Module	**Fermented Beverages Technology, Chemistry and Microbiology**
Code	MLS_S15
Degree Program	Master of Science in Life Sciences (MSLS)
Cluster	Food
Specialization	Viticulture and Enology
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
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 Brányik 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	14.06.2020 / BB/CC