

Master in Life Sciences

A cooperation between
BFH, FHNW, HES-SO, ZHAW

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	<ul style="list-style-type: none"> • Prof. Dr Michael Beyrer, HES-SO • Guest lecturers
Entry requirements	<ul style="list-style-type: none"> • 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	<p>After completing the module, the students will be able to</p> <ul style="list-style-type: none"> • 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	<p><u>Theoretical input</u></p> <p>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.</p> <p>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).</p> <p><u>Practical activities</u></p> <p><u>1st activity: Shelf-life extension and food safety control with non-thermal technologies</u></p> <ul style="list-style-type: none"> • 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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	<ul style="list-style-type: none">• Optional: Cold atmospheric plasma treatments• Reporting and discussion of results <p><u>2nd Topic: Plant-based food</u></p> <ul style="list-style-type: none">• 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																								
Teaching / learning methods	<p><u>Theoretical inputs (18% - 16h):</u></p> <ul style="list-style-type: none">• Lecturing and co-working <p><u>Practicals (18% - 16h)</u></p> <ul style="list-style-type: none">• Practical activities in the pilot plant and several laboratories <p><u>Self-study (64% - 58h)</u></p> <ul style="list-style-type: none">• Pre-reading – 24h• Report preparation: 20h• Exam preparation: 12h• Written exam: 1h																								
Assessment of learning outcome	<ol style="list-style-type: none">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%)																								
Format	Winter School																								
Timing of the module	<p>Autumn semester, CW 4</p> <table><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></table>	Day of the block week	<1	1	2	3	4	5	>5	Contact teaching (lessons)		8	9	9	8	8		Self-study (hours)	24	2	2	2	2	2	24
Day of the block week	<1	1	2	3	4	5	>5																		
Contact teaching (lessons)		8	9	9	8	8																			
Self-study (hours)	24	2	2	2	2	2	24																		
Venue	Sion / Sitten																								
Bibliography	<p>Recommended textbooks for pre-course work (information regarding relevant chapters will be provided on Moodle):</p> <p>Fellows PJ, 2016. Food Processing Technology. Woodhead Publishing, 4th edition, 1152 pp.</p> <p>Singh RP, Heldman D, 2013. Introduction to Food Engineering. Academic Press, 5th edition, 892 pp.</p> <p>Advanced course material:</p> <p>Sun DW, 2014. Emerging Technologies for Food Processing. Academic Press, 2nd edition, 666 pp.</p>																								
Language	English																								
Links to other modules																									



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Comments	<p>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:</p> <ol style="list-style-type: none">1. Students for whom F1 is a compulsory module2. Students from the Food-Cluster3. Students who need the ECTS for the graduation in the semester concerned4. The remaining places will be drawn by lot <p>Whether participation is possible will be communicated by the end of week 37.</p>
Last Update	03.04.2025