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 • Prof. Dr. Laurence Nicolay, HES-SO • Prof. 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	<u>Theoretical inputs - food processing techniques:</u> 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. <u>Topic I - Shelf life extension of food by non-thermal technologies</u> • 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

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<u>Topic II – Vegan alternatives for meat and cheese products</u>
• Raw materials: Manufacturing protein concentrates or isolates and methods for characterization
• Technology for textured vegetable proteins
• Overview on technologies for structuring vegetable proteins at high moisture
• Principles of alignment and binding of vegetable proteins in industry-scale machinery

<u>Topic III – Twin screw extrusion</u>
• 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

<u>Topic IV (optional) – Micro-encapsulation of flavors, phytochemicals and probiotics</u>
• 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
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<tr><td>Teaching / learning methods</td><td>
Blend of theoretical inputs, hands-on practical and self-study:

<u>Theoretical inputs (18% - 16h):</u>
• 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

<u>Practical (18% - 16h)</u>
• Practical activities in the pilot plant or laboratories

<u>Self-study (64% - 58h)</u>
• 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
20 participants maximum per session – CW5 as backup
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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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Venue	Sion / Sitten and/or online
Bibliography	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.
Language	English
Links to other modules	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
Comments	The module will be carried out twice if enrolments exceed 20 participants
Last Update	10.01.2021