UNIVERSIDADE DA CORUÑA

Teaching Guide				
Identifying Data				2018/19
Subject (*)	Environmental Monitoring		Code	610500024
Study programme	Mestrado Universitario en Ciencias. Tecnoloxías e Xestión Ambiental (plan 2012)			
Descriptors				
Cycle	Period	Year	Type	Credits
Official Master's Degree	2nd four-month period	First	Optional	3
Language	Spanish			
Teaching method	Face-to-face			
Prerequisites				
Department	Química			
Coordinador	Moreda Piñeiro, Jorge	E-mail	jorge.moreda@udc.es	
Lecturers	Lopez Mahia, Purificacion Moreda Piñeiro, Jorge	E-mail	purificacion.lopez.mahia@udc.es jorge.moreda@udc.es	
Web				
General description	The aim of this subject is the study of the laboratory automation and the automation application to Process Analysers and Environmental Monitoring Pollution.			

Study programme competences / results	
Code	Study programme competences / results
A1	Coñecemento das realidades interdisciplinares da Química e do Medio Ambiente, dos temas punteiros nestas disciplinas e das perspectivas de futuro.
A13	Comprender os procesos de bioacumulación e as técnicas de biomonitorización e biomarcaxe.
A19	Coñecemento e interpretación da lexislación, normativa e procedementos administrativos básicos sobre medios acuosos, chans e atmosferas. Comprensión das bases científicas e económicas da sustentabilidade.
A22	Dominar as técnicas instrumentais de análises máis típicas no ámbito químico profesional.
B2	Que os estudantes saiban aplicar os coñecementos adquiridos e a súa capacidade de resolución de problemas en contornas novas ou pouco coñecidos dentro de contextos máis amplos (ou multidisciplinares) relacionados coa súa área de estudo.
B3	Que os estudantes sexan capaces de integrar coñecementos e enfrontarse á complexidade de formular xuízos a partir dunha información que, sendo incompleta ou limitada, inclúa reflexións sobre as responsabilidades sociais e éticas vinculadas á aplicación dos seus coñecementos e suizos.
B4	Que os estudantes saiban comunicar as súas conclusións e os coñecementos e razóns últimas que as sustentan a públicos especializados e non especializados dun modo claro e sen ambigüedades.
B6	Ser capaz de analizar datos e situacións, xestionar a información dispoñible e sintetizala, todo iso a un nivel especializado.
C1	Ser capaz de traballar en equipos, especialmente nos interdisciplinares e internacionais.
C2	Ser capaz de manter un pensamento crítico dentro dun compromiso ético e no marco da cultura da calidade.
C6	Utilizar as ferramentas básicas das tecnoloxías da información e as comunicacións (TIC) necesarias para o exercicio da súa profesión e para a aprendizaxe ao longo da súa vida.
C9	Valorar criticamente o coñecemento, a tecnoloxía e a información dispoñible para resolver os problemas cos que deben enfrontarse.

Learning outcomes			
Learning outcomes	Study programme competences / results		
Knowledge about environmental and chemical monitoring of processes, knowledge about instrumental techniques and the automation involved in the environmental analysis, and to ienvironmental data management	AC13 AC19 AC22	BC2 BC3 BC4 BC6	CC9

Searching of information related to environmental data	AC1	BC2 BC3 BC4 BC6	CC1 CC2 CC6

Contents	
Topic	**Sub-topic**
1: FUNDAMENTALS OF LABORATORY AUTOMATION I. INTRODUCTION	Introduction. Degrees of automation. Definitions. Analytical techniques and automation. Objetives. Laboratory automation and information management. Disadvantages of automation. Quality and automation.
2: FUNDAMENTALS OF LABORATORY AUTOMATION II. AUTOMATIC ANALYSERS	Automatic analysers and classification. Automatic batch analysers: classification, Automatic tritation systems. Robots in the laboratory. Automatic continuous analysers: classification, automatic unsegmented flow methods (FIA y SIA).
3: FUNDAMENTALS OF LABORATORY AUTOMATION III. SENSORS	Integrated analytical systems. Definition. Classification.
4: PROCESS ANALYSERS	Features of process analysers. Definitions. Characteristics. laboratory instruments vs. process analysers. Advantages and disadvantages of process analysers. Classification. Components of a process analyser.Sampling system. Process analysers: fotometric, electrochemical and chromatographics. Protection of analyser equipment
5: AUTOMATION IN ENVIRONMENTAL. POLLUTION MONITORING. INTRODUCTION	Introduction. Definitions. Classification. Batch and continuous monitoring. Instrumentation.
6: AUTOMATION IN ENVIRONMENTAL POLLUTION II. WATER ANALYSERS. AIR ANALYSERS	Water analysers: off-line and on-line water analysers, single-parameter and multi-parameter analusers. Water survey networks. Air analysers. Air survey networks.
Tutorials: Visits and computer practices	Visit to LMAG-Xunta de Galicia: air monitoring Visit to inmision air network of IUMA-UDC Visit to clinic lab Computer practices i.e backtrajectories and SKIRON modelling, PALMA application, etc

