Module	**Analytical Technologies**
Code	V3_4
Degree Programme	Master of Science in Life Sciences (MSLS)
ECTS Credits	4 ECTS
Workload	Total 120 h: Contact 60 h; Self-study 60 h
Module Coordinator	**Name** Prof. Dr. Jürgen Stohner **Phone** +41 (0)58 934 54 93 **Email** sthj@zhaw.ch **Address** ZHAW Zürcher Hochschule für Angewandte Wissenschaften Life Sciences and Facility Management Campus Reidbach; RT 309.3 Postfach CH-8820 Wädenswil The coordinator is also a lecturer
Lecturers	• Dr. Ivana Kroslakova • Dr. Susanne Kern • Dr. Sebastian Opitz • Dr. Samo Smrke • Roland Josuran • Dr. Caspar Demuth • Dr. Juan Limon Petersen • Guest lecturers & external experts
Entry Requirements	• Understanding of analytical chemistry from Bachelor of Science in Life Sciences/ Chemistry • Basics in mathematics and statistics • Basics in analytical biology
Learning Outcomes and Competences	After completing the module students • will understand the basic components of mass spectrometry, liquid chromatography, data analysis & chemometrics, analytical chemistry related to forensics, environmental topics and biosensors with selected applications in the life sciences. • are capable of reading, analysing and critically discussing publications written in • English dealing with applications in the above-mentioned fields. It provides advanced knowledge in: • Key analytical technologies for volatile and non-volatile bio-analytics, more specifically in (high resolution) mass-spectrometry, on-line volatile analysis (PTR-MS), bio-analytics (MALDI-ToF-MS) and various MS-coupled liquid chromatography and gas chromatography technologies, in conjunction with applications. • data analysis of complex and large datasets • molecular and technological principles of selected biosensors, as well as their

	potential and limitations. Furthermore, the course will provide an overview of array technologies for bioanalytics drug-screening and diagnostics. • Techniques for collecting good data • Techniques for extracting information from multivariant data
Module Content	The module introduces and deepens the theoretical and practical understanding and competencies in key area of **mass spectrometry-based analytical technologies (1)**. This includes a range of state-of-the-art technologies like PTR-ToF-MS, MALDI-ToF-MS, GC-MS, LC(MS) and biosensors. High resolution mass pectrometry (HRMS) as a versatile tool for structure elucidation and non-target screening will be presented. Furthermore, chemometric techniques for analysis of large and complex datasets will be introduced and applications will be discussed. Finally, advanced techniques and practices in process analysis and quality assurance will be discussed. More specifically this includes the following subjects: Critical discussion of the basic elements of mass spectrometry, including: (i) ionization sources & ionization schemes; (ii) mass analysers (quadrupole MS, TOF, Orbitrap); (iii) detectors and understanding of a series of selected MS based methods important for the life sciences, such as: • MALDI time-of-flight mass spectrometry and applications to proteins and Peptides • Chemical ionisation mass spectrometry and its applications to food technologies and flavour sciences • Structure elucidation and non-target screening of micropollutants, both with GCHRMS and LC-HRMS **Liquid chromatography (2)** technologies coupled to mass spectrometry: technologies and applications will be highlighted. **Biosensors (3)** make use of a biological or biomimetic recognition element coupled with detectors based on various functional principles. Applications of biosensors in offline or inline measurements range from biomedical to environmental uses. In this module, selected biosensors using electrochemical transduction schemes will be discussed. A specific focus will be laid on advanced measurement techniques which are commonly applied for a wide range of analytes in biosciences. **Chemometrics (4)** is a chemical discipline that uses mathematical and statistical methods (a) to design or select optimal experimental procedures; (b) to provide maximum relevant chemical information by analysing chemical data; and (c) to obtain knowledge about chemical systems. Fundamentals on univariate leastsquares regression, multivariate least squares regression (classical and principal component) with worked examples. Analytical chemistry is also an integral part of **forensic sciences (5)**. The students gain knowledge about current analytical technologies in this special field of interest by studying examples from selected topics.

Teaching / Learning Methods	• lectures • short seminars • presentations • case studies • exercises Pre-readings will be sent by email for preparation prior to lecture.
Assessment of Learning Outcome	Each course will be assessed by a final written examination. Details will be communicated during the module and in the respective courses. The final grade is the un-weighted average of the grades of the five individual course marks.
Bibliography	Review papers and selected application papers in English (will be distributed during the individual courses). The pre-reading and pre-study of these papers is compulsory, and the lectures will build and be based on these reading materials.
Language	German or English depending on the audience.
Comments	-
Last Update	06.03.2026