



Teaching Guide				
Identifying Data				2018/19
Subject (*)	Analytical Mass Spectrometry of Organic Compounds		Code	610509126
Study programme	Mestrado Universitario en Investigación Química e Química Industrial (Plan 2017)			
Descriptors				
Cycle	Period	Year	Type	Credits
Official Master's Degree	Yearly	First	Optional	3
Language	Spanish			
Teaching method	Face-to-face			
Prerequisites				
Department	Química			
Coordinador	Muniategui Lorenzo, Soledad	E-mail	soledad.muniategui@udc.es	
Lecturers	Muniategui Lorenzo, Soledad	E-mail	soledad.muniategui@udc.es	
Web				
General description	It is a subject of the Specialty on Advanced Analytical Techniques. Mass spectrometry is an indispensable tool in any chemical analysis laboratory, particularly those that perform their activity in the areas of food safety, environment, clinic, etc.; it is used for the identification and quantitative determination of species of interest. This subject aims to improve the student's knowledge on the instrumental techniques of analysis acquired during the degree, and to know the recent trends in relation to sources of ionization, mass analyzers and information extraction systems.			

Study programme competences / results	
Code	Study programme competences / results
A3	Innovate in the methods of synthesis and chemical analysis related to the different areas of chemistry
A6	Design processes involving the treatment or disposal of hazardous chemicals
A7	Operate with advanced instrumentation for chemical analysis and structural determination.
A9	Promote innovation and entrepreneurship in the chemical industry and in research.
B2	Students should apply their knowledge and ability to solve problems in new or unfamiliar environments within broader (or multidisciplinary) contexts related to their field of study.
B4	Students should be able to communicate their conclusions, and the knowledge and the reasons that support them to specialists and non-specialists in a clear and unambiguous manner
B5	Students must possess learning skills to allow them to continue studying in a way that will have to be largely self-directed or autonomous.
B7	Identify information from scientific literature by using appropriate channels and integrate such information to raise and contextualize a research topic
B9	Demonstrate ability to analyze, describe, organize, plan and manage projects
B10	Use of scientific terminology in English to explain the experimental results in the context of the chemical profession
B11	Apply correctly the new technologies to gather and organize the information to solve problems in the professional activity.
C1	CT1 - Elaborar, escribir e defender publicamente informes de carácter científico e técnico
C3	CT3 - Traballar con autonomía e eficiencia na práctica diaria da investigación ou da actividade profesional.
C4	CT4 - Apreciar o valor da calidade e mellora continua, actuando con rigor, responsabilidade e ética profesional.

Learning outcomes	
Learning outcomes	Study programme competences / results



Acquisition of knowledge on aspects of analytical interest on mass spectrometry for the study of organic compounds.	AC3	BC2	CC1
Acquisition of the characteristics and uses of the isotope dilution.	AC6	BC4	CC3
Acquisition of knowledge related to studies of degradation and metabolomics.	AC7	BC5	CC4
	AC9	BC7	
		BC9	
		BC10	
		BC11	

Contents	
Topic	Sub-topic
1. INTRODUCTION TO ANALYTICAL MASS SPECTROMETRY.	Descrición básica da instrumentación: O espectrómetro de masas. Sistemas de vacío. Etapas na xeración dun espectro de masas. Calibración de masas e axuste do espectrómetro de masas. Conceptos básicos en espectrometría de masas: Distribucións isotópicas: masas promedio e monoisotópicas. Cálculo do defecto de masas. Avaliación da exactitude e resolución: masas nominais fronte a exactas. Cargas simples e múltiples.
2. IONIZATION TECHNIQUES. Fundamentals, operations and instrumentation	Introdución: dependencia analito-fonte de ionización-analizador de masas. Clasificación das técnicas de ionización. Ionización Electrónica (EI). Ionización Química (CI). Selección de gases reactivos e mecanismos de ionización. Ionización a P atmosférica: ESI, APCI, APPI. Desorción Láser asistida por matriz (MALDI). Outras técnicas de ionización: DESI, DART.
3. MASS ANALYZERS. Operational principles, instrumentation and basic characteristics	Principais analizadores. Cuadrupolos. Trampas de iones. Sistemas de tempo de voo (TOF). De sector magnético. Orbitrap. Analizadores en tándem. Analizadores híbridos en tándem.
4. HYBRIDIZATION WITH CHROMATOGRAPHIC TECHNIQUES	Aspectos técnicos. Obtención e tratamento de datos. Adquisición. Modos de operación. Aplicacións da hibridación GC-MS e GC-MS/MS. Aplicacións da hibridación LC-MS e LC-MS/MS. Análise cuantitativa. Dilución isotópica. Identificación de metabolitos e produtos de transformación. Deconvolución espectral.

