Course guide
250674 - 250674 - Organic Contaminants in Aquatic Ecosystems and Their Environmental Risk

Unit in charge: Barcelona School of Civil Engineering
Teaching unit: 751 - DECA - Department of Civil and Environmental Engineering.
Degree: MASTER'S DEGREE IN ENVIRONMENTAL ENGINEERING (Syllabus 2014). (Optional subject).
Academic year: 2022  ECTS Credits: 5.0  Languages: Spanish

LECTURER
Coordinating lecturer: FRANCISCO JAVIER SANCHEZ VILA
Others: MARCOS CARNICERO DEL RIO, PAULA FELICIDAD RODRIGUEZ ESCALES, FRANCISCO JAVIER SANCHEZ VILA

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Specific:
13340. Apply scientific concepts to environmental problems and their correlation with technological concepts.
13347. Dimension unconventional systems and advanced treatment and raise their mass balance and energy.

Transversal:
8560. SUSTAINABILITY AND SOCIAL COMMITMENT: Being aware of and understanding the complexity of the economic and social phenomena typical of a welfare society, and being able to relate social welfare to globalisation and sustainability and to use technique, technology, economics and sustainability in a balanced and compatible manner.

8563. FOREIGN LANGUAGE: Achieving a level of spoken and written proficiency in a foreign language, preferably English, that meets the needs of the profession and the labour market.

TEACHING METHODOLOGY

For the students to achieve their goals and skills described above, the course is divided into three sessions:
- Classroom sessions, covering theoretical and practical aspects, with examples
- Non-contact sessions. Students will spend time outside the classroom in order to understand the theoretical content of the course and apply them in a classroom
- Evaluation sessions

Although most of the sessions will be given in the language indicated, sessions supported by other occasional guest experts may be held in other languages.
LEARNING OBJECTIVES OF THE SUBJECT

CE01 - Apply scientific concepts to environmental problems and their correlation with technological concepts.
CE08-Dimension unconventional systems and advanced treatment and raise their mass balance and energy.

Explore scientific concepts and technical principles of quality management of the receiving means, atmosphere, water and soil, and applied to problem solving.
Explore scientific concepts and technical principles of management and treatment of gaseous emissions, water supply, sewage and waste and remediation techniques for groundwater and contaminated soils.
Sized systems for the treatment of major pollutants vectors in specific sectors of activity.
Interprets rules, identifies goals, assesses technical alternatives proposed unconventional solutions and priority actions.

Organic pollution in the continental waterways and applicable law.
Pollutants (POPs) and emerging organic (ECs):
Features and families.
Sources, fate and effects.
The Stockholm Convention. Measures and derivative obligations.
Analytical determination of POPs for ECs and Methodologies.
Sampling and pretreatment.
Main techniques of extraction and purification.
Instrumental Analysis.
Application examples.
Environmental monitoring of POPs and ECs.
Analysis and fate of POPs.
Analysis and ECs processes.
Transformation processes in the environment and identification of products.
Application examples.
Ecotoxicology of organic contaminants.
Bioavailability and bioaccumulation.
Environmental impact analysis.
Toxicity and mode of action of pollutants.
Endocrine disruptors: Description and main effects.
Biomarkers and bioassays. Morphological, biochemical and molecular biology techniques.
Effects of organic pollutants on human health:
Description of the problems arising from the dispersion of organic pollutants.
Routes of entry and effects at different stages of the life cycle.
Assessment of the environmental risk.
Top ecotoxicity models applicable.
Application to the determination of environmental risk.
Relationship between the chemical and ecological status risk.
Top chemometric tools in the treatment and interpretation of data.

Knowing the main elements of legislation and state governing the presence of organic micropollutants in water, sediments and soils.
Recognizing the types of chemical contaminants, differentiating between priority and emerging.
Identifying their sources and routes of entry to the environment.
Understanding the processes of transformation that can undergo chemical pollutants in the environment.
Knowing the degree of removal of contaminants by chemical treatments.
Understanding the problems of chemical pollution in the context of global change.
Understanding the basics of environmental biomonitoring and ecotoxicology.
Knowing the main environmental effects and risks of organic pollutants on human health and the main chemometric tools available for treatment and interpretation of environmental data.
## STUDY LOAD

<table>
<thead>
<tr>
<th>Type</th>
<th>Hours</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>Hours large group</td>
<td>15,0</td>
<td>12.00</td>
</tr>
<tr>
<td>Hours medium group</td>
<td>10,0</td>
<td>8.00</td>
</tr>
<tr>
<td>Self study</td>
<td>80,0</td>
<td>64.00</td>
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<tr>
<td>Guided activities</td>
<td>10,0</td>
<td>8.00</td>
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<tr>
<td>Hours small group</td>
<td>10,0</td>
<td>8.00</td>
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</tbody>
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**Total learning time:** 125 h

## CONTENTS

### Organic Pollution

**Description:**

Sampling. Pretreatment of samples. Principals.

