode using the computer tools licensed by the University of Valencia. The contribution of each evaluable activity to the final grade of the subject will remain unchanged, as set out in this guide.*

### **References**

*The literature recommended in the Teaching Guide is maintained since it is accessible.*