

Module Overview MSc in Life Sciences FHNW

type	modules groupe by type	semester	Specialisation Modules							contents	venue		
			Organic & Supramolecular Chemistry	Analytical Chemistry	Bioanalytics	Applied Cell Biology	Pharmatechnology	Biotechnology	Chemical Engineering			Environmental Technologies	Biomedical Engineering
Specialisation Modules (Monday - Wednesday)	<b>Organic and Supramolecular Chemistry</b>												
	Advanced Organic Chemistry	AS	●							structure and electronic effects, pericyclic reactions, multicomponent reactions, industrial applications and case studies	Muttenz		
	Modern Technologies in Organic Synthesis	SS	●	●						photochemistry, electrochemistry, synthesis in flow systems, organocatalysis and biocatalysis	Muttenz		
	Supramolecular Chemistry and Nanochemistry	SS	●	●						supramolecular interactions, reversible covalent bonds, supramolecular catalysis, supramolecular medicinal chemistry	Muttenz		
	Bio-interfaces and Bio-conjugate Chemistry	AS	●	●	●	●				surface chemistry, surface structuring, organ on a chip, bioconjugation, biocompatibility, surface-tissue interactions	Muttenz		
	<b>Analytical Chemistry</b>												
	Advanced Mass Spectrometry	SS		●	●					technological aspects of mass spectrometry, metabolomics, proteomics, trends and applications in mass spectrometry, student presentation	Muttenz		
	Advanced NMR Spectroscopy	AS		●	●					one- and two dimensional NMR spectroscopy, polarization transfer experiments, product operator formalism, gradients, fast data acquisition	Muttenz		
	Biostructures and Solid State Sciences	AS	●	●	●	●				crystallography, powder X-ray, protein structure determination, cryo electron microscopy, solid state characterization	Muttenz		
	Molecular & Translational Imaging	SS		●	●	●				current key imaging modalities, positron emission tomography, magnetic resonance imaging, spectroscopic imaging methods	Muttenz		
	<b>Bioanalytics</b>												
	Proteomics and Protein Analytics	SS	●	●	●	●	●	●		protein identification by mass spectrometry, quantification, posttranslational modifications, light-scattering, infrared spectroscopy, calorimetry	Muttenz		
	Genomics	AS		●	●	●	●	●		next generation sequencing technologies, genomics in a clinical context, liquid biopsy, practical exercise, student workshop: genome engineering	Muttenz		
	Chromatography and Mass-Spectrometry	AS		●	●	●	●	●		fundamentals on chromatographic separations and mass spectrometry, applications of bioanalytical mass spectrometry, case studies	Muttenz		
	Biomarker	SS	●	●	●	●	●	●		type of biomarkers, design of study to identify biomarkers, traditional and novel types of biomarkers, student group work on biomarker identification	Muttenz		
	<b>Applied Cell Biology</b>												
	Bioassays: engineered Cells, Tissues and Organisms	SS			●	●				In vitro methods, cell-based assays, genome engineering and basic concepts of high throughput screening; mammalian and non-mammalian systems	Muttenz		
	Cellular imaging	AS		●	●	●	●	●		physics of imaging, molecular imaging, confocal imaging, super-resolution imaging, live imaging, alternatives to light microscopy, applications	Muttenz		
	Advanced Cell Culture Systems	AS		●	●	●	●	●		Microphysiological systems, Organ on a Chip; technical requirements and limitations; impact of design, materials and microfluidics; specific applications	Muttenz		
	Laboratory Automation in the Pharmaceutical Industry	SS		●	●	●	●	●		robotics, liquid handling, sensors, automated pharmacological characterization of drug candidates, automated cell culture and production	Muttenz		
	<b>Pharmatechnology</b>												
	Continuous Pharmaceutical Production	AS					●	●		continuous production of solid forms and of extrudates, incl. laboratory course at an industrial site	Muttenz		
	Pharmaceutical Production Facilities	AS					●	●		design of production plants; containment systems; heating, ventilation, air-conditioning (HVAC); water, vapour and gas distribution	Muttenz		
	Formulation of Biologics and Routes of Drug Delivery	SS	●	●	●	●	●	●		formulation and delivery of biologics (liquid and solid forms), drug delivery, drug targeting	Muttenz		
	Drug Formulation and Delivery for Solid Dosage Forms	SS					●	●		controlled release technologies, per-oral drug delivery, formulation of poorly-water soluble drugs, biopharmaceutical modeling	Muttenz		
	<b>Biotechnology</b>												
	Gene- and Cell-Therapeutics	AS			●	●	●	●		ex-vivo gene manipulation, viral vectors, stem cells as therapeutics, toxicology, pharmacokinetics and manufacturing of gene- and cell therapies	Muttenz		
	Continuous Biomanufacturing	AS	●	●	●	●	●	●		equipment and concepts for continuous upstream and downstream units, product quality considerations, economics and regulatory aspects, case studies	Muttenz		
	Process Analytical Technology	SS		●	●	●	●	●		process analytical technology in research, development and manufacturing, at-line and online analytics, multivariate data analysis and design	Muttenz		
	Process Automation	SS			●	●	●	●		control strategies, implementation of chemometric models, case studies	Muttenz		
	<b>Chemical Engineering</b>												
