Syllabus

Kursbeschreibung

Titel der Lehrveranstaltung	Starter and functional microbes for innovation, authenticity and healthy status
Code der Lehrveranstaltung	44761
Zusätzlicher Titel der Lehrveranstaltung	
Wissenschaftlich-disziplinärer Bereich	
Sprache	Englisch
Studiengang	Master in Lebensmittelwissenschaften für Innovation und Authentizität
Andere Studiengänge (gem. Lehrveranstaltung)	
Dozenten/Dozentinnen	Prof. Marco Gobbetti, Marco.Gobbetti@unibz.it https://www.unibz.it/en/faculties/agricultural-environmental-food-sciences/academic-staff/person/32209 Prof. Andrea Polo, Andrea.Polo@unibz.it https://www.unibz.it/en/faculties/agricultural-environmental-food-sciences/academic-staff/person/36646 Prof. Raffaella Di Cagno, Raffaella.DiCagno@unibz.it https://www.unibz.it/en/faculties/agricultural-environmental-food-sciences/academic-staff/person/37608 dr. Olga Nikoloudaki, Olga.Nikoloudaki@unibz.it https://www.unibz.it/en/faculties/agricultural-environmental-food-sciences/academic-staff/person/38535
Wissensch. Mitarbeiter/Mitarbeiterin	
Semester	Zweites Semester
Studienjahr/e	1st

KP	12
Vorlesungsstunden	72
Laboratoriumsstunden	48
Stunden für individuelles Studium	180
Vorgesehene Sprechzeiten	42
Inhaltsangabe	The natural microbial starters for innovation and authenticity: criteria and tools for selecting and use microbial starters in food fermentations; examples of spontaneous fermentation and drivers affecting the fermentation; type of natural and commercial starters; examples of uses of selected microbial starters in cheeses, baked goods, fermented fruits/vegetables and functional foods. Computational analysis in food microbiomes: the module provides an introduction to the use of sequencing and data integration to study microbial ecosystems in food fermentations. The course covers the principles of 16S rRNA gene sequencing and shotgun metagenomics, alongside physicochemical measurements such as pH, acidity, and metabolite content. Using accessible platforms like MicrobiomeAnalyst, students will gain hands-on experience in microbiome profiling, diversity analysis, functional annotation, and integration of multi-source data. By the end of the course, they will be able to interpret and communicate results linking microbial communities to fermentation quality and functionality. The food: human axis for driving the gut microbiome: principles on the digestive system; gut microbiota composition and functionality; omics for investigating the gut microbiota/microbiome; observational and intervention studies on the effect of diet, fibres, polyphenols and food intolerances on the gut microbiota composition and functionality; gut-brain axis and cases of study on autism; how to carry out an intervention study on the gut microbiota/microbiome.
Themen der Lehrveranstaltung	The topics of the modules are described in the section of each module
Stichwörter	The keywords of the modules are listed in the section of each module

Empfohlene Voraussetzungen	
Propädeutische Lehrveranstaltungen	None
Unterrichtsform	Traditional teaching in classroom; discussion and analyses of cases of study (scientific articles). Lab exercises will be in didactic laboratories and include the use of advanced analytical methods, and group activities among participants with collaborative solving of experimental questions.
Anwesenheitspflicht	No
Spezifische Bildungsziele und erwartete Lernergebnisse	Knowledge and understanding: Knowledge of analytical methods for determining the authenticity, functionality, and microbiological safety of food products, as well as the related methodological tools for risk assessment. These knowledge areas will be developed through an educational program that integrates theoretical teaching activities with practical activities, such as laboratory exercises, computer simulations, simulations of food processes using pilot plants, and company visits. Ability to apply knowledge and understanding: Ability to manage the technological, microbiological, biochemical, chemical, and physical processes that drive food transformation and the main issues related to the stability and shelf life of food products. Ability to plan and develop analytical techniques, innovative products, and processes using a multidisciplinary approach, with particular attention to local food productions. Making judgements: Independent judgement is developed through a training programme designed to stimulate critical analysis in students. This includes the use of case studies, simulations using spreadsheets and videos, the reading and critical discussion of scientific articles, as well as specialist seminars held by experts in the food sector. The assessment of the independent judgement acquired by students is entrusted to the individual teachers responsible for the training activities, who will assess it through oral and/or written reports on specific topics and/or through exams.

