



1. General information

Course: MASS SPECTROMETRY

Type: ELECTIVE

Degree: 2326 - MASTER DEGREE PROGRAMME IN CHEMICAL RESEARCH

Center: 1 - FACULTY OF SCIENCE AND CHEMICAL TECHNOLOGY

Year: 1

Main language: Spanish

Use of additional
languages:

Web site:

Code: 310587

ECTS credits: 6

Academic year: 2019-20

Group(s): 20

Duration: C2

Second language: English

English Friendly: Y

Bilingual: N

Lecturer: ALFONSO ARANDA RUBIO - Group(s): 20

Building/Office	Department	Phone number	Email	Office hours
Marie Curie/2ª planta	QUÍMICA FÍSICA	926051915	alfonso.aranda@uclm.es	Martes, miércoles y jueves de 12:00 a 14:00h

Lecturer: BERNABE BALLESTEROS RUIZ - Group(s): 20

Building/Office	Department	Phone number	Email	Office hours
Marie Curie, primera planta	QUÍMICA FÍSICA	926052049	bernabe.ballesteros@uclm.es	Lunes, martes a partir de las 4:00 p.m. a las 6:00 p.m. Miércoles de 11 a 13 h

Lecturer: YOLANDA DIAZ DE MERA MORALES - Group(s): 20

Building/Office	Department	Phone number	Email	Office hours
Edificio Marie Curie, segunda planta, despacho 2.05	QUÍMICA FÍSICA	926052872	yolanda.diaz@uclm.es	Lunes y Miércoles de 16:00-18:00h. Martes y Jueves de 12:00 a 13:00h.

Lecturer: MARIA DEL PILAR MARTIN PORRERO - Group(s): 20

Building/Office	Department	Phone number	Email	Office hours
Marie Curie, 2ª planta	QUÍMICA FÍSICA	926052614	maripilar.martin@uclm.es	Martes, miércoles a partir de las 3:30 p.m. a 5:30 p.m. y jueves y viernes desde las 12:30 p.m. a la 1:30 p.m.

2. Pre-Requisites

Not established

3. Justification in the curriculum, relation to other subjects and to the profession

Mass spectrometry is a fundamental tool in many fields of research. It allows the identification of substances, characterization of their structures and their concentrations. It is also allowing technological development in various fields such as pharmacy and biotechnology, research in materials, energy, petrochemical, gas analysis, atmosphere and environment, nanoparticles, etc. The utility of mass spectrometry is spreading thanks to its couplings with other techniques such as GC-MS, LC-MS, ICP-MS, SPME, etc.

The basic aspects of mass spectrometry are the subject of study in the majority of Chemistry degrees. However, a deeper knowledge of the fundamentals of the technique and of the technological aspects in relation to the methods of sampling, ionization, separation and detection of ions is required. This knowledge allows the effective application of mass spectrometry in different professional and research fields.

4. Degree competences achieved in this course

Course competences

Code	Description
E05	Knowing the usefulness of separation techniques, analysis and structural determination, their joint application in the resolution of research problems, as well as possessing skills in the use of such techniques.
E09	Knowing the possibilities offered by new analytical methodologies in different fields of application, such as environmental analysis, pharmacological analysis, etc.
E12	Being able to plan and develop projects and experiments, as well as linking different scientific specialties (interdisciplinary character).
T01	Capacity for organization, planning and decision making.
T05	Ability to obtain bibliographic information at the research level, including Internet resources (databases, specialized scientific bibliography, social networks, etc ...), as well as carry out a selection and classification of it.

5. Objectives or Learning Outcomes

Course learning outcomes

Description

To acquire exhaustive knowledge of the separation techniques/mass spectrometry interfaces and to identify the advantages and drawbacks of each kind of interface.

To reinforce the required knowledge to interpret mass spectra in characterization problems, quantitative sample analysis and process monitoring
 To be able to operate mass spectrometry equipment
 To know the different techniques of sampling, ionization and separation of ions in mass spectrometry equipment.

6. Units / Contents

Unit 1: Introduction to mass spectrometry

Unit 2: Vacuum and high vacuum technologies

Unit 3: Ionization methods. Volatile and low volatile substances. Electron impact, chemical ionization, ionization by field, desorption by laser, bombardment by fast atoms, desorption by plasma, secondary ions

Unit 4: Mass analyzers Ion separation Sectors, quadrupole, Ion Trap, flight time. Ion detectors

Unit 5: Inlet systems for different types of samples

Unit 6: Applications of mass spectrometry. Coupling of MS with other analytical techniques. GC-MS, LC-MS, ICP-MS

Unit 7: Experimental sessions

7. Activities, Units/Modules and Methodology

Training Activity	Methodology	Related Competences (only degrees before RD 822/2021)	ECTS	Hours	As	Com	R	Description
Class Attendance (theory) [ON-SITE]	Lectures	E05 E09 E12	1	25	N	-	-	
Workshops or seminars [ON-SITE]	Problem solving and exercises	E05 E09 E12	0.4	10	Y	N	N	
Laboratory practice or sessions [ON-SITE]	Practical or hands-on activities	E05 E09 E12 T01 T05	0.72	18	Y	Y	N	
Final test [ON-SITE]	Assessment tests	E05 E09 E12 T01 T05	0.08	2	Y	Y	Y	
Study and Exam Preparation [OFF-SITE]	Self-study	E05 E09 T05	2	50	N	-	-	
Other off-site activity [OFF-SITE]	Self-study	E05	0.6	15	N	-	-	
Study and Exam Preparation [OFF-SITE]	Assessment tests	E05 E09 E12	0.4	10	N	-	-	
Practicum and practical activities report writing or preparation [OFF-SITE]	Practical or hands-on activities	T05	0.8	20	N	-	-	
Total:			6	150				
Total credits of in-class work: 2.2			Total class time hours: 55					
Total credits of out of class work: 3.8			Total hours of out of class work: 95					

As: Assessable training activity

Com: Training activity of compulsory overcoming

R: Rescheduling training activity

8. Evaluation criteria and Grading System

Evaluation System	Grading System		Description
	Face-to-Face	Self-Study Student	
Final test	40.00%	0.00%	
Laboratory sessions	30.00%	0.00%	Experiments in research laboratory and report
Assessment of problem solving and/or case studies	20.00%	0.00%	Problem solving and practical cases of application in mass spectrometry.
Other methods of assessment	10.00%	0.00%	Design of an experiment to apply the fundamentals of mass spectrometry
Total:	100.00%	0.00%	

Evaluation criteria for the final exam:

Continuous evaluation of the work of seminars and laboratory (50%), the preparation and presentation of an alleged case study (10%) and the performance of a written test or short questions (40%)

9. Assignments, course calendar and important dates

Not related to the syllabus/contents

Hours	hours
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10. Bibliography and Sources

Author(s)	Title/Link	Publishing house	Citv	ISBN	Year	Description
Edmond de Hoffmann y Vicent Stroobant	Mass Spectrometry. Principles and Applications	Wiley			2007	
Gross, J	Mass Spectrometry: a textbook	Springer				
Thermo Finnigan	Manual de instrucciones Trace GC Ultra				2003	
Thermo Fisher Scientific	Manual de usuario DSQ II				2006	
Watson, J; Sparkman, O	Introduction to Mass Spectrometry	Wiley			2007	