Freie Universität Bozen
Libera Università di Bolzano
Università Liedia de Bulsan

Syllabus
Course description

Course title	Biology of microorganisms and secondary metabolites
Course code	40455
Scientific sector	Module I: AGR16 Module II: CHIM10
Degree	Bachelor in Food and Enogastronomy Sciences (L-26)
Semester	II
Year	2025-2026
Credits	8 = 6 (AGR16) + 2 (CHIM10)
Modular	*Yes*

Total lecturing hours	- Module I: Biology and Biotechnology of Food Microorganisms **(36 hours)** - Module II: Secondary metabolites (12 hours)
Total lab hours	- Module I: Biology and Biotechnology of Food Microorganisms **(24 hours)** - Module II: Secondary metabolites (8 hours)
Total exercise hours	-
Attendance	Strongly recommended
Prerequisites	
Course page	

Specific educational objectives	Biology and Biotechnology of Food Microorganisms (Module I): - 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 micro-organisms in food as well as the distribution of spoilage and pathogenic microorganisms in plant- and animal-based food. - Secondary Metabolites (Module II): This module addresses the role of secondary metabolites of food interest, focusing primarily on their functions in terms of health benefits. Particular emphasis will be placed on understanding the main classes of metabolites, including alkaloids, flavonoids, terpenes, glucosinolates, and tannins, with examples from plant and fungal sources.

	Specific studies will illustrate how these metabolites enhance product quality and provide functional health benefits.	

Module 1	Biology and Biotechnology of Food Microorganisms
Lecturer	**Raffaella Di Cagno, office, raffaella.dicagno@unibz.it tel. +39 0471 017216; ICOFF - NOI; Home - Micro4food**
Scientific sector of the lecturer	**AGR/16**
Teaching language	**Italian**
Office hours	**Monday to Friday, to be agreed by e-mail**
Teaching assistant *(if any)*	**To be defined**
Office hours	
List of topics covered	- Principî di biologia cellulare dei procarioti: morfologia, organizzazione ed espressione del genoma, citologia, chemiotassi. - Struttura cellulare degli eucarioti - Virus, in particolare i batteriofagi. - Basi biochimiche e bioenergetiche del metabolismo microbico. - Processi metabolici principali e secondari. - Respirazione, fermentazione e regolazione del metabolismo microbico. - Metodiche di base in microbiologia. Cinetica della crescita microbica in sistemi continui e discontinui. Esame morfologico e colturale dei microrganismi. - Principî di tassonomia microbica. - Ecofisiologia dei microrganismi: fattori intrinseci ed estrinseci degli alimenti che influenzano la crescita microbica. - I microrganismi degli alimenti (es. carne e pollame, uova, pesce, latte) - Metodiche di base per la determinazione dei microrganismi negli alimenti. - Controllo dei microrganismi negli alimenti.
Teaching format	*Frontal lectures, exercises, labs, projects, etc.*

Module 2	Secondary metabolites
Lecturer	Luigimaria Borruso, BZ K1.05, luigimaria.borruso@unibz.it, +39 0471 017610
Scientific sector of the lecturer	CHIM/10
Teaching language	Italian
Office hours	Da lunedì a venerdì, da concordare per mail
Teaching assistant (if any)	-
List of topics covered	Definition of secondary metabolites Ecological importance Basics of secondary metabolism Food applications

	Main categories of secondary metabolites: Alkaloids; Flavonoids; Terpenes; Glucosinolates; and Tannins
Teaching format	The course includes lectures and laboratory activities. The assessment of the student's preparation is conducted through an oral exam. The exam includes questions to verify the understanding of the topics covered in the course. Additionally, questions regarding the possible practical implications of the topics taught in the course will be evaluated.

Learning outcomes	***Module I:*** Biology and Biotechnology of Food Microorganisms ***Knowledge and understanding*** *of basic and laboratory skills for the cultivation, growth, isolation and identification of food-related microorganisms and the techniques for the control of spoilage and pathogenic microorganisms in food.* ***Applying knowledge and understanding*** *capability to access information effectively, empowering individuals to adeptly navigate and apply the principles of biology and biotechnology of food related microorganisms* ***Making judgments*** *through the practical and theoretical knowledge achieved during the course, to transform the acquired knowledge applicable to further domains of food microbiology.* ***Communication skills*** *to present knowledge with a language pertinent to this specific field.* ***Learning skills*** *to effectively navigate the fundamental concepts of cultivation, identification and control of food related microorganisms.* **Module II: Secondary metabolites** **Knowledge and understanding** of plant secondary metabolites, ecological interactions, and their potential applications in food. **Applying knowledge** to analyze and identify plant secondary metabolites, understanding their chemical properties and biological activities. **Judgment skills** to evaluate the significance of secondary metabolites in food safety, flavor, and preservation, as well as their potential health benefits or risks. **Communication skills** to effectively present the role of plant secondary metabolites, using relevant terminology for the field of plant biology and food science. **Learning skills** to explore the fundamental concepts of plant secondary metabolites and their practical applications in food and biotechnological industries.

Assessment	The course exam consists of a written test divided between the two modules, with questions aimed at assessing the knowledge and understanding of the topics covered, as well as questions designed to evaluate the application of the skills acquired in biology and biotechnology food related microorganisms and secondary metabolism.
Assessment language	Italian
Evaluation criteria and criteria for awarding marks	Ability to clearly present the topics studied during the course using appropriate technical terminology. Additionally, the ability to establish connections between different topics will be evaluated.

Required readings	- Course topics dealing with biology and biotechnology of food related microorganisms will be covered with the help of Power Point presentations - Notes and other teaching materials from the lectures. - Natural Secondary Metabolites, *Márcio Carocho Sandrina A. Heleno Lillian Barros Natural Secondary Metabolites*
Supplementary readings	- Brock, Biologia dei microrganismi Vol. 1 Microbiologia generale (casa editrice Ambrosiana); Brock, Biologia dei Microrganismi - Microbiologia Ambietale e Industriale (ed. Pearson) Lehninger Principi di Biochimica, *David L. Nelson Michael M. Cox*