



Teaching Guide

| Identifying Data | | | | | 2022/23 |
|--------------------------|---|--------|---|---------|---------|
| 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 | Departamento profesorado másterQuímica | | | | |
| Coordinador | Moreda Piñeiro, Jorge | E-mail | jorge.moreda@udc.es | | |
| Lecturers | Lopez Mahia, Purificacion Moreda Piñeiro, Jorge Querol Carceller, Xavier Sánchez Piñero, Joel | E-mail | purificacion.lopez.mahia@udc.es jorge.moreda@udc.es joel.sanchez@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. 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 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 B3 B6 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.

A realización fraudulenta das probas ou actividades de avaliación será penalizada tendo en conta o establecido na normativa.

For those students who apply for the advance assessment in December, the considerations indicated in the teaching guide for the previous year will be applied.

The teaching-learning process, including evaluation, refers to a complete academic course and, therefore, will start again with a new academic course, including all the activities and evaluation procedures that are scheduled for said academic course.

Sources of information

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| Basic | <ul style="list-style-type: none"> - 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 | <ul style="list-style-type: none"> - 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. - 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. - 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.