COURSE DATA

Data Subject

Code	43049
Name	Sampling and analysis of environmental pollutants by mass spectrometry
Cycle	Master's degree
ECTS Credits	3.0
Academic year	2023 - 2024

Study (s)

Degree	Center	Acad. year	Period
2139 - M.U. en Contaminación, Toxicología y Sanidad Ambient. 12-V.2	Faculty of Biological Sciences	1	First term

Subject-matter

Degree	Subject-matter	Character
2139 - M.U. en Contaminación, Toxicología y Sanidad Ambient. 12-V.2	1 - Core training	Obligatory

Coordination

Name	Department
BOLUDA HERNANDEZ, RAFAEL	25 - Plant Biology
PICO GARCIA, YOLANDA	265 - Prev. Medicine, Public Health, Food Sc.,Toxic. and For. Med.
SORIA GARCIA, JUAN MIGUEL	275 - Microbiology and Ecology

SUMMARY

Basic training to design, apply and interpret instruments and methodologies of environmental monitoring. For this purpose, the whole analytical process will be studied from the sampling, method validation, different techniques of sample preparation and extraction, several methods to determine the analytes to the analytical applications: pesticides, perfluorinated compounds, heavy metals, etc…..

Course Guide
43049 Sampling and analysis of environmental
pollutants by mass spectrometry

PREVIOUS KNOWLEDGE

Relationship to other subjects of the same degree

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

Other requirements

OUTCOMES

2139 - M.U. en Contaminación, Toxicología y Sanidad Ambient. 12-V.2

- Students should apply acquired knowledge to solve problems in unfamiliar contexts within their field of study, including multidisciplinary scenarios.

- Students should be able to integrate knowledge and address the complexity of making informed judgments based on incomplete or limited information, including reflections on the social and ethical responsibilities associated with the application of their knowledge and judgments.

- Students should communicate conclusions and underlying knowledge clearly and unambiguously to both specialized and non-specialized audiences.

- Students should demonstrate self-directed learning skills for continued academic growth.

- Students should possess and understand foundational knowledge that enables original thinking and research in the field.

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- Capacidad de análisis, síntesis y razonamiento crítico en la aplicación del método científico.

- Capacidad para transmitir ideas, problemas y soluciones y de comunicarlas a una audiencia profesional y no profesional.

- Capacidad para el trabajo multidisciplinar en equipo y la cooperación.

- Capacidad para el aprendizaje autónomo y organizado y para la adaptación a nuevas situaciones.

- Comprensión del mundo natural como producto de la evolución y de su vulnerabilidad frente a la influencia humana.

- Saber utilizar las diferentes fuentes bibliográficas y bases de datos biológicos y usar las herramientas bioinformáticas.

- Desarrollo de un compromiso ético y capacidad de participación en el debate social.

- Reconocimiento, respeto y promoción de los derechos humanos fundamentales, especialmente los de igualdad, de los valores democráticos y de los valores propios de una cultura de paz.

- Comprender los mecanismos de toxicidad de contaminantes.

- Conocer los mecanismos desarrollados por los organismos para la resistencia a la contaminación ambiental.

- Utilizar los indicadores de riesgos y daños ambientales para la salud.

LEARNING OUTCOMES

SKILLS TO ACQUIRE.

- To handle scientific terminology properly and become familiar with their sources.
- To get an integrated view of the defense mechanisms of adaptation to the environment of animals. Make sense of foreground, interrelate and apply.Ability to analyze data, choosing the right method, critical evaluation and interpretation of experimental results in various forms of expression (tables, graphs ...).
- Acquire synthesis capacity to collect, coherently and in an organized way, information or data of different origins.
- Meet the management of basic scientific instrumentation typical of Applied Physiology.

SOCIAL SKILLS

- Develop capacity for critical thinking, fostering communication and discussion with a view to stimulating individual creative ability.
- Ability to work in groups when dealing with problematic situations collectively.
- Ability to build a comprehensive text written and organized.
- Ability to speaking to a public audience, such as the class itself, by exposure or intervention in a debate on a topic or controversial issue.
- Ability to interact with both the teacher and with peers.
- Interest in social and economic application of science and in particular the Environmental Toxicology.
- Interest in popular science and the impact of science on culture and consciousness of society.
- Professional training. Acquisition of scientific and technical knowledge related to resistance to xenobiotics that will facilitate the work in Environmental Toxicology in a society in continuous technological progress.

DESCRIPTION OF CONTENTS

1. Sampling and analysis of pollutants by mass spectrometry

1.-Environmetal contamination: priority contaminants in Europe, U.S.A EPA list. Legislation and state of the art.

2.-The role of chemical analysis in the monitoring of environmental contamination. Advantages and limitations.
3.-Sampling and sample preparation. Planning of a sampling operation. Preservation of sample integrity. Equipment and strategies for sampling in air, water, soil and sediments.

4.-Analysis of inorganic contaminants at trace and ultra-trace levels.

5.-Analysis of organic contaminants: off-line sample preparation techniques. Extraction/preconcentration from water samples. Gas preconcentration. Extraction of solid samples. Strategies to remove interferences

6.-Analysis of organic contaminants: on-line sample preparation techniques. Extraction/preconcentration of water samples. Preconcentration of gases. Strategies to remove interferences.

7.-Instrumentation to determine organic and inorganic contaminants: LC-MS(MS), GC-MS(MS), AAS, ICP-MS, ICP-OES, etc

8.-Validation of the analytical results and quantification in the instrumental analysis. Calibration. Limits of detection and quantification and limits of confidence. Sensitivity and selectivity.

9.-Analytical applications: pesticides, perfluorinated compounds, drugs of abuse, pharmaceuticals, polychlorinated biphenyls.

10.-Evaluation and interpretation of the data.

WORKLOAD

ACTIVITY	Hours	% To be attended
Theory classes	30,00	100
Laboratory practices	0,00	100
Development of group work	7,00	0
Study and independent work	12,00	0
Preparation of evaluation activities	15,00	0
Preparing lectures	10,00	0
Preparation of practical classes and problem	1,00	0
TOTAL	**75,00**	

TEACHING METHODOLOGY

- Master class for acquiring the fundamental knowledge, including methodological aspects.
- seminars and investigative works
- A field trip
- All activities and master classes are reinforced with documentation and information exchanges between lecturers and students using the "aula virtual" tool of the Universitat de València webpage.

EVALUATION

We propose the following distribution of a maximum of 100 points

- Assimilation of knowledge and concepts (up to 60 points). There will be a written exam that will deal with topics of the subject.
- Seminars (presentation, content, advocacy and participation) (up to 30 points).
- Field trip and work (up to 10 points)

REFERENCES

Basic

- 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

Additional

- 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