COURSE DATA

DATA SUBJECT

Code: 47086
Name: Muestreo, análisis y técnicas de medición de contaminantes en matrices ambientales y organismos.
Cycle: Master's Degree
ECTS Credits: 3
Academic year: 2025-26

STUDY (S)

Degree	Center	Acad. year	Period
2285 - Máster Universitario en Contaminación Ambiental y Ecotoxicología	Facultat de Ciències Biològiques	1	First quarter

SUBJECT-MATTER

Degree	Subject-matter	Character
2285 - Máster Universitario en Contaminación Ambiental y Ecotoxicología	Procesos contaminantes y sus efectos	COMPULSORY

COORDINATION

TOLOSA CHELOS JOSEFA

SUMMARY

Basic training in the design, application, and interpretation of instruments and methodologies for environmental pollutant monitoring. This training covers the entire analytical process using different environmental matrices and organisms, starting with sample collection, method validation, different sample preparation and extraction techniques, and the most commonly used analytical methods. In addition, analytical applications for specific pollutants such as pesticides, heavy metals, perfluorinated compounds, drugs of abuse, pharmaceuticals, polychlorinated biphenyls, etc. will be studied. Finally, the implications of exposure to environmental pollutants on human health will be studied through biological monitoring and the use of biomarkers.

PREVIOUS KNOWLEDGE

RELATIONSHIP TO OTHER SUBJECTS OF THE SAME DEGREE

There are no specified enrollment restrictions with other subjects of the curriculum.

OTHER REQUIREMENTS

Not specified.

COMPETENCES / LEARNING OUTCOMES

-

Acquire skills for designing and executing sampling programmes and analysing environmental pollutants.

Collaborate effectively in work teams, taking on responsibilities and leadership roles and contributing to collective improvement and development.

Demonstrate critical and self-critical reasoning in the field of the degree, considering aspects such as professional ethics, moral value and the social implications of the different activities carried out.

Develop and implement programmes and projects to prevent, control and mitigate environmental pollution.

Develop the ability to work in multidisciplinary teams and to cooperate effectively.

Develop the capacity for analysis, synthesis and critical thinking in applying the scientific method.

Diagnose environmental problems.

Evaluate the quality of water and soil.

Know and understand, within the area of the degree, inequalities based on sex and gender in society; integrate different needs and preferences based on sex and gender into the design of solutions and problem-solving.

Know the animal models used for studying human diseases in relation to environmental pollution.

Know the biochemical parameters of clinical interest in human samples.

Know the standards and legislation relating to environmental pollution.

Learn how to write scientific articles in the fields of environmental pollution and ecotoxicology.

Understand the nature of different environmental matrices, their components and aspects related to their degradation, resilience and health.

Use different bibliographic sources and biological databases.

DESCRIPTION OF CONTENTS

Block 1. Soil Sampling and Sample Preparation.

Soil Sampling Procedure. Planning a Sampling Operation. Preserving Sample Integrity. Sampling Techniques and Types. Sample Handling. Main Techniques for Determining Contaminants in Soil.

Block 2. Sampling and Sample Preparation in the Aquatic Environment.

Procedure for Sampling in the Aquatic Environment. Planning a Sampling Operation. Preserving Sample Integrity. Sampling Techniques and Types. Sample Handling. Main Techniques for Determining Contaminants in Water.

Block 3. Chromatographic techniques for the determination and analysis of organic contaminants in environmental samples.

Procedures and techniques for extracting organic contaminants from environmental samples. Purification and concentration techniques for analytes. Advanced techniques for the identification, separation, and quantification ofanalytes in environmental samples (various types of chromatography and detectors: HPLC-ESI-MS-QTOF, HPLC-ESI-MS-ORBITRAP, UHPLC-MS, GC-MS). Validation of analytical methods.

Block 4. Spectroscopic techniques for the determination of metals in environmental samples.

Extraction and digestion procedures from environmental samples. Analyte concentration techniques. Techniques for the identification and quantification of analytes in environmental samples: atomic and mass spectrometry (FAAS, FAES, ETAAS, ICP-OES, ICP-MS, AFS, DMA). Hydride generation and cold vapor. Validation of analytical methods.

Block 5. Measurement of contamination in humans.

General concepts of human toxicology. Toxicokinetics in humans. Factors that interfere with metabolism. Definition and types of markers. Biological monitoring. Study design. Reference values. Sampling. Type of matrix. Sampling time. Interpretation of results. Ethical issues related to markers. Results communication.

WORKLOAD

PRESENCIAL ACTIVITIES

Activity	Hours
Theory	30,00
Total hours	**30,00**

NON PRESENCIAL ACTIVITIES

Activity	Hours
Attendance at other activities	0,00
Individual or group project	7,00
Independent study and work	12,00
Preparation of lessons	10,00
Preparation for assessment activities	15,00
Resolution of case studies	1,00
Total hours	**45,00**

TEACHING METHODOLOGY

The course is structured as follows:

Master classes to develop fundamental knowledge and the methodology to be used, with the most important and difficult theoretical and theoretical-practical content explained in class using various teaching resources.

Seminars and research projects to be conducted individually or in groups.

Joint field trips with the professors involved in the course.

All activities will use the "aula virtual" tool of the University of Valencia webpage for document exchange and communication.

EVALUATION

The following distribution is proposed, out of a maximum of 10 points:

Assimilation of theoretical and theoretical-practical concepts (up to 6 points). A written exam will be given on the lecture content, assessing the student's understanding of theoretical concepts and calculations, based on the learning outcomes and specific objectives of the course.

Seminars and individual and/or group projects (presentation, content, defense, and participation) (up to 3 points).

Field trip and fieldwork (up to 1 point).

REFERENCES

Achaval, A. Crecimiento demográfico y contaminación ambiental. Ed. Buenos Aires:Dunken 2006 Sabater, S. et al. (eds.), he Llobregat: The Story of a Polluted Mediterranean River, Hdb Env Chem, DOI 10.1007/698_2012_147, Springer-Verlag Berlin Heidelberg 2012.

Barcelo, D. (ed) Aguas continentales. Gestión de recursos hídricos, tratamiento y calidad del agua, Cyan, Proyectos y Producciones Editoriales, 2008.

Petrovic, M.; Barcelo, D., Analysis, fate and removal of pharmaceuticals in the water cycle, Comprehensive Analytical Chemistry, Wilson&Wilson, 2007.

Pawliszyn, J. Sampling and simple preparation for field and laboratory, Comprehensive Analytical Chemistry, Wilson&Wilson, 2002.

Barceló, D; Diedrich Hansen, P. Biosensors for Environmental Monitoring of Aquatic Systems, Springer Berlin Heidelberg, 2005.