



Teaching Guide				
Identifying Data				2016/17
Subject (*)	Técnicas de Preparación da Mostra	Code	610509026	
Study programme	Mestrado en Investigación Química e Química Industrial (plan 2016)			
Descriptors				
Cycle	Period	Year	Type	Credits
Official Master's Degree	Yearly	First	Optativa	3
Language	SpanishGalicianEnglish			
Teaching method	Face-to-face			
Prerequisites				
Department	Química Analítica			
Coordinador	Alonso Rodriguez, Elia	E-mail	elia.alonso@udc.es	
Lecturers	Alonso Rodriguez, Elia	E-mail	elia.alonso@udc.es	
Web				
General description	Esta materia abarca o estudo das técnicas de extracción máis avanzadas, algunhas das cales son clave en moitos procedementos analíticos, tanto de uso en laboratorios de empresas como en laboratorios de control. Por outra banda, inclúense os avances máis recentes neste campo, constituíndo a base da investigación en desenvolvemento de metodoloxía analítica de preparación da mostra.			

Study programme competences / results	
Code	Study programme competences / results
A2	Suggest alternatives for solving complex chemical problems related to the different areas of chemistry.
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
B10	Use of scientific terminology in English to explain the experimental results in the context of the chemical profession
B12	Being able to work in a team and adapt to multidisciplinary teams.

Learning outcomes		
Learning outcomes	Study programme competences / results	
Define concepts, principles, theories and applications of different sample preparation techniques	AC2	
Propose alternatives to the traditional extraction techniques for solving complex chemical problems	AC7	
Apply advanced extraction processes in innovative fields of industry and chemical research		BC2
Innovate in sample preparation methods used in chemical analysis in different areas of chemistry	AC9	
Assess risks and environmental impacts of new sample preparation techniques against conventional techniques, proposing "Green Analytical Chemistry" alternatives	AC2	
Analyze and discuss examples of applications using the knowledge acquired, including primary literature sources and scientific databases (SciFinder, WOK, Medline, etc.)		BC4 BC7
Promote innovation in industry and in chemical research	AC9	BC5 BC10 BC12
Employ of advanced instrumentation for chemical analysis	AC7	



Contents	
Topic	Sub-topic
Unit 1. Introduction to advanced sample preparation techniques.	<ul style="list-style-type: none"> <li>- Importancia da etapa de preparación de mostra.</li> <li>- Técnicas clásicas de extracción.</li> <li>- Tratamento enzimático de mostra.</li> <li>- Tendencias na etapa de preparación de mostra.</li> <li>- Sistemas de mostraxe pasiva.</li> <li>- Mostraxe activa de aire e partículas.</li> </ul>
Unit 2. Supercritical fluid extraction.	<ul style="list-style-type: none"> <li>- Propiedades xerais dos fluídos supercríticos.</li> <li>- Instrumentación: compoñentes básicos dun extractor de FS.</li> <li>- Modos de extracción: métodos on-line e off-line.</li> <li>- Aplicacións.</li> </ul>
Unit 3. Microwave assisted extraction.	<ul style="list-style-type: none"> <li>- Fundamentos teóricos.</li> <li>- Transformación da enerxía de microondas en calor.</li> <li>- Extracción con disolventes de alta perda dieléctrica.</li> <li>- Extracción con disolventes transparentes á radiación.</li> <li>- Instrumentación.</li> <li>- Aplicacións.</li> </ul>
Unit 4. Accelerated solvent extraction.	<ul style="list-style-type: none"> <li>- Fundamento.</li> <li>- Instrumentación.</li> <li>- Modo de operación.</li> <li>- Aplicacións.</li> </ul>
Unit 5. Solid phase extraction.	<ul style="list-style-type: none"> <li>- Fundamento.</li> <li>- Tipos de fases sólidas.</li> <li>- Desenvolvemento de métodos.</li> <li>- Automatización da extracción en fase sólida.</li> <li>- Microextracción con adsorbentes empacados (MEPS).</li> <li>- Extracción en fase sólida dispersiva (dSPE, QuEChERS).</li> <li>- Dispersión da matriz nunha fase sólida (MSPD).</li> </ul>
Unit 6. Solid phase microextraction.	<ul style="list-style-type: none"> <li>- Introducción.</li> <li>- Principios básicos.</li> <li>- Modos de extracción.</li> <li>- Tipos de recubrimientos.</li> <li>- Parámetros que afectan o proceso de extracción.</li> <li>- Cuantificación.</li> <li>- Aplicacións.</li> </ul>
Unit 7. Liquid phase microextraction.	<ul style="list-style-type: none"> <li>- Microextracción con pinga suspendida (Single-drop microextraction, SDME).</li> <li>- Técnicas de membrana (Membrane Assisted Solvent Extraction, MASE).</li> <li>- Microextracción en fase líquida dispersiva (Dispersive liquid-liquid microextraction, DLLME).</li> <li>- Microextracción dispersiva asistida por ultrasóns (Ultrasound-Assisted Emulsification-Microextraction, USAEME)</li> </ul>

