

25238 - Analytical technology for the detection of contaminants

Información del Plan Docente

Academic Year	2018/19
Subject	25238 - Analytical technology for the detection of contaminants
Faculty / School	201 - Escuela Politécnica Superior
Degree	277 - Degree in Environmental Sciences 571 - Degree in Environmental Sciences
ECTS	6.0
Year	
Semester	Four-month period
Subject Type	Optional
Module	---

1.General information

1.1.Aims of the course

1.2.Context and importance of this course in the degree

1.3.Recommendations to take this course

2.Learning goals

2.1.Competences

2.2.Learning goals

2.3.Importance of learning goals

3.Assessment (1st and 2nd call)

3.1.Assessment tasks (description of tasks, marking system and assessment criteria)

4.Methodology, learning tasks, syllabus and resources

4.1.Methodological overview

The methodology followed in this course is oriented towards the achievement of the learning objectives. A wide range of teaching and learning tasks are implemented, such as lectures, cabinet sessions, laboratory sessions and tutorials.

Being a course taught on the 4th year of the Degree, it is taken for granted that the student has already received some general basic knowledge of chemical analysis. It is intended that the student retains such knowledge, expand and put them into practice. Therefore, this course is scheduled to be eminently practical.

This course is designed to be developed in 4 hours straight sessions a week. Depending on how advanced or not the

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matter, 2 sessions of theoretical class and then 2 sessions of classes applied (computer room, laboratory, case studies, problems) or sessions laboratory practice 4 hours will be given, in addition to the outputs field sampling.

On the other hand, practices or applied sessions are open and modifications can be made having regard to possible demands of students enrolled, as well as joint participation with other subjects of the same course.

This course is very practical and it is intended that students are able to apply the knowledge and skills they have acquired. Therefore, teaching is scheduled giving great importance to the practical and applied part, but from an intensification of theoretical knowledge, on which laboratory work will be developed. In order to optimize the learning process, lectures and practice sessions are interspersed, reducing the time in which students acquire the necessary knowledge or receive the corresponding instructions until applied in the laboratory.

4.2. Learning tasks

This course is organized as follows:

- **Lectures** (30 hours). 2 weekly hours. They consist of lectures and participatory sessions in the classroom.
- **Cabinet sessions**. Various activities will be held including: planning work to develop in the laboratory sessions, exhibition of actual cases, study of research papers, computer room classes concerning literature searches, databases, etc.
- **Laboratory sessions** (30 hours). Theoretical knowledge acquired to apply to the analysis of real samples (sampling and analysis) will be implemented. The student must follow specific protocols for the management of the different instrumental techniques of analysis included in the course, including sampling, preparation and chemical treatment of the samples, handling equipment and collection and processing of data and interpretation of Results.
- **Tutorials**. Sessions, student demand, to resolve any doubts both theoretical sessions and practices.

4.3. Syllabus

This course will address the following topics:

Lectures

- **Topic 1**. Bibliographic search related to analytical methods for the detection of contaminants. Legislation, scientific magazines, official methods and standardized methods.
- **Topic 2**. Planning an analysis of contaminants in environmental sample. Sample protocol. Real case studies (practical) of environmental analysis.
- **Topic 3**. Calibration Methods. External calibration. Standard addition and the use of an internal pattern. A study of the quality parameters in Chemical Analysis. Basic Chemometrics.
- **Topic 4**. Determining the metals present in environmental samples. Methods of digestion/decomposition. Atomic Emissions Spectroscopy-ICP. Emission Spectroscopy - Mass Spectroscopy. Introduction to simple solids for determining metal. Real case studies.
- **Topic 5**. Determination of organic contaminants in environmental settings.
 - o 5.1- Separation methods, conventional methods of extraction and more specific methods for the analysis of organic contaminants (solid-phase extraction, solid-phase microextraction, supercritical fluid extraction). Extract cleaning methods. Practical case studies (articles of investigation).
 - o 5.2- Chromatographic Analysis Techniques. Optimization of chromatographic separation. Selection of chromatographic columns. Introduction to using sample for the analysis of volatile organic compounds (techniques of the purge and trap system, technique of headspace analysis). Selective detection systems (ECD, nitrogen-phosphorous detector) and universal detection systems (UV spectrometry, mass Spectrometry, FID). Practical case studies.

