



Teaching Guide

| Identifying Data | | | | | 2022/23 |
|--------------------------|--|--------|--|-----------|---------|
| Subject (*) | Analytical Estrategies and the Environment | | Code | 610500002 | |
| Study programme | Mestrado Universitario en Ciencias, Tecnoloxías e Xestión Ambiental (plan 2012) | | | | |
| Descriptors | | | | | |
| Cycle | Period | Year | Type | Credits | |
| Official Master's Degree | 1st four-month period | First | Obligatory | 6 | |
| Language | SpanishEnglish | | | | |
| Teaching method | Face-to-face | | | | |
| Prerequisites | | | | | |
| Department | Química | | | | |
| Coordinador | Muniategui Lorenzo, Soledad | E-mail | soledad.muniategui@udc.es | | |
| Lecturers | Beceiro Gonzalez, Maria Elisa Carloseta Zubieta, Alatzne Gonzalez Castro, Maria Jose Muniategui Lorenzo, Soledad Prieto Blanco, Maria del Carmen Terán Baamonde, Javier | E-mail | elisa.beceiro.gonzalez@udc.es alatzne.carloseta@udc.es m.j.gonzalez.castro@udc.es soledad.muniategui@udc.es m.c.prieto.blanco@udc.es javier.teran.baamonde@udc.es | | |
| Web | http://campusvirtual.udc.es | | | | |
| General description | This subject has an approach eminently practical, whose main aim is to help students to develop the "analytical approach" for solving diverse problems, selecting the most suitable analytical methodology in each case. Developments and trends in the sample treatment and instrumental determination shall be considered; and its application for the determination of priority and emerging pollutants in samples of environmental interest (air, water, soil, sediment, biological samples, food, etc..). | | | | |

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. |
| A3 | Capacitar ao alumno para o desenvolvemento dun traballo de investigación nun campo da Química ou do Medio Ambiente, incluíndo os procesos de caracterización de materiais, o estudo das súas propiedades fisicoquímicas e biolóxicas e dos procesos que poden sufrir no medio natural. |
| A10 | Relacionar a presenza de especies químicas no medio natural cos conceptos de toxicidade e biodisponibilidade. |
| A21 | Comprender os fundamentos dos procesos de calidade e o modo de xestionalos. |
| A22 | Dominar as técnicas instrumentais de análises máis típicas no ámbito químico profesional. |
| B1 | Posuír e comprender coñecementos que acheguen unha base ou oportunidade de ser orixinais no desenvolvemento e/ou aplicación de ideas, a miúdo nun contexto de investigación. |
| B2 | Que os estudantes saiban aplicar os coñecementos adquiridos e a súa capacidade de resolución de problemas en contornas novas ou pouco coñecidas 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 xuízos. |
| 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. |
| B7 | Ser capaz de planificar adecuadamente desenvolvementos experimentais, 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. |
| C3 | Ser capaz de adaptarse a situacións novas, mostrando creatividade, iniciativa, espírito emprendedor e capacidade de liderado. |
| C9 | Valorar criticamente o coñecemento, a tecnoloxía e a información dispoñible para resolver os problemas cos que deben enfrontarse. |



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| C11 | Valorar a importancia que ten a investigación, a innovación e o desenvolvemento tecnolóxico no avance socioeconómico e cultural da sociedade. |
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| Learning outcomes | | | |
|--|---------------------------------------|---------------------------------|--------------------------|
| Learning outcomes | Study programme competences / results | | |
| To know how to analyze and solve chemical problems related to the environment based on analytical criteria. Planning and implementation of the stages of an analytical process | AC1 AC3 AC10 AC22 | BC1 BC2 BC5 BC6 BC7 | CC1 CC2 CC11 |
| To know how to select and implement best practice measurement and analytical experimentation, ensuring the quality of the chemical data | AC1 AC3 AC10 AC21 AC22 | BC1 BC2 BC6 BC7 | CC1 CC2 |
| To know advanced techniques of sampling, sample treatment and instrumental determination in environmental analysis | AC1 AC3 AC10 AC22 | BC1 BC2 BC6 BC7 | CC1 CC2 |
| To know how to interpret environmental data and information from measurements | AC1 AC3 AC10 AC22 | BC1 BC2 BC3 BC6 BC7 | CC1 CC2 CC3 CC9 |

| Contents | |
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| Topic | Sub-topic |
| Chapter 1.- ANALYTICAL PROBLEM | Defining the problem and designing the analytical method. Classification of methodology and selection criteria. Development of an analytical method. Performance characteristics of analytical method. Method Validation. Sustainable Analytical Chemistry. |
| Chapter 2.- SAMPLING | Sampling methodology. Representative sample. Sampling strategies and sampling plan. Passive sampling. Automatic sampling. |
| Chapter 3.- SAMPLE PREPARATION | Recent advances in sample preparation techniques. Green sample treatments. Microextraction techniques. New extractants materials. Automated systems. Miniaturization of the sample preparation systems. |
| Chapter 4.- INSTRUMENTAL METHODS OF ANALYSIS | Current trends in spectroscopic and chromatographic methods. Hyphenated techniques. |
| Chapter 5.- CHEMICAL SPECIATION | Importance of chemical speciation in environment. Speciation methodology. Analytical challenges. Methods of analysis and applications. |
| Chapter 6.- ENVIRONMENTAL APPLICATIONS | Contaminants in environment. Air quality analysis. Water analysis. Analysis of soil and sediment. Analysis of biological samples. Food analysis and food safety |

| Planning | | | | |
|-----------------------|------------------------|--------------------------------------|-------------------------------|-------------|
| Methodologies / tests | Competencies / Results | Teaching hours (in-person & virtual) | Student?s personal work hours | Total hours |
| | | | | |



