Syllabus

Course Description

Course Title	Microbiology and Agroindustries
Course Code	40194
Course Title Additional	
Scientific-Disciplinary Sector	
Language	Italian
Degree Course	Bachelor in Agricultural, Food and Mountain Environmental Sciences
Other Degree Courses (Loaned)	
Lecturers	Dr. Lorenzo Brusetti, Lorenzo.Brusetti@unibz.it https://www.unibz.it/en/faculties/agricultural-environmental-food-sciences/academic-staff/person/27178 Dr. Edoardo Longo, Edoardo.Longo@unibz.it https://www.unibz.it/en/faculties/agricultural-environmental-food-sciences/academic-staff/person/35783 Prof. Emanuele Boselli, Emanuele.Boselli@unibz.it https://www.unibz.it/en/faculties/agricultural-environmental-food-sciences/academic-staff/person/37607 Dr. Hafiz Husnain Nawaz, HafizHusnain.Nawaz@unibz.it https://www.unibz.it/en/faculties/agricultural-environmental-food-sciences/academic-staff/person/48928 dr. Martina Moretton, Martina.Moretton@unibz.it https://www.unibz.it/en/faculties/agricultural-environmental-food-sciences/academic-staff/person/53223
Teaching Assistant	dr. Federica Piergiacomo Dott. Lorenzo Lovatti
Semester	Second semester

Course Year/s	2
CP	15
Teaching Hours	94
Lab Hours	56
Individual Study Hours	225
Planned Office Hours	45
Contents Summary	The course is part of the characterizing courses of the Bachelor Programme and in particular of the disciplinary field of microbiology and food technology. The aim of the course is to provide the students with general scientific contents and methods and, in addition, to transfer specific and professional competencies. The first disciplinary aim of the Course is to describe the fundamental knowledge enabling the comprehension of the role of microorganisms on the life of the planet, giving special emphasis in the food and environmental sector. The student will know how the bacterial cell works, its metabolism, its genetic characteristics, its role in the soil, biogeochemical cycles and its biotransformation. The second disciplinary aim is to gain knowledge on the comprehension of the main food processing technologies: milk and dairy products, food lipids and edible oils, wine and beer. The student will gain specific knowledge on the main processing operations related to these food products, and their effects in relation to the quality, stability and shelf life of the derived foods.
Course Topics	- Introduction to microbiology - The bacterial and archaeal cell - The bacterial behaviour - The bacterial spore and the cell differentiation - Evolution and bacterial genetics - Bacterial metabolism - Techniques used in microbiology - Cycles of the elements - Bacterial ecology - Bacterial populations in extreme environments, rumen and gastrointestinal tract, soil and rhizosphere (mycorrhiza, etc); - Plant Growth Promoting Rhyzobacteria - Biocontrol agents against phytopathogenic insects; Bacillus thuringiensis

	- Metanogenesis and hydrogen production; Biofuels - Wastewater treatment; bioremediation; material biodeterioration and biorestoration through bacteria For each agro-industrial supply chain considered, the production process of the main products is illustrated using a common teaching scheme that includes: Definition of the product Characteristics of the raw materials Description of the processing technology Food product quality. In detail, the course covers the following topics: Technology of milk and dairy products Chemical and physical properties of milk Classification of dairy products Dairy processing technologies Quality evaluation Technology of oils, fats and derived products Chemical and physical properties of edible oils and fats Classification of oils and fats Processing technologies Quality evaluation Production of speck. Wine production technology Characteristics of musts and wines Winemaking technologies Additives, processing aids, and wine stabilization processes Quality evaluation. Brewing technology Characteristics of raw materials for beer production Types of beers and brewing processes Storage and quality evaluation. Elements of bakery technology.

