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**COURSE: Analytical Methods for Environmental Analysis**

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**ACADEMIC YEAR: 2017/2018**

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**TYPE OF EDUCATIONAL ACTIVITY: Characterizing**

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**TEACHER: Giuliana Bianco**

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phone: 00390971205451

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Language: italian

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ECTS: 6 lessons

n. of hours: 48 lessons

Campus: Potenza  
Dept./School: DIS  
Program: Chemical Sciences  
(LM54)

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Semester: II  
from 02/03/2020 to  
31 May-20 June 2019

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**EDUCATIONAL GOALS AND EXPECTED LEARNING OUTCOMES**

The course is designed to develop skills in analytical methods used for environmental analysis. The course includes a wide range of analysis techniques, surveys and environmental monitoring of water, soil, waste, sediments and air. After a brief introduction to the general problem of pollution the course illustrates, above all through the discussion of specific examples, the criteria and methodologies to be followed for the solution of problems typical of environmental analytical chemistry. Qualitative identification of pollutants and their quantitative determination are discussed with reference both to the problem of environmental protection and human health, and to Italian and EU legislation.

The main knowledge provided will be:

- o Main analytical techniques used for the analysis of environmental contaminants;
- o Analytical methods based on the absorption and emission of electromagnetic radiation for the determination of pollutants;
- o Separation analytical methods based on liquid and gaseous chromatography coupled with mass spectrometry for the determination of persistent organic micro-pollutants.

The main skills acquired by the student will be:

- o Application of the most common quantitative and / or semi-quantitative analytical methodologies for the analysis of the main environmental contaminants;
- o Acquisition of the essential cognitive elements to define and rationalize the most common and basic methodological approaches to environmental chemical analysis;
- o Ability to manage and propose instrumental investigation methods for the quantitative determination of species of environmental interest.

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**PRE-REQUIREMENTS**Not necessary

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**SYLLABUS**

Trace elements, heavy metals, metals linked to organic compounds: techniques and methods of analysis. 8 hours

Inorganic pollutants, asbestos, alkalinity, salinity, acidity. 4 hours

Trace organic pollutants (PCBs, PBDEs, Dioxins, furans, PAHs, pesticides). 6 hours

Soaps, detergents, emulsifiers, biochemical oxygen demand (BOD), chemical oxygen demand (COD), radionuclides.

Fate and (bio) transformations. 4 hours

Outline of environmental biochemistry. 4 hours

The Earth's atmosphere and the main pollutants. 4 hours

Soil pollution and methods of sampling and analysis, classification and analysis of waste. 4 hours

Sample preparation. Analytical techniques for the determination of all classes of environmental pollutants using instrumental methods (analytical spectroscopies, chromatographies, electroanalytical techniques, hyphenated techniques); mass spectrometry. Selection criteria. 4 hours

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Basic principles of mass spectrometry; Liquid chromatography / mass spectrometry (LC / MS) for the qualitative and quantitative analysis of polar and thermolabile environmental pollutants. Gas chromatography / mass spectrometry (GC / MS) for the analysis of pollutants of anthropic origin, quantitative analysis and case studies (analysis of persistent halogenated compounds: PCB, PCDD, PCDF and PBDE). 6 hours.

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**TEACHING METHODS**

Theoretical lessons

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**EVALUATION METHODS**

During the semester 2 intermediate exams will be organized and a final oral colloquium

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**TEXTBOOKS AND ON-LINE EDUCATIONAL MATERIAL**

- Stanley E. Manahan, "Chimica dell'Ambiente", Piccin, Padova
  - C. Baird, M. Cann, CHIMICA AMBIENTALE, Zanichelli, Bologna.
  - Skoog, West, Holler, Crouch "Fondamenti di Chimica Analitica", Ed. EdISES
  - Albert T. Lebedev, Comprehensive Environmental Mass Spectrometry, ILM Publications, UK 2012.
  - Biagio Gianni, Le analisi chimiche ambientali, I.C.S.A. Ed. Settimo Milanese (MI) 2009.
  - Slides from the course
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**INTERACTION WITH STUDENTS**

The teacher is open for discussion and additional teaching during the planned weekly colloquia every day from 4.00 pm to 6.00 pm, by email ([giuliana.bianco@unibas.it](mailto:giuliana.bianco@unibas.it)) or by phone (00390971 205451)

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**EXAMINATION SESSIONS (FORECAST)<sup>1</sup>**

18<sup>th</sup> February 2020, 17<sup>th</sup> march 2020, 23<sup>th</sup> june 2020, 14<sup>th</sup> july 2020, 22<sup>th</sup> September 2020, 20<sup>th</sup> October 2020, 15<sup>th</sup> december 2020.

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SEMINARS BY EXTERNAL EXPERTS    YES     NO

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**FURTHER INFORMATION**

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<sup>1</sup> Subject to possible changes: check the web site of the Teacher or the Department/School for updates.