Syllabus

Kursbeschreibung

Titel der Lehrveranstaltung	Biologie der Mikroorganismen und sekundäre Metaboliten
Code der Lehrveranstaltung	40455
Zusätzlicher Titel der Lehrveranstaltung	
Wissenschaftlich-disziplinärer Bereich	
Sprache	Italienisch
Studiengang	Bachelor in Lebensmittelwissenschaften, Önologie und Gastronomie
Andere Studiengänge (gem. Lehrveranstaltung)	
Dozenten/Dozentinnen	Prof. Raffaella Di Cagno, Raffaella.DiCagno@unibz.it https://www.unibz.it/en/faculties/agricultural-environmental-food-sciences/academic-staff/person/37608 Prof. Youry Pii, Youry.Pii@unibz.it https://www.unibz.it/en/faculties/agricultural-environmental-food-sciences/academic-staff/person/33704
Wissensch. Mitarbeiter/Mitarbeiterin	
Semester	Zweites Semester
Studienjahr/e	1st
KP	8
Vorlesungsstunden	48
Laboratoriumsstunden	32
Stunden für individuelles Studium	120
Vorgesehene Sprechzeiten	24
Inhaltsangabe	Biology and Biotechnology of Food Microorganisms (6 credits EN): The part of the course dealing with the biology of food related

	microorganisms covers the elements of biology, cytology and biochemistry of microorganisms, the more technical aspects of cultivation, growth, isolation and identification of microorganisms and their taxonomic classification; The part of the course dealing with the biotechnology of food microorganisms covers aspects of microbial ecophysiology, the determination and control of microorganisms in food, as well as the distribution of microorganisms in food as well as the distribution of spoilage and pathogenic microorganisms in plant- and animal based food. Secondary metabolites (2 credits EN): This course deals with the definition and role of secondary metabolites in food, considering, mainly focusing on their functions in terms of health benefits. Emphasis will be placed on understanding key classes of metabolites, including alkaloids, flavonoids, terpenes, glucosinolates, and tannins, with examples from plant and fungal sources. Case studies will illustrate how these metabolites enhance product quality and offer functional health benefits.
Themen der Lehrveranstaltung	Biology of Microorganisms 1. Principles of prokaryotic cell biology: morphology, genome organization and expression, cytology, chemotaxis. Cell structure of eukaryotes. 2. Viruses, in particular bacteriophages. 3. Biochemical and bioenergetic bases of microbial metabolism. Primary and secondary metabolic processes. Respiration, fermentation and regulation of microbial metabolism. 4. Basic methods in microbiology. Microbial growth kinetics. 5. Principles of microbial taxonomy. Biotechnology of Microorganisms 1. Ecophysiology of microorganisms: intrinsic and extrinsic factors in food that influence microbial growth. 2. Microorganisms in food (e.g. meat and poultry, eggs, milk, fresh plant products) 3. Basic methods for determining microorganisms in food. 4. Control of microorganisms in food: (e.g. use of chemicals, low and high temperatures)
Stichwörter	Cell biology; Food microorganisms; Ecophysiology; Determination

	of the number of microorganisms; Control of microorganisms
Empfohlene Voraussetzungen	
Propädeutische Lehrveranstaltungen	None
Unterrichtsform	Lectures and laboratory activities. Recording of lectures. Group activities among participants (collaborative problem solving).
Anwesenheitspflicht	No
Spezifische Bildungsziele und erwartete Lernergebnisse	Knowledge and understanding: Upon completion of their studies, graduates with a bachelor's degree in Food and Enogastronomy Sciences will have acquired a solid foundation of scientific knowledge in disciplines such as chemistry, physics, biology, mathematics, computer science, and law, specifically applied to the food and gastronomic sector. They will gain technological skills for managing production and transformation processes, along with an integrated view of the quality, safety, and sustainability of food supply chains and systems. In addition, graduates will understand the principles related to waste reduction, resource optimization, and the reconciliation of economics and ethics, which are central elements for addressing the modern challenges of the agri-food system. The knowledge and understanding skills mentioned above are acquired through participation in lectures, practical exercises, seminars, and through guided personal study and individual study as provided by the activated educational activities. The verification of the achievement of learning outcomes is mainly carried out through exams and any interim tests. The tests may be written and/or oral, and may also consist of reports and oral presentations of projects or seminars. Ability to apply knowledge and understanding: Students will be able to practically apply the knowledge they have acquired, developing the ability to solve complex problems in the food and gastronomic sector. Thanks to a wide range of practical activities, such as laboratories, internships, workshops, and seminars, they will be able to use chemical, physical, sensory, and microbiological analysis methods to evaluate the quality and safety of food and production processes.