Keywords	Microbiology Agro-Industries
Recommended Prerequisites	None
Propaedeutic Courses	no
Teaching Format	Frontal lectures, practical exercises, laboratory activities, innovative projects and/or educational visits.
Mandatory Attendance	no
Specific Educational Objectives and Learning Outcomes	Knowledge and comprehension capacity of the role of microorganisms in the chemical transformations in the environmental and food field and of the effects of the main unit operations on the quality of foods. Capacity to transfer the knowledge and the comprehension through the development of the horizontal integration capacity of the acquired information (technological, chemical, microbiological) and the ability to draw information from practical laboratory activities to support / integrate theoretical information of the lectures; ability to identify and implement process optimization strategies also through the development of practical skills such as flow charts, risk analysis and evaluation of production yields in the food sector. Autonomous judgement ability to identify the information necessary to understand the agroenvironmental processes supported by microbial communities, and to implement interventions aimed at improving the quality and efficiency of food production. Communication ability to present knowledge to a specialized and non-specialized audience with a proper vocabulary and pertinent to the discipline. Capacity of permanently knowledge through the use of technical tools enabling the independent acquisition of information and updated knowledge in the microbiological and food technologies.
Specific Educational Objectives and Learning Outcomes (additional info.)	
Assessment	Written exam
Evaluation Criteria	The course examination consists of a written test, divided into two parts corresponding to the two modules, which includes questions to assess knowledge and understanding of the topics covered in

	each module, as well as questions aimed at evaluating the ability to transfer these competences to applied cases in agro-environmental microbiology and food technologies.
Required Readings	Lecture notes and other teaching materials from the course are available on the course digital platform.
Supplementary Readings	• Dehò G., Galli E. "Biologia dei microrganismi", 2019, Casa Editrice Ambrosiana, Milano • Madigan M.T. et al. Brock: biologia dei microrganismi. microbiologia generale, ambientale e industriale. Pearson Ed. Milano. 2022. ISBN-10 : 8891906298 Biavati B., Sorlini C. "Microbiologia agroambientale", 2008, Casa Editrice Ambrosiana, Milano Cabras P., Martelli A., *Chimica degli Alimenti*, Piccin C. Pompei, *Operazioni Unitarie della Tecnologia Alimentare*, Casa Editrice Ambrosiana
Further Information	
Sustainable Development Goals (SDGs)	Good health and well-being, Clean water and sanitation, Affordable and clean energy, Climate action, Sustainable cities and communities, Responsible consumption and production, Industry, innovation and infrastructure

Course Module

Course Constituent Title	Biology of Microorganisms and Agricultural Microbiology
Course Code	40194A
Scientific-Disciplinary Sector	AGRI-08/A
Language	Italian
Lecturers	Dr. Lorenzo Brusetti, Lorenzo.Brusetti@unibz.it https://www.unibz.it/en/faculties/agricultural-environmental-food-sciences/academic-staff/person/27178 Dr. Hafiz Husnain Nawaz, HafizHusnain.Nawaz@unibz.it https://www.unibz.it/en/faculties/agricultural-environmental-food-sciences/academic-staff/person/48928
Teaching Assistant	dr. Federica Piergiacomo

Semester	Second semester
CP	9
Responsible Lecturer	
Teaching Hours	58
Lab Hours	32
Individual Study Hours	135
Planned Office Hours	27
Contents Summary	- Introduction to microbiology - The bacterial and archaeal cell - The bacterial behaviour - The bacterial spore and the cell differentiation - Evolution and bacterial genetics - Bacterial metabolism - Techniques used in microbiology - Cycles of the elements - Bacterial ecology - Bacterial populations in extreme environments, rumen and gastrointestinal tract, soil and rhizosphere (mycorrhiza, etc); - Plant Growth Promoting Rhyzobacteria - Biocontrol agents against phytopathogenic insects; Bacillus thuringiensis - Metanogenesis and hydrogen production; Biofuels - Wastewater treatment; bioremediation; material biodeterioration and biorestoration through bacteria
Course Topics	- Introduction to microbiology - The bacterial and archaeal cell - The bacterial behaviour - The bacterial spore and the cell differentiation - Evolution and bacterial genetics - Bacterial metabolism - Techniques used in microbiology - Cycles of the elements - Bacterial ecology - Bacterial populations in extreme environments, rumen and gastrointestinal tract, soil and rhizosphere (mycorrhiza, etc); - Plant Growth Promoting Rhyzobacteria - Biocontrol agents against phytopathogenic insects; Bacillus thuringiensis

