Module	**Small Active Molecules**
Code	MSLS_V3_1
Degree Programme	Master of Science in Life Sciences (MSLS)
ECTS Credits	4
Workload	Total 120 h: Contact 60 h; Self-study 60 h
Module Coordinator	**Name** Prof. Dr. Rainer Riedl **Phone** +41 (0)58 934 56 18 **Email** rainer.riedl@zhaw.ch **Address** ZHAW Zürcher Hochschule für Angewandte Wissenschaften Life Sciences and Facility Management Campus Reidbach Postfach CH-8820 Wädenswil x The coordinator is also a lecturer
Lecturers	• Dr. Stefan Höck • Guest speakers
Entry Requirements	B.Sc. level of Chemistry, in particular of Organic Chemistry (basic reaction mechanisms, knowledge of functional groups in Organic Chemistry)
Learning Outcomes and Competences	After completing the module students will be able to • evaluate new synthesis technologies such as solid phase synthesis, microreactors, microwave chemistry and combinatorial chemistry • understand small active molecules in biological context • understand the basics of medicinal chemistry and drug discovery • recognize catalysis as a tool in chemistry and biological chemistry • employ the most important 1D- and 2D NMR experiments and NMR pulse sequences used in structure analysis • understand the principles and applications of the Nuclear Overhauser Effect • evaluate the principles of the analysis and separation of chiral molecules • recognize X-ray crystallography as a tool for structure elucidation • understand the principles of cheminformatics, computational chemistry and molecular modelling for the design and discovery of small active molecules
Module Content	This module is concerned with the design, preparation, analysis, and the application of small molecules. This includes new synthetic methods such as microwave assisted synthesis and combinatorial synthesis as well as structural analysis by NMR. The applications cover medicinal chemistry and bio-inspired organic synthesis, whereas computational chemistry concepts cover the design of novel small active molecules.

	The learning outcomes of the different disciplines and topics are interconnected. The design of novel small active molecules in covered by computational chemistry concepts such as: • Molecular modelling • Cheminformatics The synthesis of small molecules is covered by new synthetic methodologies such as: • Solid phase and combinatorial chemistry • Microreactors and Microwave chemistry • Organocatalysts As a modern application of small molecules in the life science industry, medicinal chemistry gets taught including: • Introduction to drugs and their action • SAR approaches to drug design, docking experiments • Basics of pharmacokinetics and drug metabolism • Drug development and production Besides the synthetic topics of this module, the analytical sciences of small organic molecules are covered by: • Analytical determination of structures: 2D NMR methods, NOE experiments and their physical background • Methods to determine the relative and absolute configurations of molecules • Separation and analysis of enantiomers
Teaching / Learning Methods	• Lectures ~50% • Self-study ~30% • Guided exercises ~10% • Practical study in groups of two persons ~10%
Assessment of Learning Outcome	• Written / oral examinations • The performance in these examinations will count 25% each towards the module grade.
Bibliography	• Klebe G., Wirkstoffdesign, Spektrum Akademischer Verlag, 2009. • Bannwarth W., Hinzen B., Combinatorial Chemistry, Wiley-VCH, 2006. • Kappe O., Stadler A., Microwaves in Organic and Medicinal Chemistry, Wiley-VCH, 2005. • Ehrfeld W., Hessel V., Löwe H., Microreactors, Wiley-VCH, 2000. • Leach R., Gillet V. J., An Introduction to Chemoinformatics, Springer, 2007. • Leach R., Molecular Modelling: Principles and Applications, 2nd Edition, Pearson Education Limited, 2001. • Bachrach S. M., Computational Organic Chemistry, Wiley, 2007. • Selected book-chapters and articles.
Language	German and/or English
Comments	
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