**Spectroscopic techniques for the identification and quantitation of organic compounds in the agrifood field.**

**SSD: Chim/06**

PHD COURSE: Sustainable Agricultural and Forestry Systems and Food Security

ACADEMIC YEAR: 2024/2025

**COURSE DESCRIPTION**

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**GENERAL INFORMATION**

**SUGGESTED YEAR:**  I

**PERIOD**: from march to april

**CFU**: 4

**EXPECTED OUTCOMES**

The course will provide basic theoretical and practical information on the main spectroscopic techniques used for detection and quantitation of organic compounds with agricultural and food interest.

The student will gain a basic knowledge of the most common spectroscopic techniques, will be able to choose the most appropriate technique for a specific problem, and will be able to solve simple analytical problems in the agrifood field using spectroscopic techniques.

**CONTENTS/SYLLABUS**

1. Main extraction techniques of an organic material (plant, bacteria, food, fungi, etc)

2. Introduction of analytical separations. Basic principles of chromatography.

3. Introduction on spectroscopic techniques. Infrared (IR) spectroscopy. Basic theory. Vibrational frequencies of main functional groups. Applications of IR spectroscopy in the agrifood field.

4. Ultraviolet (UV) spectroscopy: Basic theory. Main chromophoric groups in organic compounds. Circular dichroism (CD) for the analysis of chiral compounds.

5. Mass spectrometry (MS). Basic theory. Ion Sources. Analyzers. High-resolution mass spectrometry. Tandem mass spectrometry (MS2). Instrumentation. Mechanisms of fragmentations and their structural meaning.

6.Hyphenated techniques: Gas chromatography coupled to mass spectrometry (GC-MS). Liquid chromatography coupled to mass spectrometry (LC-MS). Liquid chromatography coupled to ultraviolet spectroscopy (HPLC-UV). Some applications in the agrifood field.

7. Nuclear magnetic resonance (NMR) spectroscopy. Basic theory. Nuclear Overhauser Effect (NOE).One- and two-dimensional NMR spectra. Application of 1D- and 2D-NMR in the agrifood field.

**READINGS/BIBLIOGRAFY**

Silverstein, Webster, Kiemle. Spectrometric Identification of Organic Compounds. Casa Editrice Ambrosiana.

Randazzo. Guida Pratica alla Interpretazione di Spettri NMR. Loghia.

**TEACHING METHODS**

**Lectures hours: 20**

**Laboratory hours: -**

**Seminars hours: 4**

**Other activities hours: 4 (tutorials and practical examples of interpretation of spectral data)**

**EVALUATION CRITERIA**

1. **Methods for acquiring eligibility**
* Written exam
* Oral exam

X Project discussion

* Other
1. **Evaluation pattern**

For the eligibility, a percentage of the attendance at the course of at least 75 % is requested.