

COURSE: ENVIRONMENTAL QUALITY ANALYSIS

SUBJECT: Environmental, Food and Pharmaceutical Analysis

MODULE: Specific

PROGRAM: University Master's Degree in Analytical Chemistry

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GENERAL FEATURES *

Type: Basic Training Compulsory Elective

Master's thesis work, Practicum

Duration: Semester

Semester / s: 2

Number of ECTS credits: 5

Language / s: Spanish, Catalan, English

DESCRIPTION

BRIEF DESCRIPTION AND JUSTIFICATION (The meaning of the course in relation to the program. Between 100 and 200 words.)

The general objective of the Master in Analytical Chemistry by the Universitat Ramon Llull is to provide students with the necessary tools to tackle a global analytical process. For this reason, it is important for the students to acquire enough knowledge on the main matrices to which analytical processes are applied.

Among the main matrices are those of environmental origin. The basic objective of this subject is to provide the student with knowledge about the analysis of those chemical parameters that allow to evaluate the quality of the environment, as well as about the taking of environmental samples.

For this reason, the subject is divided into three major blocks: a first block on the relationship between environmental analysis and its relationship with environmental chemistry, a second block dedicated to sampling and a third block dedicated to the determination of parameters of environmental importance, grouped by compartments.

COMPETENCES (Of course you put in relation to the skills pre-assigned in the field.)

Basic competences

CB6 - Have and understand knowledge which provides the ground or opportunity to be innovative in the development and/or application of ideas, often in a research context

CB8 - Integrate knowledge and deal with the complexity of formulating judgments based on information which, being incomplete or limited, includes reflections on social and ethical responsibilities related to the application of their knowledge and judgments

CB9 - Communicate conclusions, and the reasons that sustain them, to specialized and non-specialized audiences in a clear and unambiguous way.

CB10 - Understand the need for life-long learning in a self-directed or autonomous way.

General competences

CG1 - Ability to lead, direct and manage projects in academic or business environments adapting to the structures, needs and ways of operation of each institution

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Specific competences

E13- Demonstrate advanced knowledge of analytical methods for determining the composition of environmental samples (air, water, soil, sediments, waste, ...), for identifying and quantifying pollutants in these samples, as well as of specific analytical techniques for the environment.

E14 - Ability to interpret the analytical results obtained in environmental samples (air, water, soil, sediments, waste, ...) and of pollutants detected in these samples

Transversal competences

T1 - Ability to communicate in English and use English as a working language

T3 - Ability to assess the impact of the use of chemistry in the sustainable development of the society

PREREQUISITES * (Modules, materials, disciplines or expertise needed to track the subject. Contain subjects that must have been completed can be made.)

Students who have accessed the master's degree from bachelor's degrees in chemistry will not need any additional training complement. For the other degrees, they must have previously studied subjects that included basic contents of instrumental analytical chemistry and structural elucidation (including mass spectrometry) and statistics.

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CONTENTS (Sections that make up the syllabus, to a second level of detail.)

1. Relationship between environmental analysis and environmental chemistry
2. Sampling for environmental analysis
 - 2.1. Air sampling
 - 2.2. Water sampling
 - 2.3. Sampling of solid matrixes
3. Atmospheric analysis
 - 3.1. Determination of gas-phase pollutants
 - 3.2. Determination of particulates and particulate-phase pollutants
4. Water analysis
 - 4.1. Measurement of water quality
 - 4.2. Analysis of trace pollutants
5. Analysis of soils, sediments, solids and waste
 - 3.1. Common procedures for analysis of solid matrixes
 - 3.2. Analysis of soils
 - 3.3. Analysis of sediments and sludge
 - 3.4. Waste characterization
 - 3.5. Analysis of biological samples for environmental monitorization

METHODOLOGY

TRAINING ACTIVITIES * (Complete the table relating activities, workload in ECTS credits, and skills.)

