VNIVERSITAT DE VALÈNCIA

Course Guide
42930 Chromatography and related techniques. Coupling techniques

COURSE DATA

Data Subject	
Code	42930
Name	Chromatography and related techniques. Coupling techniques
Cycle	Master's degree
ECTS Credits	4.0
Academic year	2022 - 2023

Study (s)

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

Subject-matter

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

Coordination

Name	Department
MEDINA HERNANDEZ, MARIA JOSE	310 - Analytical Chemistry
SIMO ALFONSO, ERNESTO	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 realacionados 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 arealizar 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 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.
12. Regarding the Sustainable Development Goals (SDGs), it is expected that students will be able to know in this subject how to apply the knowledge learned to guarantee an inclusive, equitable, and quality education and promote learning opportunities for everyone (SDG 4), to acquire a special sensitivity for sustainable management of water (SDG 6), raw materials and energy sources (SDG 7), as well as for an environmentally friendly and sustainable development (SDGs 11, 12, 13, 14 and 15), in addition to being able to design, select and/or develop efficient products, chemical processes, and analytical methodologies (SDG 7) that minimize their impact on the environment (SDGs 14 and 15), using alternative raw materials and reducing wastes (SDG 11).

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

- Background and general applications of inductively coupled plasma mass spectrometry.

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
TOTAL	**100,00**	

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 methdology 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.