	- Metanogenesis and hydrogen production; Biofuels - Wastewater treatment; bioremediation; material biodeterioration and biorestoration through bacteria
Teaching Format	The course consists of classroom lectures during which the various topics are presented by the instructor. The lectures will be recorded. Laboratory activities are also planned, to be conducted by the lecturer and teaching assistants. The lecture topics will be presented using PowerPoint presentations, which will be made available online in digital format by the instructor at the end of each topic.
Required Readings	Teaching material provided by the lecturer and available on the Teams platform.
Supplementary Readings	• Dehò G., Galli E. "Biologia dei microrganismi", 2019, Casa Editrice Ambrosiana, Milano • Madigan M.T. et al. Brock: biologia dei microrganismi. microbiologia generale, ambientale e industriale. Pearson Ed. Milano. 2022. ISBN-10 : 8891906298 Biavati B., Sorlini C. "Microbiologia agroambientale", 2008, Casa Editrice Ambrosiana, Milano

Course Module

Course Constituent Title	Agro-industries
Course Code	40194B
Scientific-Disciplinary Sector	AGRI-07/A
Language	Italian
Lecturers	Dr. Edoardo Longo, Edoardo.Longo@unibz.it https://www.unibz.it/en/faculties/agricultural-environmental-food-sciences/academic-staff/person/35783 Prof. Emanuele Boselli, Emanuele.Boselli@unibz.it https://www.unibz.it/en/faculties/agricultural-environmental-food-sciences/academic-staff/person/37607 dr. Martina Moretton, Martina.Moretton@unibz.it https://www.unibz.it/en/faculties/agricultural-environmental-food-

	sciences/academic-staff/person/53223
Teaching Assistant	Dott. Lorenzo Lovatti
Semester	Second semester
CP	6
Responsible Lecturer	
Teaching Hours	36
Lab Hours	24
Individual Study Hours	90
Planned Office Hours	18
Contents Summary	For each food supply chain, the production process of the main products is illustrated using a common teaching scheme which includes: 1. Definition of the food product 2. Characteristics of raw materials 3. Description of the processing technology 4. Quality of the food product In detail, the course includes the following topics: - Technology of oils, fats and derivatives - Wine production technology - Milk and dairy products technology - Brewing technology
Course Topics	For each agro-industrial supply chain considered, the production process of the main products is illustrated using a common teaching scheme that includes: Definition of the product Characteristics of the raw materials Description of the processing technology Food product quality. In detail, the course covers the following topics: Technology of milk and dairy products Chemical and physical properties of milk Classification of dairy products Dairy processing technologies

	Quality evaluation Technology of oils, fats and derived products Chemical and physical properties of edible oils and fats Classification of oils and fats Processing technologies Quality evaluation Production of speck. Wine production technology Characteristics of musts and wines Winemaking technologies Additives, processing aids, and wine stabilization processes Quality evaluation. Brewing technology Characteristics of raw materials for beer production Types of beers and brewing processes Storage and quality evaluation. Elements of bakery technology.
Teaching Format	Frontal lectures, practical exercises, laboratory activities, innovative projects and/or educational visits.
Required Readings	Lecture notes and other teaching materials from the course are available on the course digital platform.
Supplementary Readings	Cabras P., Martelli A., *Chimica degli Alimenti*, Piccin C. Pompei, *Operazioni Unitarie della Tecnologia Alimentare*, Casa Editrice Ambrosiana