

Course description

Hands-on Liquid Chromatography–Mass spectrometry course in the analysis of small molecules (phytochemicals, contaminants, primary metabolites) – PhD Summer School

ECTS credits: 8

Course parameters

Language: English

Level of course: PhD course

Semester/quarter: Monday 16 June – Friday 27 June 2025

Preparatory reading of textbook: Approx. 40 hours.

Hours per week during two weeks on-site work: approx 45/per week. Monday 16 June – Friday 27 June: Long and intensive days, - part of the exercises will take place in the evening to assure that all participants have plenty of hands-on time.

Report writing: Approx. 100 hours

Total hours workload: 230

Capacity limits: 10

Objectives of the course:

Advanced tools such as liquid or gas chromatography coupled to mass spectrometry are necessary tool in the research into small molecules, either phytochemicals with defense or health properties, environmental contaminants such as pesticides or primary metabolites that can be affected by the presence of other bioactive compounds. The objective of the course is to teach the participant the theoretical background as well as the practical use of these tools for quantitative analysis as well as for identification. The course will take place in a well-equipped laboratory at Aarhus University, Research Centre Flakkebjerg, DK-4200 Slagelse, Denmark. LC-MSMS, LCMS-QTRAP, LC-TOF, GC-TOF instruments will be available for the students during the course and our experienced staff will provide instruction on the use of the equipment as well as practical techniques for the preparation of samples.

Learning outcomes and competences:

At the end of the course the student **is able to:**

- Use LCMSMS equipment for quantitative and qualitative analysis of small molecules
- Give an account for the principles behind development of chromatographic methods for separation of small molecules

- Perform a basic method validation for quantitative analysis in LCMSMS
- Optimize the parameters for analysis of selected compounds
- Use LCMS-QTRAP in the identification of small molecules or their metabolization products

Compulsory programme:

Entire course.

Course contents:

The course is constructed as follows:

- ◆ Preparatory reading of selected chapters in an LC-MSMS textbook
- ◆ Approximately three days of practical exercises on basic LC-MSMS, quantitation methods, optimization of parameters for selected small molecules, preparation of samples, matrix effects, validation of the quantitative method
- ◆ Approximately three days of practical exercises chosen on the basis of each student's on-going PhD project
- ◆ Theoretical lessons on
 - ◆ Optimization of extraction methods
 - ◆ Method validation: LOD, LOQ, recovery, matrix interferences
 - ◆ ESI and APCI inlet systems
 - ◆ Use of an ion trap for analysis of small molecules
 - ◆ HPLC method development and optimization
 - ◆ Interpretation of mass spectra
 - ◆ Metabolomics
 - ◆ Representative sampling: plants, soil and water
 - ◆ Good Laboratory Practice
 - ◆ New developments in mass spectrometry
- ◆ Subsequent elaboration of a 30- to 40-page report on the practical exercises.

Prerequisites:

The course is for PhD students (in special individual cases master students with already planned PhD projects can be given access)

Lecturers from Aarhus University

Assistant professor TT Benjamin Fuchs (course coordinator)

<https://pure.au.dk/portal/en/persons/benjamin-fuchs>

Laboratory Technician Bente Laursen; assistant professor TT Jawameer Hama; postdoc Purna Kumar Khatri

Visiting lecturers

Mass spectrometry specialist, Sciex; Chromatography specialist, Phenomenex,

Type of course/teaching methods: Lectures, practical exercises

Literature: Study material will be shipped to the participating students not later than May 15.

Course homepage: None

Course assessment:

Elaboration of a 30- to 40-page report on the practical exercises. The report is assessed as "passed" or "not passed". Presence at a minimum of 90% of theoretical and practical lessons is required to obtain the course diploma.

Provider: Department of Agroecology, Aarhus University

Special comments on this course:

none

Course venue

The course venue is Research Centre Flakkebjerg, situated in Southwest Zealand, 10 km south of Slagelse (100 km west of Copenhagen). Complete address:
Department of Agroecology, Research Centre Flakkebjerg, Forsøgsvej 1,
DK-4200 Slagelse, Denmark

Accommodation

Accommodation will be at Hotel Lillevang, Jyllandsvej 32, DK-4200 Slagelse.

Cost

The price for the course covers course fee, lecture material, hotel room 12 nights, lunch, dinner, transport from hotel to research station and VAT: Total per person 22500 DKK / 3020 EUR

The price without hotel is 11750 DKK / 1580 EUR.

Comments from participants in our 2024 course

- I appreciate that we did a lot of practical exercises on the instrument
- Teachers are enthusiastic, supportive, nice and friendly

- I am really satisfied with the course; the theoretical and the hands-on sessions were well organized and correlated
- The course was amazing
- The permanent advice from professionals in the instrument is highly appreciated

Time: Monday 16 June – Friday 27 June 2025

Place: Aarhus University, Department of Agroecology, Forsøgsvej 1, DK-4200 Slagelse, Denmark

Registration

Deadline for registration and payment: 1 May 2025. Maximum number of participants: 10. First come, first served. Please register at <https://events.au.dk/hands-on-2025/signup>

Cancellation

Registration is binding, but you may cancel your registration by sending an e-mail to Course Administrator anhe@agro.au.dk no later than 1 May 2025. If you cancel your registration later than 1 May, your registration fee will be forfeit, and your seat may be transferred to another person.

If you have any questions, please contact Course Administrator anhe@agro.au.dk or Course Coordinator BF@agro.au.dk