Contents: Theory and exercises: 0.75 ECTs.

**Specific objectives:**

- (* ) Obligatory fields
- Purification techniques. Instrumental analysis for extraction and gas chromatography, icromatografia fluid coupled to mass spectrometry. Ionization methodology. Description of the main types of mass analyzers. Quantification methods.

**Full-or-part-time:** 16h 48m

Theory classes: 4h
Laboratory classes: 3h
Self study: 9h 48m
Environmental Monitoring

**Description:**

Examples: Flame retardant compounds, perfluorented compounds, drugs (human and animals medicine).

ECs and analysis processes. Introduction to the processes of environmental transformation. Redox processes of environmental degradation in aquifers.

Evaluation and modeling of the results of the degradation process can experience pollutants in the environment.

**Specific objectives:**
- Identify the environmental destination of contaminants based on their physicochemical characteristics.
- Know the possibilities mass spectrometry for the identification and characterization of transformation products.
- Identify the main sources of environmental pollution by the families of compounds considered.
- Understand the environmental problems associated with the presence of those contaminants in the aquatic environment.
- Identify the environmental destination of contaminants based on their physicochemical characteristics.
- Identify the environmental destination of pollutants based on their physicochemical characteristics.
- Recognize different degradation processes of pollutants in the environment.

Calculations to find the impact on the concentrations of organic pollutants due to the processes of transport and degradation of contaminants can experience the environment.

**Full-or-part-time:** 31h 12m
Theory classes: 7h
Practical classes: 6h
Self study: 18h 12m

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**Evaluation**

**Description:**
Evaluation second part of the course

**Specific objectives:**
Final evaluation

**Full-or-part-time:** 9h 36m
Theory classes: 2h
Laboratory classes: 2h
Self study: 5h 36m
Ecotoxicology

Description:
Description of the specific problems arising from scattering organic pollutants persistent in the environment in human population. Ways of introduction and effects of these compounds in human beings in different stages of the life cycle.

Specific objectives:
* Understanding the basics of environmental biomonitoring and ecotoxicology.
* Knowing the most important techniques for assessing environmental pollution.
* Identify families of pollutants harmful to human health.
* Know the different effects that can cause the human body.

Full-or-part-time: 14h 23m
Theory classes: 6h
Self study : 8h 23m

Environmental Risk

Description:
Main ecotoxicity models of complex mixtures of organic micropollutants. Application to the determination of environmental risk. Relationship between risk and chemical state ecologic. Principals chemometric tools in the treatment and interpretation of environmental data.
Examples of ecotoxicology and risk

Specific objectives:
* Determine whether a chemical discharged into the environment aquatic represents a risk for the ecosystem, through the application of chemometric tools and models ecotoxicity considered.
* Complete knowledge through problem solving

Full-or-part-time: 12h
Theory classes: 2h
Practical classes: 3h
Self study : 7h

GRADING SYSTEM

The mark of the course is obtained from the ratings of continuous assessment and their corresponding laboratories and/or classroom computers.

Continuous assessment consist in several activities, both individually and in group, of additive and training characteristics, carried out during the year (both in and out of the classroom).

The teachings of the laboratory grade is the average in such activities.

The evaluation tests consist of a part with questions about concepts associated with the learning objectives of the course with regard to knowledge or understanding, and a part with a set of application exercises.

EXAMINATION RULES.

Failure to perform a laboratory or continuous assessment activity in the scheduled period will result in a mark of zero in that activity.
BIBLIOGRAPHY

Basic:
- Administracions i entitats de normalització. Legislació europea i estatal.
- Diversos. Material bibliogràfic recomanat pel professorat.

Complementary:
- Diversos. Internet: CE, ACA, ....
- Professors de l'assignatura. Treballs de recerca del professorat (Tesis doctorals, articles i llibres científics).