



General information	
Academic subject	<b>Food Microbiology</b>
Degree course	<i>Master's degree in food science and technology</i>
Academic Year	<i>First</i>
European Credit Transfer and Accumulation System (ECTS)	6
Language	<i>Italian</i>
Academic calendar (starting and ending date)	<i>Second semester (27<sup>th</sup> Feb – 16<sup>th</sup> Jun 2023)</i>
Attendance	<i>No compulsory</i>

Professor/ Lecturer	
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Department and address	<i>Dept of Soil, Plant and Food Science (DiSSPA) – section of microbiology</i>
Virtual headquarters	<i>Microsoft Teams</i>
Tutoring (time and day)	Monday – Friday (09:00 – 16:00), upon agreement

Syllabus	
<b>Learning Objectives</b>	<i>The module concerns application cases and / or case studies about the main industrial issues and problems in terms of characterization, management, and conditioning of the sensory, nutritional, and hygienic quality of food products with a specific respect to those obtained from animals (e.g., dairy products, meat products and functional foods) and vegetable (e.g., leavened baked goods, fermented fruit and vegetable products, and functional foods).</i>
<b>Course prerequisites</b>	<i>Principles of biochemistry and fermented food microbiology</i>
<b>Contents</b>	<i>Endogenous enzymes of milk and their pro-technological contribution. Purification, characterization, and use of microbial enzymes in dairy processes. Use of bacterial starters in the dairy industry. Biotechnological methodologies to characterize the dairy products: case studies. Factors influencing the development of microbiota in sourdough. Bio-preservation of leavened baked products. Gastrointestinal microbiota and diet. Definition of intestinal homeostasis and dysbiosis affected by celiac disease: case studies. Quorum-sensing and food microorganisms.</i>
<b>Books and bibliography</b>	<i>Articles and scientific reviews from sector literature will be provided during the course. A copy of the printed material is available to students in the Food Microbiology section.</i> <i>L. Cocolin, M. Gobbetti, E. Neviani. Microbiologia alimentare applicata, Casa Editrice Ambrosiana. (2022).</i> <i>V. Bottazzi. Microbiologia lattiero-casearia, Edagricole.</i> <i>C.A. Batt e P.D. Patel. Encyclopedia of Food Microbiology, Academic Press.</i> <i>P.F. Fox, P.L.H. McSweeney, T.M. Cogan e T.P. Guinee. Cheese Chemistry, Physics and microbiology, Terza Edizione, Elsevier Academic Press.</i> <i>Wood, B.J.B. Microbiology of Fermented Foods. 2.a ed. Glasgow: Blackie Academic &amp; Professional (1998).</i>

	<i>De Felip, G. Recenti Sviluppi di Igiene e Microbiologia degli Alimenti. Milano: Tecniche Nuove (2001).</i> <i>M. Gobetti, A. Corsetti (Ed.). Biotecnologia dei prodotti lievitati da forno. Casa Editrice Ambrosiana. (2010).</i>
<b>Additional materials</b>	<i>Notes from the lectures and didactic material distributed during the course integrate the contents of books listed above.</i>

<b>Work schedule</b>			
Total	Lectures	Hands on (Laboratory, working groups, seminars, field trips)	Out-of-class study hours/ Self-study hours
<b>Hours</b>			
150	40	14	96
<b>ECTS</b>			
6	5	1	
<b>Teaching strategy</b>			
		<i>Lectures and exercises in the class or laboratory.</i>	
<b>Expected learning outcomes</b>			
<b>Knowledge and understanding on:</b>		<ul style="list-style-type: none"> <li>○ Knowledge that can be spent in the management of issues related to the food industry processing animal or vegetable derivate.</li> <li>○ Ability to identify strategies in terms of microbiological process development aimed at identifying a suitable microorganism for obtaining a defined metabolite.</li> </ul>	
<b>Applying knowledge and understanding on:</b>		<ul style="list-style-type: none"> <li>○ Ability to identify innovative strategies, in the context of food transformation processes, aimed at the selection of starter microorganisms through which certain metabolites can be obtained.</li> </ul>	
<b>Soft skills</b>		<ul style="list-style-type: none"> <li>● <i>Making informed judgments and choices</i> <ul style="list-style-type: none"> <li>○ Ability to evaluate and manage interventions aimed at improving the sensory, nutritional, and hygienic quality of animal-derived food products or vegetable ones through the application of microorganisms.</li> </ul> </li> <li>● <i>Communicating knowledge and understanding</i> <ul style="list-style-type: none"> <li>○ Ability to exhibit, using the sector terminology, problems concerning the microbiology field with a specific respect to food production.</li> </ul> </li> <li>● <i>Capacities to continue learning</i> <ul style="list-style-type: none"> <li>○ Ability to learn the cultural and operational tools necessary for the use of microorganisms in the context of food systems.</li> </ul> </li> </ul>	
The expected learning outcomes, in terms of both knowledge and skills, are provided in Annex A of the Academic Regulations of the Degree in Food Science and Technology (expressed through the European Descriptors of the qualification).			

<b>Assessment and feedback</b>	
<b>Methods of assessment</b>	<p><i>The test consists of an oral test about topics discussed during the theoretical and theoretical-practical lesson hours in the class, in the laboratory, and in during external visits, as reported in the Didactic Regulations of the Degree Course in Food Science and Technology (art.9) and in the study plan (Annex A).</i></p> <p><i>For students following the course during the year in which the teaching is carried out, an exemption test is provided, which consists of a written test on topics developed by the date of the exemption. The test will be evaluated out of thirty and in case of a positive result, the final oral exam will focus on the remaining part</i></p>



	<p><i>of the teaching program. The outcome of the exemption test contributes to the final evaluation of the exam. The exam for foreign students can be done in English in the manner described above.</i></p>
Evaluation criteria	<ul style="list-style-type: none"><li>● <b>Knowledge and understanding</b><ul style="list-style-type: none"><li>○ Describe the application and / or study cases concerning the main industrial problems in the fields of characterization, management, and conditioning of the sensory, nutritional, and hygienic quality of animal- and vegetable-derived foods.</li></ul></li><li>● <b>Applying knowledge and understanding</b><ul style="list-style-type: none"><li>○ Describe the strategies pivotal for the development of a food process that involves the use of microorganisms.</li></ul></li><li>● <b>Autonomy of judgment</b><ul style="list-style-type: none"><li>○ Expressing reasonable assumptions for the choosing of a microorganism based on the expected outcome, or connecting the required methodologies aimed at achieving the goal.</li></ul></li><li>● <b>Communicating knowledge and understanding</b><ul style="list-style-type: none"><li>○ The student will acquire communication skills and tools to analyse and discuss analytical data related to new process and products with interlocutors with similar and different backgrounds.</li></ul></li><li>● <b>Communication skills</b><ul style="list-style-type: none"><li>○ Use the technical-scientific vocabulary appropriately and justify the statements in relation to what is argued.</li></ul></li><li>● <b>Capacities to continue learning</b><ul style="list-style-type: none"><li>○ Designing innovative and original paths with technical and scientific rigor that use microorganisms to address existing problems or develop innovative ideas through the application of microbial fermentation biotechnologies aimed at solving problems in the field of the food industry.</li></ul></li></ul>
Criteria for assessment and attribution of the final mark	<p><i>The exemption will be evaluated out of thirty and if sufficient (at least 18/30) will contribute, by a weighted average, to the final evaluation. The assessment of the student's preparation takes place based on pre-established criteria, while the grade is also in accordance with what is reported in Annex B of the Degree Course Academic Regulations.</i></p>
<b>Additional information</b>	