	Communication skills: Use of the English language, both written and spoken, at a B2 level, with a command of technical and scientific vocabulary related to food science. Structure and draft scientific and technical documentation describing project activities. Learning skills: The degree course provides graduates with the cognitive skills, logical tools and familiarity with new information technologies necessary to ensure continuous updating of knowledge, both in their specific professional field and in the field of scientific research.
Spezifisches Bildungsziel und erwartete Lernergebnisse (zusätzliche Informationen)	
Art der Prüfung	The assessment of the student preparation is through an oral exam. The oral assessment includes questions to assess the knowledge and understanding of the course topics and questions designed to assess the ability to transfer these skills to case studies and practical applications. Questions on practical applications also assess the ability of the student to apply the knowledge and understanding of the course topics, the ability to make judgments and finally, the student communication skills.
Bewertungskriterien	The evaluation criteria are described in the section of each module
Pflichtliteratur	The required readings are indicated in the section of each module
Weiterführende Literatur	
Weitere Informationen	
Ziele für nachhaltige Entwicklung (SDGs)	Gesundheit und Wohlergehen, Nachhaltiger Konsum und Produktion, Industrie, Innovation und Infrastruktur

Kursmodul

Titel des Bestandteils der Lehrveranstaltung	The natural microbial starters for innovation and authenticity

Code der Lehrveranstaltung	44761A
Wissenschaftlich-disziplinärer Bereich	AGRI-08/A
Sprache	Englisch
Dozenten/Dozentinnen	Prof. Raffaella Di Cagno, Raffaella.DiCagno@unibz.it https://www.unibz.it/en/faculties/agricultural-environmental-food-sciences/academic-staff/person/37608
Wissensch. Mitarbeiter/Mitarbeiterin	
Semester	Zweites Semester
KP	3
Verantwortliche/r Dozent/in	
Vorlesungsstunden	18
Laboratoriumsstunden	12
Stunden für individuelles Studium	45
Vorgesehene Sprechzeiten	9
Inhaltsangabe	The natural microbial starters for innovation and authenticity: criteria and tools for selecting and use microbial starters in food fermentations; examples of spontaneous fermentation and drivers affecting the fermentation; type of natural and commercial starters; examples of uses of selected microbial starters in cheeses, baked goods, fermented fruits/vegetables and functional foods.
Themen der Lehrveranstaltung	The course will cover the following topics: - General criteria for starter selection and tools for selecting microbial starters (e.g., phenomics) - Spontaneous fermentation (sauerkrauts): advantages and limits - Natural starter (milk kefir), commercial and autochthonous starters - Case studies dealing with the use of starters in cheeses, fermented vegetables, functional foods, probiotics, and recycling of food by-products
Unterrichtsform	Traditional teaching in classroom; discussion and analysis of cases of study (scientific articles); lab activities and one external visit.

	Lab exercises will be in didactic laboratories and include the use of advanced analytical methods, and group activities among participants with collaborative solving of experimental questions.
Pflichtliteratur	Slides of lesson provided by the lecturer and scientific articles
Weiterführende Literatur	

Kursmodul

Titel des Bestandteils der Lehrveranstaltung	Computational analysis in food microbiomes
Code der Lehrveranstaltung	44761B
Wissenschaftlich-disziplinärer Bereich	AGRI-08/A
Sprache	Englisch
Dozenten/Dozentinnen	dr. Olga Nikoloudaki, Olga.Nikoloudaki@unibz.it https://www.unibz.it/en/faculties/agricultural-environmental-food-sciences/academic-staff/person/38535
Wissensch. Mitarbeiter/Mitarbeiterin	
Semester	Zweites Semester
KP	3
Verantwortliche/r Dozent/in	
Vorlesungsstunden	18
Laboratoriumsstunden	12
Stunden für individuelles Studium	45
Vorgesehene Sprechzeiten	9
Inhaltsangabe	Computational analysis in food microbiomes: the module provides an introduction to the use of sequencing and data integration to study microbial ecosystems in food fermentations. The course covers the principles of 16S rRNA gene sequencing and shotgun metagenomics, alongside physicochemical measurements such as pH, acidity, and metabolite content. Using accessible platforms like MicrobiomeAnalyst, students will gain hands-on experience in microbiome profiling, diversity analysis, functional annotation, and

