CH-728

# Mass spectrometry, principles and applications

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| Cursus | Sem. | Type |
|---|---|---|
| Chemistry and Chemical Engineering | | Opt. |

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|---|---|
| Language of teaching | English |
| Credits | 3 |
| Session | |
| Exam | Oral |
| Workload | 90h |
| **Hours** | **52** |
| Courses | 20 |
| Exercises | 8 |
| TP | 24 |
| **Number of positions** | **10** |

## Frequency

Every year

## Remark

Next time Fall 2021

## Summary

The goal is to provide students with a complete overview of the principles and key applications of modern mass spectrometry and meet the current practical demand of EPFL researchers to improve structural analsis of molecules. Numerous instrumental aspects of mass spectrometry are described.

## Content

The course program includes:

**Week 1**

1. **Lectures**

1.1 General introduction to MS: Definitions/Instrumentation
1.2 MS/MS:fragmentation methods and mechanisms; Ion Mobility MS
1.3 LC-MS and other hyphenated techniques
1.4 ICP-MS
1.5 Summary of all concepts and fundamental MS aspects seen during the week.

2. **Exercises:**

Ms.cheminfo org tools for advanced MS

3. **Pratical work:**

3.1 Fragmentation of small molecules (sugars, small peptides) using QTOF and FT-Orbitrap- MS, fragmentation by EI; interpretation of mass spectra using different tools and softwares.
3.2 Individual work for each doctorant topics.

**Week 2**

1. **Lectures**

1.1 High Resolution Mass spectrometry
1.2 Photo-dissociation spectroscopy mass spectrometry
1.3 Peptidomics/Proteomics: top-down and bottom-up approaches
1.4 MALDI-TOF: principles and applications
1.5 Ion Mobility MS

2. **Exercises**

Exercices on all topics covered by the MS course

3. **Final exam**
15'presentation of each PhD student of its individual Practical Work

The course includes practical work in mass spectrometry that will be given in the Mass Spectrometry Service Facility of ISIC (SSMI, SB, EPFL).

## Keywords

mass spectrometry, tandem mass spectrometry, High-resolution mass spectrometry (HRMS), liquid chromatography, Gas chromatography, quantification, proteomics, lipidomics, metabolomics, proteomics

## Assessment methods

Oral