### Module title
Progresses in Food Processing

<table>
<thead>
<tr>
<th>Code</th>
<th>F1</th>
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</thead>
<tbody>
<tr>
<td><strong>Degree Programme</strong></td>
<td>Master of Science in Life Sciences</td>
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<tr>
<td><strong>Group</strong></td>
<td>Food</td>
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<tr>
<td><strong>Workload</strong></td>
<td>3 ECTS (90 student working hours: 42 lessons contact = 32 h; 58 h self-study)</td>
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**Module Coordinator**
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- Email: michael.beyrer@hevs.ch
- Address: Haute Ecole d'Ingénierie - Filière Technologies du vivant, Route du Rawyl 64, 1950 Sion

**Lecturers**
- Dr. Michael Beyrer, HES-SO
- Dr. Laurence Nicolay, HES-SO
- Dr. Lydie Moreau, HES-SO
- Guest lecturers

**Entry requirements**
- Basic knowledge of thermal and mechanical food processing operations
- Basic knowledge of heat and mass transport phenomena
- Knowledge of most characteristic modifications of food ingredients caused by the processing or preparation of food
- Basic knowledge in food microbiology
- Basic skills in chemical, microbiological and physical food analysis

**Learning outcomes and competences**
After completing the module, students will be able to:
- Explain the purpose and the working principle of several emerging food processing technologies, as compared to “traditional” ones
- Use several food processing equipment
- Analyze several physical, microbiological and chemical characteristics of foods
- Evaluate and compare the impact of several technologies on the finished food product properties

**Module contents**
**Theoretical inputs - food processing techniques**:
- Traditional and emerging technologies will be presented: principles, equipment design and way of working, impact of different technologies on finished food properties. Advantages, limits and technical readiness of such technologies will be introduced. The technologies cover all branches from beverages, to bakery, meat and dairy products.
- Theoretical inputs regarding processing technologies will be spread throughout the module and illustrated with selected practical.

**Topic I - Shelf life extension of food by non-thermal technologies**
- Inoculation of a food (fruit juice for ex.) with a non-pathogen micro-organism
- Reduction of microbial count by heat, pulsed electric field and high pressure processing: demonstration and application of different type of equipment such as plate, tube and scraped surface heat exchangers, PEF-unit, HPP machine, etc.
- Determination of the yield of inactivation of microorganisms
- Determination of variation of other characteristic product properties, such as color, antioxidant capacity, and viscosity as a function of thermal charge
### Topic II – Micro-encapsulation of flavors, phytochemicals and probiotics

- Preparation of pre-mixes by high pressure homogenization, ultra-sonication and/or stator-rotor machines
- Coating, encapsulation and aggregation with fluidized bed technologies
- Determination of typical physical powder properties: particle size, flow index, compressibility, water sorption-desorption isotherms, etc.
- Determination of the yield for the encapsulated substance

### Topic III – Twin screw extrusion

- Manufacturing of first generation extruded products, such as directly expanded breakfast cereals
- Determination of physical and chemical properties as a function of processing parameters and composition

### Teaching / learning methods

<table>
<thead>
<tr>
<th>Teaching methods</th>
<th>Blend of theoretical inputs, hands-on practical and self-study:</th>
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</table>
| **Theoretical inputs (18% - 16h):** | - Theory regarding several technologies’ way of working, including those used during the practical, applications and limitations.  
- Advantages / disadvantages of emerging technologies versus more traditional ones |
| **Practical (18% - 16h):** | - Practical activities in the pilot plant or laboratories |
| **Self-study (64% - 58h):** | - Pre-reading – 24h  
- Report preparation: 20h  
- Exam preparation: 12h  
- Written exam: 1h |

### Assessment of learning outcome

1. Final individual written test for theoretical inputs and self-study (open book (60%)
2. Group report for practical’s assessment, to be handed in 3 weeks after the end of the module (40%)

### Format

- Winter School

### Timing of the module

- Autumn semester, CW 4  
- 20 participants maximum per session – CW5 as backup

<table>
<thead>
<tr>
<th>Day of the block week</th>
<th>&lt;1</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>&gt;5</th>
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<tbody>
<tr>
<td>Contact teaching (lessons)</td>
<td>8</td>
<td>9</td>
<td>9</td>
<td>8</td>
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<tr>
<td>Self-study (hours)</td>
<td>24</td>
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<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>24</td>
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### Venue

- Sion / Sitten

### Bibliography

- **Recommended textbooks for pre-course work (information regarding relevant chapters will be provided on Moodle):**
- **Advanced course material:**

### Language

- English
<table>
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<tr>
<th>Links to other modules</th>
<th>This module will complete the food technology aspects of specialisation module FNH-3 “Technology meets Nutrition” of BFH. The present module focuses on new technologies while the module FNH-3 covers the nutritional aspects linked to technologies</th>
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<tbody>
<tr>
<td>Comments</td>
<td>The module will be carried out twice if enrolments exceed 20 participants</td>
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<tr>
<td>Last Update</td>
<td>08.04.2019</td>
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