Planning				
Methodologies / tests	Competencies / Results	Teaching hours (in-person & virtual)	Student's personal work hours	Total hours
Guest lecture / keynote speech	A3 A6 A7 A9 B5 C1 C3 C4	12	36	48
Seminar	A7 B2 B4 B5 B7 B9 B10 B11 C1 C3 C4	7	18	25
Personalized attention		2	0	2

(\*)The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.

Methodologies	
Methodologies	Description
Guest lecture / keynote speech	Clases presenciais teóricas. Clases expositivas (utilización de pizarra, computador, canón), complementadas coas ferramentas propias da docencia virtual. Estudo persoal baseado nas diferentes fontes de información Realización das diferentes probas para a verificación da obtención tanto de coñecementos teóricos como prácticos e a adquisición de habilidades e actitudes



Seminar	<p>Seminarios realizados con profesorado propio do Máster, ou con profesionais convidados da empresa, a administración ou doutras universidades. Sesiões interactivas relacionadas coas distintas materias con debates e intercambio de opinións cos alumnos.</p> <p>Resolución de exercicios prácticos (problemas, cuestións tipo test, interpretación e procesamento da información, avaliación de publicacións científicas, etc.)</p> <p>Realización de traballos, tanto individualmente, como en grupo, sobre contidos da materia</p> <p>Exposición oral de traballos, informes, etc., incluíndo debate con profesores e alumnos.</p>
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### Personalized attention

Methodologies	Description
Seminar	Tutorías individuais o en grupo reducido.

### Assessment

Methodologies	Competencies / Results	Description	Qualification
Seminar	A7 B2 B4 B5 B7 B9 B10 B11 C1 C3 C4	Resolución de problemas e casos prácticos Realización de traballos e informes escritos Avaliación continua durante o curso	25
Guest lecture / keynote speech	A3 A6 A7 A9 B5 C1 C3 C4	Examen final	75

### Assessment comments

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### Sources of information

<b>Basic</b>	<p>Bibliografía recomendada Básica (manuais de referencia) C. Dass, Fundamentals of Contemporary Mass Spectrometry, Wiley, 2007 R. M. Smith, K.L. Busch, Understanding Mass Spectra- A basic Approach, John Wiley &amp; Sons, 1999. R.K. Boyd, C. Basic, R.A. Behen, Trace Quantitative Analysis by Mass Spectrometry, John Wiley and Sons, 2008 Complementaria E. de Hoffmann, V. Stroobant, Mass Spectrometry: Principles and Applications, 3a ed., Wiley, 2007 A. E. Ashcroft, Ionization Methods in Organic Mass Spectrometry, Royal Society of Chemistry, 1997 J. H. Gross, Mass Spectrometry: a textbook, Springer, 2005 K. Downard, Mass Spectrometry: a Foundation Course, RSC, 2004 B. Ardrey, Liquid Chromatography-Mass spectrometry: an introduction, Wiley, 2003 R. Willoughby, E. Sheehan, S. Mitrovich, A global view of LC/MS, Global View Publishing, 2nd edition, 2002 M. C. McMaster, GC/MS, A Practical User's Guide, John Wiley &amp; Sons, 2008 W.M.A. Niessen, Liquid Chromatography-Mass spectrometry, Taylor and Francis, 2007</p>
<b>Complementary</b>	

### Recommendations

#### Subjects that it is recommended to have taken before

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#### Subjects that are recommended to be taken simultaneously

Sample Preparation Techniques /610509128
Chromatography and Analytical Separation Techniques /610509125

#### Subjects that continue the syllabus

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### Other comments

The knowledge compulsory are those that are established as basic requirements for access this Master. It is advisable to have basic knowledge about Mass spectrometry, acquired in the different subjects that give access to the present Master. It is also recommended to study the subject of "Chromatography and Separation Analytical Techniques"



(\*)The teaching guide is the document in which the URV publishes the information about all its courses. It is a public document and cannot be modified. Only in exceptional cases can it be revised by the competent agent or duly revised so that it is in line with current legislation.