Planning				
Methodologies / tests	Competencies / Results	Teaching hours (in-person & virtual)	Student?s personal work hours	Total hours
Guest lecture / keynote speech	A2 A9	12	18	30
Seminar	A2 A7 B2 B4 B5 B7 B10 B12	7	28	35
Mixed objective/subjective test	A2 B2	2	6	8



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	Nelas abordaranse os fundamentos teóricos e instrumentais de cada unha das técnicas de preparación de mostra. Proxectaranse diapositivas, e nalgúns casos utilizaranse animacións informáticas ou algún vídeo, que facilitarán o seguimento das explicacións. Durante a presentación dos distintos temas iranse formulando preguntas ao fío dos conceptos explicados co obxecto de dinamizar as clases e fomentar a participación.
Seminar	Sesións realizadas con profesorado propio do Máster, ou con profesionais convidados da empresa, a administración ou doutras universidades. Resolución de casos prácticos (problemas, cuestións tipo test, interpretación e procesamento da información, avaliación de publicacións científicas, etc.). Ademais, utilizarase algunha das clases de seminario para que os alumnos presenten os traballos expostos nalgún dos temas e para poder discutilos en grupo.
Mixed objective/subjective test	Proba escrita utilizada para a avaliación da aprendizaxe do alumno.

Personalized attention	
Methodologies	Description
Seminar	In the seminar sessions an individualized learning control of the students will be held and their questions will be resolved.  Students being recognized officially as partial-time and entitled not to attend the lectures will be attended in a tutorships regime (set hour with teacher in advance).

Assessment			
Methodologies	Competencies / Results	Description	Qualification
Seminar	A2 A7 B2 B4 B5 B7 B10 B12	Resolución de problemas e/ou casos prácticos (10%) Realización de traballos e informes escritos (10%) Exposición oral (traballos, informes, problemas e casos prácticos) (10%) Avaliación continua do interese e actitude do alumno mediante preguntas e cuestións durante o curso (10%)	40
Mixed objective/subjective test	A2 B2	Realizarse un exame final que versará sobre a totalidade dos contidos da materia.	60

Assessment comments
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- To be examined it is necessary to have attended 80% of the seminar classes and personalized attention.
- Continuous assessment (N1) represent 40% of the final grade and will consist of seminar sessions and personalized attention.
- The final exam (N2) will cover the entire contents of the subject.
- Student's final grade will be obtained applying the following formula:

$$\text{Final grade} = 0,4 \times N1 + 0,6 \times N2 \quad N1 \text{ (0-10 points)} \quad N2 \text{ (0-10 points)}$$

- Students who fail the course must attend all classes again.

For students being recognized officially as partial-time and entitled not to attend the lectures, the final exam represent 80% of the final grade and supervised projects 20%.

### Sources of information

<b>Basic</b>	- Pawliszyn, J. (Ed.) (2012). Comprehensive Sampling and Sample Preparation. Elsevier
<b>Complementary</b>	<ul style="list-style-type: none"> <li>- Cela, R.; Lorenzo, R.A.; Casais, C. (2002). Técnicas de Separación en Química Analítica. Síntesis</li> <li>- Dean, J.R. (Ed.) (2009). Extraction Techniques in Analytical Sciences. Wiley</li> <li>- Pawliszyn, J.; Lord, H.L. (Ed.) (2010). Handbook of Sample Preparation. Wiley</li> <li>- Kokosa, J.M.; Przyjazny, A.; Jeannot, M.A. (2009). Solvent Microextraction. Wiley</li> <li>- Self, R. (2005). Extraction of Organic Analytes from Foods. The Royal Society of Chemistry (RSC)</li> <li>- Mitra, S. (Ed.) (2003). Sample Preparation Techniques in Analytical Chemistry. Wiley</li> <li>- Luque de Castro, M.D.; Luque García, J.L. (2002). Acceleration and Automation of Solid Sample Treatment. Elsevier</li> <li>- Fritz, J.S. (1999). Analytical Solid-Phase Extraction. Wiley-VCH</li> <li>- Pawliszyn, J. (1997). Solid Phase Microextraction. Theory and Practice. Wiley-VCH</li> <li>- Pawliszyn, J. (Ed.) (1999). Applications of Solid Phase Microextraction. RSC Chromatography Monographs</li> <li>- Scheppeers Wercinski, S.A. (Ed.) (1999). Solid Phase Microextraction. A Practical Guide. Marcel Dekker Inc.</li> </ul>

### Recommendations

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

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

#### Subjects that continue the syllabus

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#### Other comments

Recommendations to pass the course:- Regular attendance to classes is recommended and resolve questions that arise during the study of the subject.- It is important that the student read the literature recommended by teachers prior to the development of each seminar session.- Performance of a work under the direct guidance of teachers through attendance at sessions of personalized attention.

(\*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.