<table>
<thead>
<tr>
<th><strong>Module</strong></th>
<th><strong>Fermented Beverages Technology, Chemistry and Microbiology</strong></th>
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<tbody>
<tr>
<td><strong>Code</strong></td>
<td>MLS_S15</td>
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<tr>
<td><strong>Degree Program</strong></td>
<td>Master of Science in Life Sciences (MSLS)</td>
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<td><strong>Cluster</strong></td>
<td>Food</td>
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<td><strong>Specialization</strong></td>
<td>Viticulture and Enology</td>
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<td><strong>ECTS Credits</strong></td>
<td>4</td>
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<tr>
<td><strong>Workload</strong></td>
<td>120 h: Contact &amp; Field work 75 lessons = 56 h; Self-study 64 h</td>
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<tr>
<td><strong>Module Coordinator</strong></td>
<td>Name: Dr. Benoit BACH</td>
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<td></td>
<td>Phone: +41 22 363 40 50</td>
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<td></td>
<td>Email: <a href="mailto:benoit.bach@changins.ch">benoit.bach@changins.ch</a></td>
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<tr>
<td></td>
<td>Address: CHANGINS, Viticulture and Enology Route de Duillier 50, Case postale 1148, CH-1260 Nyon 1</td>
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<tr>
<td><strong>Lecturers</strong></td>
<td>Dr Benoit Bach, CHANGINS, Viticulture and Enology</td>
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<td>Dr Charles CHAPPUIS, CHANGINS, Viticulture and Enology</td>
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<td>Guest lecturers</td>
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<td><strong>Entry Requirements</strong></td>
<td>Equivalent of a Bachelor of Science in Chemistry, Biochemistry, Biology, or Enology Viticulture</td>
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<td><strong>Learning Outcomes and Competences</strong></td>
<td>After completing the module students will be able to:</td>
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<td>• Make alcoholic beverages such as wine, beer, cider and spirits</td>
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<td>• Identify key-compounds in flavors of alcoholic beverages and understand their production, fate and interactions</td>
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<td>• Select and apply suitable analytical and sensory methods to solve specific problems in producing high quality alcoholic beverages</td>
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<td><strong>Module Content</strong></td>
<td>Process</td>
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<tr>
<td></td>
<td>Understanding of fermented beverage production (wine, beer, cider, spirits)</td>
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<td>Microbiology</td>
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<td>Microbiological methods applied in wine microbiology (PCR, flow cytometry)</td>
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<td>Yeast selection and fermentation biotechnologies (key control during spontaneous/wild fermentation).</td>
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<td>Analytical chemistry</td>
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<td>Use of analytical chemistry to understand the biochemical transformations in fermented beverages</td>
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- 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

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<th>Teaching / Learning Methods</th>
<th>Meeting and practice with producers</th>
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<td>Integration into a research group</td>
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<td>Laboratory practice and oral presentation</td>
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<th>Assessment of Learning Outcome</th>
<th>Oral presentations during semester: 50% of the final grade</th>
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<td>Final presentation: 50% of the final grade</td>
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<td></td>
<td>Pires Eduardo José Brányik Tomáš (2015) Biochemistry of beer fermentation Springer</td>
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<td></td>
<td>Andrea Buettner et al. (2017) Handbook of odor. Springer International Publishing Switzerland</td>
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<th>Language</th>
<th>French/English</th>
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<th>Comments</th>
<th>The course will be supported by student self-directed study of scientific articles and laboratory work</th>
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<tr>
<th>Last Update</th>
<th>14.06.2020 / BB/CC</th>
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