	Reaction Technology	SS	●	●	●	●	●	●		reactor technology, reaction kinetics, simulation of reactions, operational modes, regulatory aspects	Muttenz		
	Process Development and Technology	SS	●	●	●	●	●	●		separation principles, mass and energy balances, process design and layout studies	Muttenz		
	Sustainable Process Development	AS	●	●	●	●	●	●		process simulation (case studies), cost estimations, mass and energy balances, life cycle assessment of processes	Muttenz		
	Process Transfer and Scale-up	AS			●	●	●	●		key performance indicators, mass and energy balances, design of experiment for scale-up, case study with experimental part	Muttenz		
	<b>Environmental Technologies</b>												
	Environmental Risk Assessment	SS		●				●		environmental sampling, fate of pollutants, exercise on fate, effects and risk assessment, mixtures, risk communication	Muttenz		
	Costs and Benefits of Sustainable Production	SS					●	●		decision making frameworks, cleaner production, circular economy, industrial symbiosis, resource recovery case study	Muttenz		
	Process Technology for Industrial Pollution Control	AS					●	●		air: emission reduction, off-gas treatment, water: emission control, industrial water treatment, resource efficiency	Muttenz		
	Remediation	AS					●	●		management of contaminated sites, biogeochemical basics of remediation, physical, chemical remediation technologies, bioremediation, case studies	Muttenz		
	Water and Wastewater Treatment	SS					●	●		basic principles, coagulation, flocculation, sand filtration, wastewater process engineering, activated carbon, micropollutants, lab experiments	Muttenz		
	Valorization of Biomass Waste and Side Streams	AS					●	●		material flow and recovery, separation and conversion technologies, recovery examples, case study on resource recovery	Muttenz		
	Solid Waste Management	SS					●	●		environmental laws, regulatory drivers, process technology, case study from industry	Muttenz		
	<b>Biomedical Engineering</b>												
	Implant Design and Manufacturing	SS						●		active and passive medical implants, "hands on" design of patient-specific implants, medical additive manufacturing, test methods for mechanical testing	Muttenz		
	Sensors and Signal Processing	AS						●		sensors for implants; noise reduction, filtering and error corrections	Muttenz		
	Model-Based Signal Processing and Medical Diagnostics	AS						●		bioelectrical signals, physical diagnostic measurements, model-based signal analysis, pattern detection, signal classification	Muttenz		
Medical Device Development	SS						●		development process, regulatory aspects, risk management procedures	Muttenz			
Surgical Robotics	SS						●		robot kinematics, robot dynamics, safety; practical exercise	Muttenz			
Cluster-Specific Modules (Thursdays, half a semester or block weeks after the semester)	<b>Cluster Chemistry</b>												
	Materials Science	AS-1	●	●		●	●		solid state bulk materials, crystallographic and electronic structure, structural, optical, mechanical and magnetic properties, metallic and ceramic materials	Olten/online			
	Surface Characterisation	AS-2	●	●				●	advanced microscopy, infrared and Raman spectroscopy, EDX, WDX, XPS; Interactions with surfaces: SPR, QCM, OWLS, contact angle, ellipsometry	Olten/online			
	Polymers and Applications	AS-B3	●	●				●	polymer synthesis, polymer characterization, biopolymer, polymer processing	Fribourg			
	Green Chemistry	SS-1	●	●				●	green chemistry metrics, industrial green chemistry, green solvents	Olten/online			
	Chemistry and Energy	SS-2	●	●				●	chemical energy storage, biogas, bioenergy, photocatalysis, photovoltaics, energy and mobility	Olten/online			
	Industrial Chemical Process Safety	SS-B2	●	●				●	process safety and production unit design, thermal safety, green process design of hazardous reactions, environmental, health and safety	Fribourg			
	<b>Cluster Bio/Pharma</b>												
	Compound Profiling in Pharmaceutical Drug Discovery	AS-1	●	●	●	●	●	●		target identification, clinical candidate selection, ADME, toxicology assessment, validity of test models, extrapolation from animal and in vitro data	Olten/online		
	Physicochemical Principles in Pharmaceutics	AS-2	●	●	●	●	●	●		interfacial phenomena, surfactants, pharmaceutical nanotechnology, colloids, rheology, pharmaceutical polymers, micromeritics, compacted powder	Olten/online		
	Design of Biopharmaceutical Production Facilities	AS-B1	●	●				●		facility concept, modularization of production facilities, zone concept, regulatory aspects, supply chain, automation	Wädenswil		
	Bioanalytics in a regulated Environment	AS-B3	●	●	●	●	●	●		concept of specification, development phases of a test methods, monographs for biopharmaceuticals, GMP requirements, analytical SOP	Muttenz		
	Physiology and Immunotherapies	SS-1	●	●	●	●	●	●		3D-construction of human tissues, co-cultures of blood immune cells and infectious microorganisms, immune-based therapies	Bern/online		
	Tissue Engineering for Drug Discovery	SS-2	●	●	●	●	●	●		tissue engineering techniques, bioprinting, skin, cosmetic testing, engineerid liver and kidney, cancer models	Olten/Bern/online		
	Regulatory Affairs	SS-B1	●	●	●	●	●	●		quality management in production and development, license application process	Sion		