	The achievement of the ability to apply knowledge is accomplished through critical reflection on the texts proposed for individual study, stimulated by classroom activities, the study of research and application cases presented by the professors, the performance of practical laboratory exercises, fieldwork, bibliographic research, the completion of individual and/or group projects included in the core and elective courses of the curriculum, as well as during internships and the preparation of the final exam. The assessments, carried out through written and/or oral exams, reports, and exercises, involve the completion of specific tasks in which the student demonstrates mastery of tools, methodologies, and critical autonomy. During internships, the assessment is conducted through the presentation of a report by the student to the supervising professor. Making judgements: Evaluate and critically analyze the quality, safety, and sustainability of production processes and food products, considering scientific, technological, economic, and cultural aspects. Students will be able to make informed decisions based on scientific data and the analysis of production contexts to ensure the excellence of the final product. Apply ethical and sustainable approaches, reconciling economic needs with environmental and social requirements. Graduates will be able to identify solutions to reduce waste, enhance by-products, and optimize resource use, proposing food production models in line with the principles of the circular economy. Communication skills: Communicate effectively and appropriately with both technical and non-technical interlocutors, including professionals in the food and gastronomic sector, public and private institutions, and the general public. This includes the ability to adapt the communication style based on the audience, using the specific technical language of the food and gastronomic sector when necessary. Present and discuss the results of their analyses and research in both written and oral form, using technological and multimedia tools. Graduates will be able to draft technical reports, research papers, and scientific documents, as well as present their results clearly and structured, for example during conferences, seminars,

	or business meetings. Actively participate in discussions and group work in multidisciplinary and international contexts, demonstrating active listening, negotiation, and collaboration skills. Practical experiences and internships will provide students with the abilities to work effectively in teams and contribute to solving complex problems in the sector. Use the three languages of instruction of the course (Italian, German, and English) fluently and confidently, both for written and oral communication. Thanks to the trilingual approach of the Free University of Bozen-Bolzano, graduates will be able to face international work contexts, participate in global networks, and contribute to the development of international cooperation projects to address the challenges of the food and gastronomic sector. Learning skills: At the end of the degree program, graduates will have developed strong learning skills, essential for successfully continuing academic studies and entering the workforce. In particular, they will be able to: Learn autonomously and continuously, keeping up to date with scientific and technological advancements in the food and gastronomic sector. Graduates will have acquired study methods and research tools that will allow them to independently update their skills, critically interpreting new knowledge. Effectively manage the learning of complex concepts by integrating the various scientific and technical disciplines covered in the degree program, such as chemistry, biology, food technologies, economics, and law. They will be able to identify the most relevant sources, understand and apply new methodologies, and adapt to sector developments. Develop collaborative learning strategies, thanks to the experience gained through group work, internships, and laboratory activities. Graduates will be able to share their knowledge and learn from others, demonstrating adaptability and teamwork skills. Continue their studies independently in Master's degree programs (such as the LM-70 class, Food Science and Technology, currently offered at the same university) or in other related fields, using the skills and methods acquired during the bachelor's degree to tackle

