

Advanced course in Mass Spectrometry

SYLLABUS

1 Lecturer information Name and Surname: prof. dr hab. Piotr Stefanowicz

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The lecturer will come in the context of the Erasmus+ programme and the MOU between the Facuoty of Chemistry of the University of Wroclaw and the Department of Chemistry, School of SMFN of the University of Florence with no additional costs for the PhD School.

2 Title of the course

Advanced course in Mass Spectrometry

3 Course program

Mass spectrometry is a relevant tool for chemists. The most updated techniques will be described as well as several examples will be presented to apply knowledge and solving exercises to reinforce understanding of mass spectrometry principles.

4 Course content detailed per lesson of two hours

Monday 24.03.2025 - Lesson 1, 2 – 5 pm

Aula 18, Blocco Aule, via Bernardini 6, 50019 Sesto Fiorentino

- a) Why does a chemist need mass spectrometry?
- b) Mass spectrum basic concepts
- c) Mass spectrometer flow chart

Join online: https://meet.google.com/wyg-yzix-opz

Wednesday 26.03.2025 - Lesson 2, 2 - 6 pm

Aula 18, Blocco Aule, via Bernardini 6, 50019 Sesto Fiorentino

d) How are ions obtained? - Ion sources and ionisation techniques (EI, CI, APCI, ESI, MALDI)

e) Measuring m/z values, mass analysers

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f) Tandem and Hybrid Mass Spectrometers

g) Ion fragmentation -Types of ions formed during ionisation -How to predict ion decay -Typical fragmentation mechanisms

Join online: https://meet.google.com/wca-srnd-wyp

Thursday 27.03.2025 - Lesson 3, 2 – 5 pm

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h) Interpretation of Mass Spectra. - Determining the molecular weight of the compound under investigation -High-resolution spectra, determination of the compound formula –Using fragmentation spectra for structure determination

i) Examples and exercises

Join online: https://meet.google.com/rch-figw-bdm

Friday 28.03.2025 - Lesson 4 and final exam, 14 – 16 am

Aula 01 Tendostruttura, 50019 Sesto Fiorentino

l) Examples and exercises. Final exam.

Join online: https://meet.google.com/iuv-hwqx-xhz

5 Suggested reading

Slides with references will be provided before the starting date of the course.

6 Learning Objectives

Understand the Role of Mass Spectrometry – Explain why mass spectrometry is essential in chemical analysis. Learn Basic Concepts of Mass Spectra – Define key terms like m/z ratio, isotopic patterns, and peak interpretation. Describe the Mass Spectrometer Workflow – Understand the components and functioning of a mass spectrometer. Explore Ionization Techniques – Compare different ionization methods (EI, CI, APCI, ESI, MALDI) and their applications. Analyze Mass Measurement Techniques – Learn how different mass analyzers determine m/z values. Understand Tandem and Hybrid MS – Explain their advantages in complex analyses. Study Ion Fragmentation Patterns – Identify types of ions, predict ion decay, and understand fragmentation mechanisms. Interpret Mass Spectra – Determine molecular weight, molecular formula, and structural information from spectra. Apply Knowledge to Practical Examples – Solve exercises to reinforce understanding of mass spectrometry principles.

7 Knowledge and Skills to be acquired

Mass Spectrometry for chemical analysis. Basic Concepts of Mass Spectra. Mass Spectrometer Workflow. Ionization Techniques. Analysis of Mass Measurement Techniques. Ion Fragmentation Patterns. Interpretation of Mass Spectra, Knowledge to Practical Examples.

8 Prerequisites

MSc in Chemical Sciences



9 Teaching Methods

X MODE 2 - Lessons delivered in-person and in remote with simultaneous recording by the GMEET platform

The lessons will be recorded and available to all the students that cannot take part to the lessons in streaming. The GMEET platform will be used. All course content will be uploaded to the Moodle platform on the Chemical Sciences PhD page "Courses and Seminars of the PhD in Chemical Sciences 2024-2025"

10 Further information

No additional information

11 Type of Assessment

The final evaluations will have to be validated maximum 1 month after the end of the course

12 Period 24-28 March 2025