Training Activities	ECTS	Competences
Sessions of exposition of concepts	31 / 1.15	E13, E14, T3
Sessions solving exercises, problems and cases	4 / 0.15	E13, E14, T3
Seminars	2 / 0.07	E13, E14, T3
Presentations	4 / 0.1	E13, E14, T1, T3
Activities of personal study by students	90 / 3.33	E13, E14, T3
Evaluation activities (exams, monitoring controls ...)	4 / 0.15	E13, E14, T3
TOTAL	135/5	

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TEACHING METHODOLOGY (Justifying the teaching methods used in relation to the competences and contents of the course. Between 100 and 200 words.)

- Sessions of exposition of concepts: Exposition of contents through presentation or explanation (possibly including demonstrations) by a professor.
- Sessions solving exercises, problems and cases: Solving exercises, approach / problem solving and presentation / discussion of cases by a professor with the active participation of students.
- Seminars: Statement made by a teacher in order to review, discuss and answer questions about materials and topics presented in the sessions of exposure sessions concepts and solving exercises, problems and cases.
- Presentations: Oral presentation to a professor and possibly other students by a student. It can be a paper prepared by the student by searching the published literature or a summary of a practical or project undertaken by the student.
- Activities of personal study by students: Personal work required of the student to acquire the competences of each subject and assimilate the knowledge presented in the sessions of exposition of concepts and of solving exercises, problems and cases, using, when necessary, the consultation recommended material.
- Evaluation activities: Oral and/or written statements made during a semester or after it.

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EVALUATION

ASSESSMENT SYSTEM * (Complete the table relating evaluation methods, competences and weight in the course grade.)

Evaluation Methods	%	Competences
Final Exam	50%	E13, E14, T3
Monitoring activities	25%	E13, E14, T3
Projects and presentations	20%	E13, E14, T1, T3
Participation	5%	E13, E14, T1, T3

LEARNING OUTCOMES (Explanation of the embodiments that allow the student skills assessment, relating them to the skills and methods of assessment.)

The student must demonstrate knowledge of the main sampling methods of environmental matrices. (E13, E14)

The student must demonstrate knowledge of the main analytical methods for the determination of chemical compounds in environmental matrices. (E13, E14)

The student must demonstrate knowledge of specific analytical methods for the determination of chemical compounds in environmental matrices. (E13, E14)

The student must demonstrate his ability to interpret the results obtained in the determination of chemical compounds in environmental matrices. (E14, T3)

The student must demonstrate his knowledge of the main standards that are applied in the environmental analysis. (E13)

The student must be able to communicate in English and to use English as a working language. (T1)

QUALIFICATION (Explanation of the computer system of the course grade.)

First call: The grade of this course is obtained:

Final exam	50%
Monitoring activities	25%
Projects and presentations	20%
Participation	5%

In subsequent calls, the note of monitoring activities can be substituted by the final exam note of that call, if this results in a better final grade.

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ASSESSMENT OF THE COMPETENCES (Define calculation expressions for each competence and the relevant evaluation methods.)

The competences E13, E14 and T3 are evaluated with the qualification of the subject. The T1 competence is evaluated with the qualification of the projects and presentations.

BIBLIOGRAPHY (Recommended and accessible to students.)

- REEVE R., Introduction to Environmental Analysis; Wiley, 2002. ISBN: 0-471-49295-7.
- RADOJEVIC M., BASHKIN V.N., Practical Environmental Analysis; 2nd edition; RSC Publishing, 2006. ISBN: 0-85404-679-8.
- PATNAIK P., Handbook of Environmental Analysis; 2nd edition; CRC Press, 2010. ISBN: 978-1-4200-6581-7.
- DEAN J.R., Environmental Trace Analysis; Wiley 2014. ISBN: 978-1-119-96271-7
- KEITH L.H., Principles of Environmental Sampling; 2nd edition; American Chemical Society, 1996. ISBN: 0-8412-3152-4.
- MANAHAN S.E., Environmental Chemistry; 9th edition; CRC Press, 2009. ISBN: 978-1420059205..
- BAIRD C., CANN M., Environmental Chemistry; 4th edition; W.H. Freeman and Company, 2008. ISBN: 1-4292-0146-0.

DOCUMENT HISTORY

PREVIOUS CHANGES (You set the date and author / s, the most recent first)
July 2015, Dr. Jordi Díaz

LAST REVISION (Indicate date and author / s.)
September 2016, Dr. Jordi Díaz