	new learning challenges, even in high-level academic and professional contexts.
Spezifisches Bildungsziel und erwartete Lernergebnisse (zusätzliche Informationen)	
Art der Prüfung	The assessment consists of two separate written tests, one for each module, including questions designed to assess the knowledge and skills acquired during the course, including those developed through laboratory activities. The final grade will be calculated as the credit-weighted average of the grades obtained in the two modules.
Bewertungskriterien	Clarity of responses and appropriate vocabulary, ability to summarize, relevance of topics covered and ability to elaborate.
Pflichtliteratur	The lecturer will provide specific material (PowerPoint presentations) for each topic covered in the course. Lecture notes are strongly recommended as study material.
Weiterführende Literatur	BROCK, Biologia dei Microrganismi - Microbiologia generale, ambientale e industriale. XIV edizione (Eds. M.T. Madigan, J.M. Martinko, K.S. Bender, D. H., Buckley, D. A. Stahl). Microbiologia dei Prodotti Alimentari. G.A. Farris, M. Gobbetti, E. Neviani e M. Vincenzini, Casa Editrice Ambrosiana (2012).
Weitere Informationen	
Ziele für nachhaltige Entwicklung (SDGs)	Nachhaltiger Konsum und Produktion, Gesundheit und Wohlergehen

Kursmodul

Titel des Bestandteils der Lehrveranstaltung	Biologie und Biotechnologie der Lebensmittelmikroorganismen
Code der Lehrveranstaltung	40455A
Wissenschaftlich-disziplinärer Bereich	AGRI-08/A
Sprache	Italienisch
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	6
Verantwortliche/r Dozent/in	
Vorlesungsstunden	36
Laboratoriumsstunden	24
Stunden für individuelles Studium	90
Vorgesehene Sprechzeiten	18
Inhaltsangabe	The part of the course dealing with the biology of food related microorganisms covers the elements of biology, cytology and biochemistry of microorganisms, the more technical aspects of cultivation, growth, isolation and identification of microorganisms and their taxonomic classification. The part of the course dealing with the biotechnology of food microorganisms covers aspects of microbial ecophysiology, the determination and control of microorganisms in food, as well as the distribution of microorganisms in food as well as the distribution of spoilage and pathogenic microorganisms in plant- and animalbased food.
Themen der Lehrveranstaltung	
Unterrichtsform	As reported in general course description
Pflichtliteratur	As reported in general course description
Weiterführende Literatur	

Kursmodul

Titel des Bestandteils der Lehrveranstaltung	Sekundäre Metaboliten
Code der Lehrveranstaltung	40455B
Wissenschaftlich-disziplinärer Bereich	CHEM-07/B

Sprache	Italienisch
Dozenten/Dozentinnen	Prof. Youry Pii, Youry.Pii@unibz.it https://www.unibz.it/en/faculties/agricultural-environmental-food-sciences/academic-staff/person/33704
Wissensch. Mitarbeiter/Mitarbeiterin	
Semester	Zweites Semester
KP	2
Verantwortliche/r Dozent/in	
Vorlesungsstunden	12
Laboratoriumsstunden	8
Stunden für individuelles Studium	45
Vorgesehene Sprechzeiten	6
Inhaltsangabe	This course deals with the definition and role of secondary metabolites in food, considering, mainly focusing on their functions in terms of health benefits. Emphasis will be placed on understanding key classes of metabolites, including alkaloids, flavonoids, terpenes, glucosinolates, and tannins, with examples from plant and fungal sources. Case studies will illustrate how these metabolites enhance product quality and offer functional health benefits.
Themen der Lehrveranstaltung	Definition of secondary metabolites Basics of secondary metabolism Main categories of secondary metabolites: Alkaloids; Flavonoids; Terpenes; Glucosinolates; and Tannins Traditional vs. biotechnological methods for the production of secondary metabolites Application in food industry
Unterrichtsform	The course combines lectures, and laboratory activities: Lectures: frontal lessons in which the main topics are presented and discussed. Lectures are highly participatory, and students are expected to engage actively through questions, discussions, and in-class exercises. Practical and laboratory sessions : hands-on activities aimed at applying and consolidating theoretical knowledge. Teaching materials will be presented mainly through

	PowerPoint slides. All slides will be uploaded in advance on the Microsoft Teams platform, ensuring that students can access them before class. All the frontal lectures will be recorded and made available on the Microsoft Teams platform.
Pflichtliteratur	Power Point slides used for the frontal lectures and scientific literature supplied by the teacher during the course
Weiterführende Literatur	