Laboratory sessions

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- **Section I.** Sampling and characterization of drinking water taken from different areas. Determining various parameters of water quality (pH, conductivity, chloride, residual chloride, hardness, nitrates, sulphates, phosphates, oxidability)
- **Section II.** Sampling and characterization of urban sewage (before and after purification). Determination of different contaminant parameters (Solids in Suspension, organic nitrogen, ammoniac, phosphates, DQO, DBO).
- **Section III.** Determination of heavy metals in solid waste (sewer sludge, industrial or agricultural waste). Study of bioavailability.
- **Section IV.** Determination of organic compounds (poly-aromatic hydrocarbons) in water and soil. Optimization of: extraction methods, Chromatographic separation (High Performance Liquid Chromatography, and Gas Chromatography), detection system for Mass Spectrometry.
- **Section V.** Selection of a method for the determination of a contaminant in an environmental sample putting in practice the different techniques of measuring, calibration method and quality control. Utilization of the Standard Material Certification.

4.4. Course planning and calendar

Further information concerning the timetable, classroom, office hours, assessment dates and other details regarding this course will be provided on the first day of class or please refer to the Faculty website and Moodle.

4.5. Bibliography and recommended resources

BB	Análisis químico de trazas / Editoras: Carmen Cámara, Concepción Pérez-Conde . Madrid : Sintesis, 2011
BB	Sogorb Sánchez, Miguel Angel. Técnicas analíticas de contaminantes químicos : aplicaciones toxicológicas, medioambientales y alimentarias / Miguel Ángel Sogorb Sá
BC	Eugenio Vilanova Gisbert . Madrid : Díaz de Santos, 2004
BC	Aguas / PANREAC . Barcelona [etc.] : Montplet & Esteban
BC	Análisis químico de aguas residuales / Jesús Beltrán de He
BC	Alonso ... [et al.] [Badajoz] : Universidad de Extremadura, I
BC	de Ciencias de la Educación : Abecedario, 2004
BC	Dean, John R.. Extraction methods for environmental analy
BC	John R. Dean. Reprint. Chichester [etc.]: John Wiley & Son
BC	1998
BC	Dean, John R.. Methods for environmental trace analysis /
BC	R. Dean . Chichester [etc.] : Wiley , cop. 2003
BC	Dunnivant, Frank M.. Environmental laboratory exercises fo
BC	instrumental analysis and environmental chemistry / Frank
BC	Dunnivant Hoboken, New Jersey : John Wiley & Sons, cop
BC	Harris, Daniel C.. Análisis químico cuantitativo / Daniel C. H
BC	3ª ed. Barcelona [etc.] : Reverté, cop. 2007
BC	Métodos normalizados : para el análisis de aguas potables
BC	residuales / preparado y publicado conjuntamente por Ame
BC	Public Health Association, American Water Works Associa
BC	Water Pollution control Federation ; directora de edición Ma
BC	H. Franson Madrid : Díaz de Santos, D.L. 1992
BC	Métodos oficiales de análisis / [publicados por el] Ministerio
BC	Agricultura, Pesca y Alimentación, Dirección General de P
BC	Alimentaria . Madrid : Secretaría General Técnica, Minister
BC	Agricultura, Pesca y Alimentación, 1993-1994
BC	Reeve, Roger N.. Introduction to environmental analysis / F
BC	N. Reeve Chichester [etc.] : John Wiley & Sons, cop. 2002
BC	Trace determination of pesticides and their degradation pro
BC	in water / [edited by] Damià Barceló, Marie- Claire Hennion
BC	ed. Amsterdam [etc.] : Elsevier, 2003

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The updated recommended bibliography can be consulted in:
<http://psfunizar7.unizar.es/br13/egAsignaturas.php?id=10989>