Master of Science in Sustainable Food

All modules carry 5 ECTS Credits each with the exception of Laboratory Module, which carries 10 ECTS Credits.

REFRESHER MODULE

1) Laboratory Module

The laboratory module provides students with the theoretical and practical knowledge in a broad spectrum of experimental methods applied in food structure analysis, molecular biology, microbiology, molecular sensory science, analytical food chemistry and agricultural science (e.g. rheology, microbial analysis, sensory assessment, high resolution liquid chromatography). The module aims to give students a first-hand experience in their laboratory applications thus familiarising with the technical details and potential pitfall in addition to strengthening their theoretical background of these methods.

Hours: 90 / **Semester:** 1

CORE MODULES

2) Technofunctionality of Food Components

This module enables students to gain an in-depth knowledge of the influence of different ingredients on the quality and functionality of food. Through review of the chemical properties of the individual food components, students will be able to deepen their understanding of their structure-activity relationships linking to their physicochemical and technofunctional properties. The module will also deep dive into essential food nutrients such as proteins, lipids and carbohydrates and their individual properties in detail.

Hours: 45 / **Semester:** 1

3) Nutrition and Microbiome in Health and Disease

This module provides insights into the principles of microbial ecologies specifically discussing the intestinal eco-system, and introduce measures on how to analyse changes, focusing on the response to food intake through the discussion on the anatomy and physiology of the digestive tract. In addition, the course will discuss mechanisms of micro-host interactions at the level of gut barrier functions, the mucosal immune system, the nervous system and human metabolism. Students will also acquire a comprehensive state-of-the-art knowledge of the role of the microbiome in human health and disease such as immune-related pathologies and cancer, and metabolic disorders through discussions on the principles of immune and metabolic disorders; the role of the intestinal microbiome in regulating initiation and progression or prevention and treatment of diseases.

Hours: 45 / **Semester:** 1

4) Energy Metabolism and Regulation

The module imparts knowledge on how quality and quantity of food stuffs affect energy metabolism and the role of environmental factors and genetic / epigenetic variation in the regulation of energy balance. The integrative physiology of energy metabolism will be highlighted through the study of redundant peripheral and central control mechanisms known to regulate energy intake, turnover and storage. Students will be able to elaborate and articulate their knowledge in physiology of human nutrition and energy metabolism and know examples for pathophysiological disturbances of energy metabolism and regulation and potential treatment options.

Hours: 45 / **Semester:** 1

5) Food Structure and Texture Engineering (Food Design)

The module sheds light on the principles of structures from a micro- up to macroscopic level in food systems and its functionalities. Students will gain an in-depth understanding of the development and modification of specific structures by engineering approaches with up-to-date equipment. In detail, structures in food systems and its functionality are covered, diving into the structural hierarchy and their relationship with quality aspects in food. Students will also gain a comprehensive knowledge on the innovative and emerging technologies and processes in relation to their impact on the structure of different biopolymers and its functionality in foods such as structuring by thermos-mechanical polymer approaches, and texture design by additive manufacturing.

Hours: 45 / **Semester:** 2

6) Molecular Sensory Science

The module delves into the principles of odour and taste perception on a molecular level to enable students to gain state-of-the-art knowledge in Sensomics. Students will advance their understanding in flavour perception, and various methods for the analysis of odour active compounds as well as the analysis of taste active compounds using the Sensomics approach to classify these substances by their aroma value or dose over threshold factor and assess their relevance in food.

Hours: 45 / **Semester:** 2

7) Sustainability in Food Systems

This module builds on the key concepts of supply chain management, strategy and sustainability to provide students with the necessary competencies to evaluate pertinent issues in the food system. It will deep dive into the value proposition of the food system – creation and capture of added value, management of stakeholders of the food system, innovation in supply chains, sustainability as an innovation, sustainable supply chains and ethical issues in supply chain management and the food system, sustainability measurement, and the implementation of a sustainability strategy as well as costs and benefits of sustainable practices in the food system.

Hours: 45 / **Semester:** 2

8) Food Toxins and Toxicants (Food Toxicology)

The module provides students a solid understanding of food toxins and toxicants by delving into the fundamentals of toxicology covering toxicokinetics, toxicodynamics, and risk assessments and risk management of food. Students will deepen their scientific understanding in specific contaminants and residues in foods and the environment while developing skills to analyse and apply analytical methods, conduct risk assessment of selected compounds and groups with toxic relevance such as but not limited to mycotoxins, process contaminants, pesticide residues, heavy metals, chlorinated

contaminants and emerging contaminants such as Mineral Oil Saturated Hydrocarbons (MOSH) and Mineral Oil Aromatic Hydrocarbons (MOAH).

Hours: 45 / **Semester:** 2

9) Microbial Food Safety from Farm to Fork

The module dives into the principles of microbiological food safety focusing on modern food production systems such as aquaponics growth, and fermenter systems. Students will develop state-of-the-art knowledge in issues of microbiological threat for food safety such as bacteria, antibiotic resistance, cyanobacteria, employ risk assessment such as advanced analysis and analytical tools, and formulate mitigation strategies such as prevention of contamination and recontamination, prevention of unwanted bacterial toxins and prevention of food spoiling organisms to increase food safety.

Hours: 45 / **Semester:** 2

TECHNICAL ELECTIVE MODULES (CHOOSE TWO OUT OF THREE)

10) Economic and Environmental Life Cycle Assessment

Using the concepts and tools of life cycle assessment (LCA), the module aims to impart students with the knowledge and skills to analyse industrial metabolisms as well as products and services regarding their environmental impacts. Students will gain a deeper understanding of the LCA methodology and procedure by applying the theoretical knowledge to a practical example, thus gaining a deeper understanding of the LCA methodology.

Hours: 45 / **Semester:** 1

11) Molecularbiological Methods to assess Authenticity, GMO and Veterinary Drugs in Food

The module provides insights into the molecular-biological methods and principles to detect, quantify and assess food authenticity, genetic modified organisms and veterinary drugs with focus on hormones, endocrine hormone disrupters and antibiotics in human food by both theoretical lectures and practical laboratory training. Students will be able to develop competencies in applying these molecular-biological methods and principles for a successful risk assessment and they can conclude the impact of food safety and authenticity on human health.

Hours: 45 / **Semester:** 2

12) Food Tissue Engineering / Cellular Agriculture

In this module, students will be introduced to the concepts of cellular agriculture, its connection to food science and the use of biotechnological methods in producing novel food. Students will acquire state-of-the-art knowledge in cellular agriculture, and apply the knowledge to evaluate individual strategies for production of biotechnological alternatives to agricultural food products such as cultivated meat including technical and environmental aspects, biotechnological efficiency parameters and critical review of the feasibility of a novel production strategy.

Hours: 45 / **Semester: 3**