	<b>Cluster Environment</b>												
	Journal Club Environmental and Natural Resource Sciences	AS-1								scientific publishing, reading and presenting selected publications, discussion and wrap-up of groups of related publications	Bern/online		
	Life Cycle Assessment	AS-2						●		seminal examples of LCA, use and misuse of LCA, environmental management methods, steps of an LCA procedure	Bern/online		
	Sustainable Natural Resource Management	AS-B1						●		Rio+20, conflicts in natural resources management, challenges	Zollikofen		
	Ecological Infrastructure in Landscapes	AS-B3								landscape and movement ecology, GIS tools, ecological infrastructure, ecological connectivity, land-use planning	Genf		
	Biodiversity	SS-1								global change, species loss, functioning of the ecosystem, ecosystem services, international conventions, biodiversity maintenance	Bern/online		
	Water Management in Households, Industry and Agriculture	SS-2						●		water resources, water supply and distribution, water use, water cycle management	Olten/online		
	<b>Cluster Food</b>												
	Journal Club Food and Nutrition Sciences	AS-1								scientific publishing, reading and presenting selected publications, discussion and wrap-up of groups of related publications	Bern/online		
	Progresses in Food Processing	AS-B1/2								food processing techniques, practical on shelf life extension and micro-encapsulation	Sion		
	Nutrition and Nutrition Related Chronic Diseases	AS-B3								healthy and unhealthy diets, epidemiology, diet as risk factor for diseases, public health approaches	Olten		
	Foodomics	SS-1		●						digestive tract and ingestion, techniques for nutrigenome, microbiome and metabolome analysis, data mining	Bern/online		
	Sustainable Food Supply Chains	SS-2								process analysis, sustainable agriculture, social aspects, sourcing, energy management, sustainable diet, customer information	Olten/online		
	Advanced Sensory Techniques	SS-B1								innovative sensory evaluation methods, analysis of sensory data, cognitive and psychophysical aspects of perception	Changins		
	<b>Group BECS (Wednesday!)</b>												
	Modelling of Complex Systems	AS-1						●		system theory, system dynamics, modeling software Vensim, numerical integration methods, Monte-Carlo simulation	Olten/online		
Machine Learning and Pattern Recognition	AS-2						●		Bayesian inference, graphical models, classification, ensemble methods	Olten/online			
Optimisation Methods	SS-1						●		identification of problems solvable with optimization methods; linear, non-linear, deterministic and stochastic optimization methods; Mathematical optimization	Olten/online			
Medical Imaging and Image Processing	SS-2						●		quantitative image processing, segmentation, registration, classification; practical work with Matlab and other tools	Olten/online			
Core Competences (Fridays, Tuesdays)	<b>Data</b>												
	Handling and Visualizing Data	AS-1A	●	●	●	●	●	●	introduction to R, organising data, databases, describing data: scatter, skewness, outliers, visualising data, informative plots	online/Muttenz			
	Data and Ethics	AS-1B	●	●	●	●	●	●	personal data security, information security, encryption, digital signatures, data stewardship, data ethics, privacy	online/Muttenz			
	Design and Analysis of Experiments	AS-2A	●	●	●	●	●	●	statistical interference, experimental design, feasibility, efficiency and power of experiment designs, statistical analysis, interpretation and reporting	online/Muttenz			
	Modelling and Exploration of Multivariate Data	AS-2B	●	●	●	●	●	●	modeling: linear, nonparametric and multiple regression, model selection and diagnosis; exploration: visual inspection, principal component analysis	online/Muttenz			
	<b>Business, Management and Society</b>												
	Business Administration for Life Sciences	SS-1A	●	●	●	●	●	●	Business models, marketing, production, sourcing, capital budgeting, financial accounting, cost accounting	online/Muttenz			
	Management and Leadership for Life Sciences	SS-1B	●	●	●	●	●	●	Management, corporate ethics, strategic management, HR-management, leadership, change management	online/Muttenz			
	Innovation and Project Management	SS-2A	●	●	●	●	●	●	Entrepreneurship, megatrends, innovation management, presentation techniques, project management	online/Muttenz			
	Politics and Society	SS-2B	●	●	●	●	●	●	politics: a process of negotiation, struggle and compromise; the role of the society; public opinion, responsibility, ethics	online/Muttenz			
English for Master Students (no ECTS gained)	AS							optional English module; the passed exam allows to meet the English competence requirement	Muttenz				

- AS: autumn semester
  - SS: spring semester
  - 1 or -2: first or second half of semester
  - Bx: block week at the end of the semester
  - red circles: module group of the specialisation (most modules have to be taken)
  - orange and green circles: elective module groups (only a few modules have to be taken)
  - grey circles denote the module group Core Competences (5 out of 7 modules have to be taken)
- Muttenz, 01.04.2022
- Other elective modules can be chosen freely, in total 17 modules à 3 ECTS are required.