



Module title	Progress 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	<p>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</p>
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> We explain principles, equipment design, and impact on food properties of emerging technologies. 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 the chapter (1) and extraction of proteins and twin-screw extrusion in chapter (2).</p> <p><u>Practical activities</u> <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

	<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 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	Autumn semester, CW 4 <table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <tr> <td style="padding: 2px;">Day of the block week</td> <td style="padding: 2px;"><1</td> <td style="padding: 2px;">1</td> <td style="padding: 2px;">2</td> <td style="padding: 2px;">3</td> <td style="padding: 2px;">4</td> <td style="padding: 2px;">5</td> <td style="padding: 2px;">>5</td> </tr> <tr> <td style="padding: 2px;">Contact teaching (lessons)</td> <td style="padding: 2px;"></td> <td style="padding: 2px;">8</td> <td style="padding: 2px;">9</td> <td style="padding: 2px;">9</td> <td style="padding: 2px;">8</td> <td style="padding: 2px;">8</td> <td style="padding: 2px;"></td> </tr> <tr> <td style="padding: 2px;">Self-study (hours)</td> <td style="padding: 2px;">24</td> <td style="padding: 2px;">2</td> <td style="padding: 2px;">2</td> <td style="padding: 2px;">2</td> <td style="padding: 2px;">2</td> <td style="padding: 2px;">2</td> <td style="padding: 2px;">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	Recommended textbooks for pre-course work (information regarding relevant chapters will be provided on Moodle): Fellows PJ, 2016. Food Processing Technology. Woodhead Publishing, 4 th edition, 1152 pp. Singh RP, Heldman D, 2013. Introduction to Food Engineering. Academic Press, 5 th edition, 892 pp. Advanced course material: Sun DW, 2014. Emerging Technologies for Food Processing. Academic Press, 2nd edition, 666 pp.																								
Language	English																								
Links to other modules																									
Comments	There is a participant limit in this module. Registrations will be considered as follows: 1. Students for whom F1 is a compulsory module																								



	<ul style="list-style-type: none">2. 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	18.04.2023