



## Teaching Guide

Identifying Data					2017/18
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	Optativa	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

Code	Study programme competences
A12	Coñecer as distintas estratexias para o tratamento estatístico de series de datos relacionadas con datos ambientais.
A22	Dominar as técnicas instrumentais de análises máis típicas no ámbito químico profesional.
B5	Que os estudantes posúan as habilidades de aprendizaxe que lles permitan continuar estudando dun modo que haberá de ser en gran medida autodirixido ou autónomo.
B6	Ser capaz de analizar datos e situacións, xestionar a información dispoñible e sintetizala, todo iso a un nivel especializado.

## Learning outcomes

Learning outcomes	Study programme competences		
Knowledge about environmental and chemical monitoring of processes, knowledge about instrumental techniques and the automation involved in the environmental analysis, and to environmental data management	AC12	BC5	
	AC22	BC6	
Searching of information related to environmental data		BC6	

## Contents

Topic	Sub-topic
1: FUNDAMENTALS OF LABORATORY AUTOMATION I. INTRODUCTION	Introduction. Degrees of automation. Definitions. Analytical techniques and automation. Objectives. 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 titration 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 analysers. Water survey networks. Air analysers. Air survey networks.
Tutorials: Visits and computer practices	<p>Visit to LMAG-Xunta de Galicia: air monitoring</p> <p>Visit to inmisión air network of IUMA-UDC</p> <p>Visit to EMALSSA: water network</p> <p>Computer practices i.e backtrajectories and SKIRON modelling, PALMA application, etc</p>

Planning				
Methodologies / tests	Competencies	Ordinary class hours	Student?s personal work hours	Total hours
Supervised projects	A22 B5	0	10	10
Field trip	B5 B6	9	4.5	13.5
Mixed objective/subjective test	A12 A22 B6	2	0	2
Seminar	A12 B6	5	15	20
Guest lecture / keynote speech	A12 A22	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 be done.
Mixed objective/subjective test	An Objective Test which enclose all the theoretical and practical contents of the signature will be 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 be done. In these sessions, theoretical concepts will be applied, environmental data will be interpreted, retro-trajectory calculations will be performed, synoptic 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 presented 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	Description	Qualification
Supervised projects	A22 B5	Supervised project will be submitted during the semester and will represent 30% of the total assessment.	30



Mixed objective/subjective test	A12 A22 B6	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
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#### 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

<b>Basic</b>	<ul style="list-style-type: none"><li>- M Valcárcel y M.S. Cárdenas (2000). Automatización y miniaturización en Química Analítica. Springer (Barcelona)</li><li>- F. R. Burden, I. McKelie, U. Förstner, A. Guenther (2000). Environmental Monitoring Handbook.. McGraw-Hill</li><li>- D. A. Skoog, F. J. Holler y T. A. Nieman (2000). Principios de Análisis Instrumental. McGraw-Hill</li></ul>
<b>Complementary</b>	<ul style="list-style-type: none"><li>- D. C. Harris (1992). Análisis Químico Cuantitativo. Grupo Editorial Iberoamericana</li><li>- D. Harvey (2002). Química Analítica Moderna. McGraw-Hill</li><li>- R. Kellner, J. M. Mermet, M. Otto, M. Valcárcel, H. M. Widmer (1998). Analytical Chemistry. Wiley VCH</li><li>- P.B. Stockwell (1988). Automatic Chemical Analysis. Taylor and Francis (Londres)</li><li>- W.J. Hurst (1995). Automation in the Laboratory. VCH Publisher (New York)</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

##### Other comments

Recommended:- Be able to redact, synthesize and present a work neatly.&nbsp;- Knowledge 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. - &nbsp;- Prepare the seminars thoroughly. - &nbsp;- Participate actively&nbsp;-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.