

Syllabus

Course Description

Course Title	Industrial microbiology for food quality improvement
Course Code	44716
Course Title Additional	
Scientific-Disciplinary Sector	AGRI-08/A
Language	English
Degree Course	Master in Food Sciences for Innovation and Authenticity
Other Degree Courses (Loaned)	
Lecturers	Dr. Alessia Levante, Alessia.Levante@unibz.it https://www.unibz.it/en/faculties/agricultural-environmental-food-sciences/academic-staff/person/44382
Teaching Assistant	
Semester	First semester
Course Year/s	2
CP	6
Teaching Hours	60
Lab Hours	-
Individual Study Hours	90
Planned Office Hours	18
Contents Summary	-
Course Topics	The course provides knowledge and tools to understand and apply industrial microbiology to food quality, safety, stability and innovation, with particular attention to fermented foods and controlled microbial processes. The main topics are: - targeted overview of microbial physiology, metabolism, genetics and growth relevant to food systems; - intrinsic and extrinsic factors affecting microbial growth, survival, adaptation and metabolite production in foods;

	- beneficial microorganisms and microbial starters: selection, technological functionality, sensory quality, safety and stability of fermented products; - innovative fermentations for food quality improvement, including novel fermented ingredients, valorisation of food matrices and by-products, biopreservation, protective cultures and antimicrobial metabolites; - precision fermentation and controlled microbial production of ingredients, enzymes, proteins and functional molecules for food applications; - single-cell proteins and microbial biomass as sustainable ingredients: microorganisms of interest, substrates, quality, safety and regulatory aspects; - practical aspects of industrial fermentations: types of bioreactors and vessels, batch, fed-batch and continuous fermentations, control of process parameters, scale-up and monitoring; - upstream processing: strain selection, inoculum preparation, medium formulation and sterilisation, substrate and raw material management; - downstream processing: biomass separation, product recovery and purification, stabilisation, formulation and evaluation of final quality; - spoilage and pathogenic microorganisms: control principles, sanitation, thermal and non-thermal treatments, shelf-life and hygienic safety; - principles and applications of predictive microbiology, interpretation of growth curves and critical use of experimental data.
Keywords	
Recommended Prerequisites	
Propaedeutic Courses	
Teaching Format	
Mandatory Attendance	No
Specific Educational Objectives and Learning Outcomes	General learning goal. The course contributes to training students who can interpret and manage the role of microorganisms in food systems, linking microbiological principles, industrial processes and objectives related to quality, safety, shelf-life, authenticity and innovation. At the end of the course, students will be able to:

	1. Knowledge and understanding: describe the structure, physiology, metabolism, genetics and growth/survival dynamics of microorganisms relevant to foods; explain the role of beneficial, spoilage and pathogenic microorganisms in food processes. 2. Applying knowledge and understanding: apply concepts of microbial growth, environmental factors, sanitation, fermentation and predictive microbiology to case studies related to food quality, safety, shelf-life and product development. 3. Making judgements: critically analyse microbiological data, growth/inactivation curves, experimental results and scientific papers, evaluating their limitations, significance and industrial implications. 4. Communication skills: present and discuss a case study or scientific paper clearly, using appropriate microbiological terminology and linking results, methods and industrial applications. 5. Learning skills: independently retrieve, read and interpret scientific and technical material on industrial food microbiology, updating knowledge on emerging methods and applications.
Specific Educational Objectives and Learning Outcomes (additional info.)	
Assessment	The course is graded on a 30-point scale and consists of a final oral examination aimed at verifying the expected learning outcomes. The examination includes: 1. critical discussion of a scientific paper or case study assigned or agreed with the lecturer, related to the course topics (50% of the final grade). Assessment will consider understanding of the context, ability to describe aims and methods, interpretation of results, critical analysis of study limitations and connection with industrial applications; 2. questions on the theoretical and applied topics of the programme (50% of the final grade). Assessment will consider correctness of knowledge, ability to connect concepts, use of discipline-specific terminology and ability to apply microbiological principles to problems of quality, safety, shelf-life and fermentation. During the course, formative activities such as quizzes, exercises or case-study discussions may be proposed.

	These activities are intended for self-assessment and feedback and do not contribute to the final grade, unless otherwise formally communicated at the beginning of the course. The result is communicated at the end of the examination and recorded through ESSE. 3. No supporting materials are allowed during the examination, except those expressly authorised by the lecturer or included in compensatory measures approved by the University Reception and Inclusion Centre.
Evaluation Criteria	
Required Readings	Compulsory materials for exam preparation: • slides, handouts, exercises, case studies and selected scientific papers uploaded to the ELLY platform; • lecture notes, integrated with the materials provided by the lecturer. Recommended materials for further study; • open-access scientific articles or reviews indicated during the course; • institutional and technical-scientific resources on food safety, quality and predictive microbiology, when indicated on ELLY. Slides and materials uploaded to ELLY are an integral part of the teaching material. Non-attending students are required to check ELLY regularly.
Supplementary Readings	
Further Information	
Sustainable Development Goals (SDGs)	Zero hunger, Responsible consumption and production, Good health and well-being