	integration of multi-source data. By the end of the course, they will be able to interpret and communicate results linking microbial communities to fermentation quality and functionality.
Themen der Lehrveranstaltung	Einführung in fermentierte Lebensmittelmikrobiome und mikrobielle Ökologie Grundlagen der DNA-Sequenzierung: 16S rRNA-Amplikon vs. Shotgun-Metagenomik (theoretischer Überblick) Versuchsaufbau und Probenahmestrategien in Studien zu Lebensmittelmikrobiomen Arbeitsablauf bei der Verarbeitung von 16S-rRNA-Daten (Qualitätskontrolle, ASVs, taxonomische Zuordnung) Alpha- und Beta-Diversitätsanalyse und ökologische Interpretation Statistische Analyse und Differentialabundanz-Testung Funktionsvorhersage aus 16S-Daten und deren Grenzen Integration von Mikrobiomdaten mit physikalisch-chemischen Parametern Datenvisualisierung, Interpretation und häufige analytische Fallstricke
Unterrichtsform	Frontalunterricht (18 Stunden) und Laboraktivitäten (12 Stunden) umfassen ausschließlich Bioinformatik (computerbasiert).
Pflichtliteratur	Einführung in die Bioinformatik in der Mikrobiologie Henrik Christensen (https://link.springer.com/content/pdf/10.1007/978-3-319-99280-8.pdf) **Bioinformatik: Eine Einführung** Jeremy Ramsden (Ramsden, J. (2023). Bioinformatik: Eine Einführung. Springer Nature.)
Weiterführende Literatur	Callahan, B., McMurdie, P., Rosen, M. *et al.* DADA2: Hochauflösende Probeninferenz aus Illumina-Amplikondaten. *Nat Methods* **13**, 581–583 (2016). https://doi.org/10.1038/nmeth.3869

Kursmodul

Titel des Bestandteils der Lehrveranstaltung	The food - human axis for driving the gut microbiome
Code der Lehrveranstaltung	44761C
Wissenschaftlich-disziplinärer Bereich	AGRI-08/A
Sprache	Englisch
Dozenten/Dozentinnen	Prof. Marco Gobbetti,

	Marco.Gobbetti@unibz.it https://www.unibz.it/en/faculties/agricultural-environmental-food-sciences/academic-staff/person/32209 Prof. Andrea Polo, Andrea.Polo@unibz.it https://www.unibz.it/en/faculties/agricultural-environmental-food-sciences/academic-staff/person/36646
Wissensch. Mitarbeiter/Mitarbeiterin	
Semester	Zweites Semester
KP	6
Verantwortliche/r Dozent/in	
Vorlesungsstunden	36
Laboratoriumsstunden	24
Stunden für individuelles Studium	90
Vorgesehene Sprechzeiten	24
Inhaltsangabe	The Food – Human Axis for Driving the Gut Microbiome: principles on the digestive system; gut microbiota composition and functionality; omics for investigating the gut microbiota/microbiome; observational and intervention studies on the effect of diet, fibres, polyphenols and food intolerances on the gut microbiota composition and functionality; gut-brain axis and cases of study on autism; how to carry out an intervention study on the gut microbiota/microbiome.
Themen der Lehrveranstaltung	Use of omics techniques and most advanced methods for investigating the gut microbiota composition and functionality; observational and intervention cases of study (publications) to modulate the gut microbiota composition and functionality; food intolerances; effects of fibers and polyphenols on the gut microbiota; gut-brain axis as mediated by the the diet and other factors; cases of study dealing with the autism; how to restore transient and permanent dysbiosis; how to carry out an intervention study on the gut microbiota/microbiome.
Unterrichtsform	Traditional teaching in classroom; discussion and analyses of cases of study (scientific articles). Lab exercises will be in didactic laboratories and include the use of advanced analytical methods,

	and group activities among participants with collaborative solving of experimental questions.
Pflichtliteratur	Scientific articles and slides of lesson provided by the lecturers.
Weiterführende Literatur	