Planning				
Methodologies / tests	**Competencies / Results**	**Teaching hours (in-person & virtual)**	**Student?s personal work hours**	**Total hours**
Supervised projects	A1 A13 A19 B2	0	10	10
Field trip	A1 A22 B6 B3 C2	9	4.5	13.5
Mixed objective/subjective test	A1 A22	2	0	2
Seminar	B4 C1 C6 C9	5	15	20
Guest lecture / keynote speech	A1 A22 C2 C9	7	21	28
Personalized attention		1.5	0	1.5
(*)The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.				

Methodologies	
Methodologies	**Description**
Supervised projects	Search of information and the elaboration of a Work on a network of atmospheric or hydrological monitoring of an autonomous community. Teacher will guide and review the academic works directed, resolve doubts, etc.
Field trip	3 sessions (3 hours) to visits environmental laboratories and environmental monitoring stations will de done.

Mixed objective/subjective test	An Objective Test which enclose all the theoretical and practical contents of the signature will done. This assessment will represent 70% of the final grade
Seminar	Several practices (6 seminars / laboratory sessions of 50 minutes) related to the theoretical contents of the subject will done. In these sessions, theoretical concepts will be applied, environmental data will be interpreted, retro-trajectory calculations will be performed, sipnotic episodes will be interpreted and time series, TOMS aerosol index distribution maps and SKIRON simulations
Guest lecture / keynote speech	Fundamental contents of the program will be presentated in 7 Sessions of 50 minutes. It is recommended that the student has previously read on their own the fundamental aspects of these topics in the recommended texts

Personalized attention	
Methodologies	**Description**
Supervised projects Seminar	Teacher will orient and discuss all aspects related to concepts that the student considers necessary. In the tutored work it is important to follow up by personalizing to comment on the progress that is being made and provide the student with the necessary guidance to develop such work successfully.

Assessment			
Methodologies	**Competencies / Results**	**Description**	**Qualification**
Supervised projects	A1 A13 A19 B2	Supervised project will be submitted during the semester and will it represent 30% of the total assessment.	30
Mixed objective/subjective test	A1 A22	The knowledge of the students will be evaluated through an Objective Test of all theoretical and practical contents of the signature. This assessment will account for 70% of the final assessment.	70

Assessment comments
To pass the course three basic requirements are required: mandatory attendance at all activities and achieve a minimum final score of 5 points in each of the activities. To take into account the qualifications in the different activities subject to evaluation requires obtaining the minimum qualification indicated above for each one. Therefore, if this minimum value is not achieved in any of them, and the average is greater than or equal to 5 (out of 10), the student will not pass the course and will appear a qualification of 4.5. The student will obtain the qualification of ?No presentado? when they do not perform the final exam.

Sources of information	
Basic	- M Valcárcel y M.S. Cárdenas (2000). Automatización y miniaturización en Química Analítica. Springer (Barcelona) - F. R. Burden, I. McKelie, U. Förstner, A. Guenther (2000). Environmental Monitoring Handbook.. McGraw-Hill - D. A. Skoog, F. J. Holler y T. A. Nieman (2000). Principios de Análisis Instrumental. McGraw-Hill
Complementary	- D. C. Harris (1992). Análisis Químico Cuantitativo. Grupo Editorial Iberoamericana - D. Harvey (2002). Química Analítica Moderna. McGraw-Hill - R. Kellner, J. M. Mermet, M. Otto, M. Valcárcel, H. M. Widmer (1998). Analytical Chemistry. Wiley VCH - P.B. Stockwell (1988). Automatic Chemical Analysis. Taylor and Francis (Londres) - W.J. Hurst (1995). Automation in the Laboratory. VCH Publisher (New York)

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.