Module title	**Progresses in Food Processing**
Code	F1
Degree Programme	Master of Science in Life Sciences
Group	Food
Workload	3 ECTS (90 student working hours: 42 lessons contact = 32 h; 58 h self-study)
Module Coordinator	**Name**: Prof. Dr Michael Beyrer **Phone**: +41 (0)27 606 85 23 **Email**: michael.beyrer@hevs.ch **Address**: School of Engineering, Institute of Life Technologies, Rue de l'Industrie 19, 1950 Sion
Lecturers	• Prof. Dr Michael Beyrer, HES-SO • Guest lecturers
Entry requirements	• Basic knowledge of thermal and mechanical food processing operations • Basic understanding 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 • **See also information under "comments"**
Learning outcomes and competences	After completing the module, the students will be able to • explain principles and fields of application of several emerging food processing technologies, • measure, report, and discuss the influence of the different technologies on food properties.
Module contents	Theoretical input We explain principles, equipment design, and impact of emerging technologies on food properties. For illustration, we present case studies for beverages, fruits, vegetables, plant-based food, meat, and dairy products and discuss the technologies' advantages, limitations, and technical readiness. The lecture focuses on (1) non-thermal and (2) plant-based food technologies applicable at a large scale. Specifically, pulsed electric fields and high-pressure processing will be elucidated in chapter (1) and extraction of proteins and twin-screw extrusion in chapter (2). Practical activities 1st activity: Shelf-life extension and food safety control with non-thermal technologies • Inoculation of food with relevant spoilage microorganisms • Inactivation of microorganisms by heat, pulsed electric field and high pressure at the pilot-plant scale • Detection of the inactivation effect and calculation of inactivation kinetics • Determination of variation of other characteristic product properties, such as colour, antioxidant capacity, texture, and viscosity, as a function of the type of treatment and process window

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- Optional: Cold atmospheric plasma treatments
- Reporting and discussion of results

2nd Topic: Plant-based food

- Illustration of the down-stream processing of bioresources for protein extracts and powder manufacturing
- Training on methods for the characterisation of the techno-functionality of proteins, such as dynamic viscosity, thermal analysis, water holding capacity, and protein solubility
- Training on twin-screw extrusion for producing meat substitutes
- Methods for the characterisation of extruded plant-based foods, such as texture analyses and sensory evaluation
- Reporting and discussion of results

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<tr><td>Teaching / learning methods</td><td>

Theoretical inputs (18% - 16h):

- Lecturing and co-working

Practicals (18% - 16h)

- Practical activities in the pilot plant and several laboratories

Self-study (64% - 58h)

- Pre-reading – 24h
- Report preparation: 20h
- Exam preparation: 12h
- Written exam: 1h

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<tr><td>Assessment of learning outcome</td><td>

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

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<tr><td>Format</td><td>Winter School</td></tr>
<tr><td>Timing of the module</td><td>

Autumn semester, CW 4

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<tr><td>Day of the block week</td><td><1</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>>5</td></tr>
<tr><td>Contact teaching (lessons)</td><td></td><td>8</td><td>9</td><td>9</td><td>8</td><td>8</td><td></td></tr>
<tr><td>Self-study (hours)</td><td>24</td><td>2</td><td>2</td><td>2</td><td>2</td><td>2</td><td>24</td></tr>
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<tr><td>Venue</td><td>Sion / Sitten</td></tr>
<tr><td>Bibliography</td><td>

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

Fellows PJ, 2016. Food Processing Technology. Woodhead Publishing, 4th edition, 1152 pp.

Singh RP, Heldman D, 2013. Introduction to Food Engineering. Academic Press, 5th edition, 892 pp.

Advanced course material:

Sun DW, 2014. Emerging Technologies for Food Processing. Academic Press, 2nd edition, 666 pp.

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<tr><td>Language</td><td>English</td></tr>
<tr><td>Links to other modules</td><td>-</td></tr>
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Comments	The practicals will be carried out twice if enrolments exceed 20 participants. A maximum of 40 participants can enrol on this course. Registrations will be considered as follows: 1. Students for whom F1 is a compulsory module 2. Students from the Food-Cluster 3. Students who need the ECTS for the graduation in the semester concerned 4. The remaining places will be drawn by lot Whether participation is possible will be communicated by the end of week 37.
Last Update	06.03.2026