Module	**Fermented Beverages Technology, Chemistry and Microbiology**
Code	MSLS_S15
Degree Program	Master of Science in Life Sciences (MSLS)
ECTS Credits	4
Workload	120 h: Contact & Field work 75 lessons = 56 h; Self-study 64 h
Module Coordinator	**Name** Dr. Benoit BACH **Phone** +41 22 363 40 50 **Email** benoit.bach@changins.ch **Address** CHANGINS, Viticulture and Enology Route de Duillier 50, Case postale 1148, CH-1260 Nyon 1
Lecturers	• Dr Benoit Bach, CHANGINS, Viticulture and Enology • Dr Charles CHAPPUIS, CHANGINS, Viticulture and Enology • Guest lecturers
Entry Requirements	Equivalent of a Bachelor of Science in Chemistry, Biochemistry, Biology, or Enology Viticulture
Learning Outcomes and Competences	After completing the module students will be able to: • make alcoholic beverages such as wine, beer, cider and spirits • Identify key-compounds in flavors of alcoholic beverages and understand their production, fate and interactions • Select and apply suitable analytical and sensory methods to solve specific problems in producing high quality alcoholic beverages
Module Content	Process • Understanding of fermented beverage production (wine, beer, cider, spirits) Microbiology • Microbiological methods applied in wine microbiology (PCR, flow cytometry) • Yeast selection and fermentation biotechnologies (key control during spontaneous/wild fermentation). Analytical chemistry • Use of analytical chemistry to understand the biochemical transformations in fermented beverages • Critical understanding and selection of suitable analytical methods to solve practical and scientific enology questions • Qualitative and quantitative analysis of flavors using advanced instrumentations such as GC, GC-MS, HPLC-DAD, LC-MS and spectroscopy (UV-VIS, NIR, AES)

	• Methods to extract flavors from fermented beverages (liquid/liquid, SPE, SPME, …) and to prepare samples for analysis • Sulfur compounds: perception, production and analysis • Quality control: quality characteristics (key-compounds of flavors and macromolecules) critical control points during the process (microbiological and colloidal stability) • Contaminants (toxins, biogenic amines, NIAS…); incidence and strategies to reduce the risks. • Valorization techniques through sensory analysis • Data processing and statistical analysis linked to analytical chemistry and sensory analysis
Teaching / Learning Methods	Meeting and practice with producers Integration into a research group Laboratory practice and oral presentation
Assessment of Learning Outcome	Oral presentations during semester: 50% of the final grade Final presentation: 50% of the final grade Remediation: Oral presentation
Bibliography	Paterson A., J. S. Swanston J. S., J. R. Piggott J. R., Andrew G. H. Lea, John R. Piggott (2003) Fermented Beverage Production Springer. Pires Eduardo José Bányik Tomáš (2015) Biochemistry of beer fermentation Springer Waterhouse A. L. and Ebeler S. E. (1998). Chemistry of Wine Flavor, Washington, D.C.:American Chemical Society, Moreno-Arribas M. V. and Carmen Polo M.. Wine Chemistry and Biochemistry, New York:Springer, 2009. Boulton, R.B., Singleton, V.L.; Bisson, L.F.; Kunkee, R.E. (1995) – Principles and Practices of Winemaking, Chapman & Hall, New York. Ribéreau-Gayon, P. ; Glories, Y. ; Maujean, A. ; Dubourdieu, D. (1998) – Traité d'Oenologie. 2. Chimie du Vin, Stabilisation et Traitements, Dunod, Paris. Andrea Buettner et al. (2017) *Handbook of odor*. Springer International Publishing Switzerland.
Language	French/English
Comments	The course will be supported by student self-directed study of scientific articles and laboratory work
Last Update	16.02.2022 / BB