UNIVERSIDADE DA CORUÑA

Teaching Guide				
Identifying Data				2017/18
Subject (*)	Advanced Atomic Techniques and Sensors		Code	610509127
Study programme	Mestrado Universitario en Investigación Química e Química Industrial (Plan 2017)			
Descriptors				
Cycle	Period	Year	Type	Credits
Official Master's Degree	Yearly	First	Optativa	3
Language	Spanish			
Teaching method	Face-to-face			
Prerequisites				
Department	Química			
Coordinador	Moreda Piñeiro, Jorge	E-mail	jorge.moreda@udc.es	
Lecturers	Moreda Piñeiro, Jorge	E-mail	jorge.moreda@udc.es	
Web				
General description	Nesta asignatura abordase o estudo das técnicas de espectrometría atómica máis avanzadas, algunhas das cuales son claves noutros procedimentos analíticos tanto de uso en laboratorios de empresas como en laboratorios de control. Por outra banda, abordánse os avances máis recientes no campo dos sensores que son a base de moitas investigacións actuais.			

Study programme competences / results	
Code	Study programme competences / results
A2	Suggest alternatives for solving complex chemical problems related to the different areas of chemistry.
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
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 (theoretical aspects and application) of the several hybrid techniques used in matallomics and metalloproteomics	AC2 AC7 AC9	BC2 BC5 BC7	CC3

Acquisition (theoretical aspects and application) of advanced atomic spectroscopic techniques both in theoretical aspects and in their practical application	AC2 AC7 AC9	BC2 BC4 BC5 BC7	CC1
Acquisition (theoretical aspects and application) of several types of optical, electrochemical, thermal and mass sensors	AC2 AC3 AC6 AC7 AC9	BC2 BC4 BC9 BC10	CC4

Contents	
Topic	**Sub-topic**
1. ATOMIC TECHNIQUES	(1) Electrothermal atomic absorption spectrometry. (2) Continuous source atomic absorption spectreometry. (3) Inductively coupled plasma atomic emisión spectrometry. (4) Inductively coupled plasma mass spectrometry. (5) Atomic fluorescence spectrometry. (6) Atomic X ray spectrometry.
2. ALTERNATIVE SAMPLING TECHNIQUES	(1) Solid sampling (2) Slurry sampling (3) Vapour generation techniques Cold vapour and covalent hydride generation). (4) Others solid sampling techniques (Laser ablation)
3. HYBRID TECHNIQUES IN THE ANALYSIS OF ORGANOMETALLIC COMPOUNDS AND METALOPROTEINS (METALLOMIC AND METALOPROTEOMIC)	(1) Liquid chromatography coupled with inductively coupled plasma atomic emission. (2) Liquid chromatography coupled with inductively coupled plasma mass spectrometry (3) Liquid chromatography coupled with atomic fluorescence spectrometry (4) Gas chromatography coupled with inductively coupled plasma mass spectrometry. (5) Capilar electrophoresis coupled with inductively coupled plasma mass spectrometry. (6) Filed flow fractionation coupled with inductively coupled plasma mass spectrometry

Planning				
Methodologies / tests	**Competencies / Results**	**Teaching hours (in-person & virtual)**	**Student?s personal work hours**	**Total hours**
Seminar	A2 B2 B4 B9 B10 C4	7	14	21
Supervised projects	A2 A3 A9 B2 B4 B5 B7 B9 B10 C1 C3	2	8	10
Objective test	A2 A3 A6 A7	2	0	2
Guest lecture / keynote speech	A2 A3 A7	12	30	42
Personalized attention		0	0	0
(*)The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.				

Methodologies	
Methodologies	**Description**
Seminar	Seminars given by Master's teachers, and professionals from companies, public administration and other universities Interactive sessions related to the different subjects with debates and exchange of opinions with students Resolution of practical exercises (problems, test questions, interpretation and processing of information, evaluation of scientific publications, etc.)
Supervised projects	Study based on different sources of information Oral presentation of papers, reports, etc., including discussion with teachers and students
Objective test	Carrying out the different tests for verifying the acquisition of both theoretical and practical knowledge and the acquisition of skills and attitudes
Guest lecture / keynote speech	Theoretical classes. Lectures (use of slate, computer, cannon), complemented with the tools of virtual teaching

Personalized attention	
Methodologies	**Description**
Guest lecture / keynote speech Seminar Supervised projects	The supervised works and problem solving will be carried out under the supervision of the teacher Doubts and work done, etc. will be reviewed by the teacher

Assessment			
Methodologies	**Competencies / Results**	**Description**	**Qualification**
Seminar	A2 B2 B4 B9 B10 C4	Seminars will be evaluated through continuous evaluation of the student's work and the individual resolution of problems and cases	15
Supervised projects	A2 A3 A9 B2 B4 B5 B7 B9 B10 C1 C3	Spervised projects involve the realization of a memory and an exposition r	10
Objective test	A2 A3 A6 A7	Theoretical contents will be evaluated by means of a test that may include test with multiple choice, short questions and reasoned answer	75

Assessment comments
The student should review the theoretical concepts on different subjects, using the recommended texts. The degree of success provides a measure of the student's preparation to the final Objective test. Teacher will analyze or solve the problem and difficulties that students could find during the process.

Sources of information	
Basic	- Skoog, Holler, Nieman (2008). Principios de Análisis Instrumental. Ed. Thonsom-Paraninfo - R. Keller, J. M. Mermet, M. Otto, H. M. Widmer, (2004). Analytical Chemistry, . Ed. Wiley - C. Cámara, C. Pérez-Conde (2011). Análisis Químico de Trazas. Ed. Síntesis - B. Welz, M. Sperling (1999). Atomic Absorption Spectrometry. Ed. Wiley - B. Welz, H. Becker-Ross, S. Florek, U. Heitmann (2004). High Resolution Continuum Source AAS. Ed. Wiley - J. D?dina, D. L. Tsalev (1995). Hydride Generation Atomic Absorption Spectrometry. Ed. Wiley - R. Cornelis (2003). Handbook of Elemental Speciation I/II. Ed. Wiley - C. Pérez Conde (1996). Sensores Ópticos. Universidad de Valencia - S. Alegret, M. del Valle, A. Merkoçi (2004). Sensores electroquímicos. Universidad Autónoma de Barcelona
Complementary	

Recommendations
Subjects that it is recommended to have taken before
Subjects that are recommended to be taken simultaneously
Subjects that continue the syllabus
Other comments
Recommended:- Be able to redact, synthesize and present a work neatly. - Knoledge of basic computing tools (use of internet, word processing, presentations, etc.). - Be able to handle textbooks. - Basic knowledge of English. - Study and review the contents taught weekly using bibliographic material to understand and deepen the information obtained in class. - Clarify any doubts with the teacher. - Prepare the seminars thoroughly. - Participate actively in class.

(*)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.