| | | | | |
|---------------------------------|---|----|----|----|
| Guest lecture / keynote speech | A1 A3 A10 A21 A22 C2 C9 C11 | 18 | 20 | 38 |
| Laboratory practice | A22 B2 B7 | 10 | 10 | 20 |
| Seminar | A1 A10 B1 B2 B3 B6 C3 C1 | 7 | 21 | 28 |
| Supervised projects | A3 A10 A21 A22 B1 B2 B3 B5 B6 C3 C11 | 5 | 55 | 60 |
| Mixed objective/subjective test | A3 A10 A21 A22 B2 | 2 | 0 | 2 |
| 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 | Teacher explains the fundamental concepts and the most important contents of each subject. It also proposes different issues that should be discussed and resolved by the students, encouraging participation |
| Laboratory practice | In the lab sessions the student will perform the application of theoretical concepts studied throughout the course and will also acquire the practical skills on techniques under study. The student will make a brief report on the obtained results |
| Seminar | Seminars clarify and extend some aspects covered in lectures and laboratory practice, especially related to the practical application of the studied methodologies. Students participate and discuss possible strategies to solve industrial and environmental problems under the teacher guidance |
| Supervised projects | Supervised projects will include finding information from different sources, presentation and oral defense of a topic proposed by the teacher related to any environmental, industrial, etc problem |
| Mixed objective/subjective test | A final exam will be done to assess the degree of learning both the theoretical and practical |

| Personalized attention | |
|------------------------|---|
| Methodologies | Description |
| Seminar | Throughout the course the teacher resolves any doubts on the subject that the student needs. |
| Supervised projects | In seminars and supervised projects, the teacher supervises the methodology used to solve the proposed problems, solves the student's doubts and guides the learning process; during 2 h of personalized attention. Students with recognition of part-time dedication and academic assistance waiver regime will be treated in tutoring (by appointment) |

| Assessment | | | |
|--------------------------------|---|---|---------------|
| Methodologies | Competencies / Results | Description | Qualification |
| Guest lecture / keynote speech | A1 A3 A10 A21 A22 C2 C9 C11 | Attendance at master classes and active participation will be evaluated | 5 |
| Laboratory practice | A22 B2 B7 | Practice work and active participation of students will be evaluated on a continuing process. | 10 |
| Seminar | A1 A10 B1 B2 B3 B6 C3 C1 | Work and active participation of students will be evaluated | 5 |
| Supervised projects | A3 A10 A21 A22 B1 B2 B3 B5 B6 C3 C11 | The academic activities will be evaluated by performing and oral defense of the supervised activities | 50 |



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|---------------------------------|-------------------|---|----|
| Mixed objective/subjective test | A3 A10 A21 A22 B2 | Learning degree for the course contents and skill acquisition by students will be assessed through an objective test. It will consist of theoretical questions and applied problems | 30 |
|---------------------------------|-------------------|---|----|

Assessment comments

To pass the subject, students must regulary atendance to all available lessons and to attain a minimun cualification in each of them. The student will obtain the qualification of not submitted when he/she don ´t make the supervised project and not presented to the mixed test. As regards the successive academic years, the teaching-learning process, including continuous assessment, refers to an academic course and, therefore, would comezar a new course, including all activities and procedures the Assessment that is scheduled for that course.

For students with part-time dedication and academic assistance waiver regime. in the event that the student can not perform all activities or continuous assessment tests, the teacher take appropriate measures to avoid prejudicing their qualification.

In the evaluation of the subject, all that is established in article 14, regarding the Fraud Commission and disciplinary responsibilities, of the UDC's Rules for the Evaluation of Bachelor's Degrees and Master's Degrees will be applied: "The fraudulent performance of the evaluation tests or activities, once verified, will directly imply the grade of "0" in the subject in the corresponding call, thus invalidating any grade obtained in all evaluation activities in view of the extraordinary call."

Sources of information

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| Basic | <ul style="list-style-type: none"> - C. Cámara, C. Pérez Conde (Ed.) (2010). Análisis Químico de Trazas. Editorial Síntesis. Madrid - J.R. Dean (1998). Extraction methods for environmental analysis. Chichester, John Wiley & Sons - F.W. Fifield; P.J. Haines (2005). Environmental Analytical Chemistry. Londres, John Wiley & Sons - E. Prichard (1996). Trace Analysis: A structured approach to obtaining reliable results . Royal Society of Chemistry, Cambridge - C. Cámara (Ed.), P. Fernández, A. Martín-Esteban, C. Pérez-Conde, M. Vidal (2002). Toma y tratamiento de muestra. Editorial Síntesis. Madrid - Reeve, Roger N. (1994). Environmental analysis. Chichester : John Wiley & Sons, - VanLoon, Gary W (2011). Environmental chemistry : a global perspective. Oxford, Oxford University Press - R.Compañó Beltrán, A. Ríos Castro (2002). Garantía de calidad en los laboratorios analíticos. Síntesis, Madrid - Se consultarán direcciones web y enlaces de interés relacionados con la materia impartida. - Material complementario: resumen de presentaciones, métodos oficiales de análisis, artículos científicos, etc. - Se utilizarán todos los medios disponibles en la plataforma de la facultad virtual de la UDC |
| 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



GREEN CAMPUS PROGRAM RECOMMENDATION: in order to help achieve an immediate sustainable environment and comply with point 6 of the "Environmental Declaration of the Faculty of Science (2020)", the documentary works requested in this subject:(a) Will be requested mostly in virtual format and computer support.(b) If paper is used: -No plastics will be used -Double-sided printing will be used -Recycled paper will be used -The use of drafts will be avoided.

(*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.