

## Organic Separation Techniques and Mass Spectrometry (C004131)

**Course size** *(nominal values; actual values may depend on programme)*

**Credits 4.0** **Study time 120 h**

**Course offerings and teaching methods in academic year 2024-2025**

A (semester 2)	English	Gent	practical lecture
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**Lecturers in academic year 2024-2025**

Lynen, Frederic	WE07	lecturer-in-charge
Desmet, Gert	VUB	co-lecturer

**Offered in the following programmes in 2024-2025**

	crdts	offering
Master of Science in Teaching in Science and Technology(main subject Chemistry)	4	A
Master of Science in Chemistry(main subject (Bio)Organic and Polymer Chemistry)	4	A
Master of Science in Chemistry(main subject Analytical and Environmental Chemistry)	4	A
Exchange Programme in Chemistry (master's level)	4	A

**Teaching languages**

English

**Keywords**

Chromatography, multidimensional separations, sample preparation strategies, advanced ionisation sources for organic analysis, method development.

**Position of the course**

The goal of this course is to introduce the advanced chromatographic and mass-spectrometric student to the recent developments in these research fields, while simultaneously allowing the student to become practically and theoretically independent in terms of chromatographic method development.

This course starts from the content of the bachelor course 'Analytical separation methods' or from equivalent courses describing (in depth) the fundamental and practical aspects of chromatography.

This **demanding course** comprises a theoretical (50%) and a major practical (50%) component. The former exposes the student to the latest developments in the fields of gas, liquid and supercritical fluid chromatography. During the practical section the student will be challenged to solve (after initial training) autonomously qualitative and quantitative problems on chromatographic instrumentation of their own choice (GC-FID, GC-MS, HPLC-UV, LC-MS).

Note that the **absence of prior active mastering of the chromatographic basics** (chromatographic theory, modes, column types and phases, method development, injectors, detectors, derivatisation) **can lead to severe time-constraints in the successful completion** of especially this practical section.

**Contents**

- Fundamentals of State-of-the-Art Gas Chromatography
- Fundamentals of State-of-the-Art Liquid Chromatography
- High-Throughput and High-Resolution 1-D Separation approaches
- Kinetic plots in Liquid Chromatography
- High Throughput and High Resolution 2-D Separation approaches
- Sample preparation techniques for gaseous, liquid and solid Samples
- Chromatographic method development
- Selection of a Chromatographic Technique for a Given Application
- Hyphenating separation techniques with mass spectrometry

- Principles of matrix assisted laser desorption/ionisation (MALDI)

#### **Initial competences**

- Fundamentele aspecten van chromatografie en massaspectrometrie in overeenstemming met het bachelorprogramma.
- Het vak Methods for Molecular Structure Analysis reeds gevolgd hebben of reeds in aanraking gekomen zijn met de eindcompetenties van dit vak.

#### **Final competences**

- 1 The student is able to select adequate sample preparation, separation and detection techniques to address qualitative and quantitative issues in organic analysis.
- 2 The student is able to implement in a theoretical and practical way adequate sample preparation, separation and detection techniques to address qualitative and quantitative issues in organic analysis.
- 3 The student is able to select the most suitable separation and detection technique to allow qualitative and quantitative analysis of beforehand unknown samples.
- 4 The student is able to perform without supervision qualitative and quantitative HPLC and GC-MS analyses and to interpret the data.
- 5 The student is able to propose solutions for sampling, separation and detection issues both in theory and in practice.

#### **Conditions for credit contract**

Access to this course unit via a credit contract is determined after successful competences assessment

#### **Conditions for exam contract**

This course unit cannot be taken via an exam contract

#### **Teaching methods**

Lecture, Practical

#### **Extra information on the teaching methods**

Classes on the most recent developments via powerpoint presentations Practical exercises on chromatographic instrumentation.

#### **Study material**

Type: Slides

Name: slides

Indicative price: Free or paid by faculty

Optional: no

Language : English

Number of Slides : 481

Oldest Usable Edition : 2024

Available on Ufora : Yes

Online Available : Yes

Available in the Library : No

Available through Student Association : No

#### **References**

Analytical Chemistry

LC.GC Europe

Journal of Chromatography A

#### **Course content-related study coaching**

Individual monitoring by tutor and assistents on request. Questions during practicals and demonstrations.

#### **Assessment moments**

end-of-term and continuous assessment

#### **Examination methods in case of periodic assessment during the first examination period**

Written assessment with open-ended questions

#### **Examination methods in case of periodic assessment during the second examination period**

Written assessment with open-ended questions

#### **Examination methods in case of permanent assessment**

Skills test, Participation, Assignment

**Possibilities of retake in case of permanent assessment**

examination during the second examination period is possible in modified form

**Extra information on the examination methods**

Periodic evaluation: 10 of the 20 marks

Written examination including exercises and theory.

Permanent evaluation: 10 of the 20 marks.

Various types of chromatographic and mass spectrometric instrumentation will set permanently at the disposal of the students for a period of 6 weeks. After initial training on the instrumentation the student will be expected to identify and quantify all molecules in an individualized unknown sample which will be provided. The involved learning process in terms of method development will allow the student to gather more insight in to separation techniques and mass spectrometry.

**Calculation of the examination mark**

50% of the final mark will be obtained through the permanent evaluation and 50% will be obtained through the periodic evaluation.

**Facilities for Working Students**

Arrangements for working students are to some extend possible.