

COURSE OF STUDY *Master degree: Food Science and Technology (LM70)*
ACADEMIC YEAR *2023-2024*
ACADEMIC SUBJECT *Starters selection and predictive microbiology*

General information	
Year of the course	<i>First</i>
Academic calendar (starting and ending date)	<i>Second semester (February 26th – June 14th, 2024)</i>
Credits (CFU/ETCS):	<i>6</i>
SSD	<i>Agricultural microbiology (AGR/16)</i>
Language	<i>Italian</i>
Mode of attendance	<i>No Compulsory</i>

Professor/ Lecturer	
Name and Surname	<i>Pasquale Filannino</i>
E-mail	<i>pasquale.filannino1@uniba.it</i>
Telephone	<i>0805442948</i>
Department and address	<i>DIP. DISSPA – Università degli Studi di Bari</i>
Virtual room	<i>Microsoft Teams: code hltde1t</i>
Office Hours (and modalities: e.g., by appointment, on line, etc.)	<i>Monday to Friday by appointment only.</i>

Work schedule			
Hours			
Total	Lectures	Hands-on (laboratory, workshops, working groups, seminars, field trips)	Out-of-class study hours/ Self-study hours
<i>150</i>	<i>40</i>	<i>14</i>	<i>96</i>
CFU/ETCS			
<i>6</i>	<i>5</i>	<i>1</i>	

Learning Objectives	The student will acquire knowledge and skills on the criteria for selecting natural and commercial microbial starters for the food industry and how to prepare and use them in relation to the main industrial needs, as well as in relation to the main sensory, hygienic, and nutritional properties of food products. The course also covers the main mathematical models for predicting microbial development in food both for the prevention of contamination by spoilage and pathogenic microorganisms and for the study of microbial interactions in complex matrices.
Course prerequisites	Knowledge of Biochemistry, General Microbiology, Food Chemistry. Knowledge of the main food technologies and food supply chains. Basic knowledge of Mathematics and Statistics.

Teaching strategy	Course topics are addressed with the aid of Power Point presentations, case study analysis, reading of regulatory texts, and classroom or laboratory practice.
Expected learning outcomes in terms of	
Knowledge and understanding on:	<ul style="list-style-type: none"> • Knowledge of the criteria for selection of natural and commercial microbial starters for the food industry. • Knowledge of the main advanced microbiological methods for selection and

	<p>production of microbial starters.</p> <ul style="list-style-type: none"> • Knowledge of the main models available for predictive microbiology applied to the food sector.
Applying knowledge and understanding on:	<ul style="list-style-type: none"> • Mastership of advanced microbiological techniques for the selection and preparation of natural and commercial microbial starters for the food industry. • Mastership of mathematical modelling techniques able to describe the microbial evolution in food products, depending on known and measurable environmental conditions.
Soft skills	<ul style="list-style-type: none"> • Making informed judgments and choices: <ul style="list-style-type: none"> ○ Ability to manage the selection process of microbial starters according to the process and product variables. ○ Ability to develop and apply models and to predict the growth of microorganisms in certain environmental conditions. ○ Ability to provide a critical interpretation of the results of microbiological analyses on food, aimed at the prediction of microbial growth, the evaluation of the effects of sanitization treatments (thermal and non-thermal), the evaluation of the commercial shelf-life of foods and food safety. • Communicating knowledge and understanding: <ul style="list-style-type: none"> ○ Ability to communicate the acquired theoretical concepts in oral and written form, using appropriately the scientific language and the specific lexicon of predictive microbiology. ○ Ability to describe, also through applicative cases, the practical aspects and potential effects of this discipline on the research and development and quality control activities in food industry. • Capacities to continue learning: <ul style="list-style-type: none"> ○ Ability to deepen and update knowledge regarding the application of starter microorganisms in the food industry, and the criteria for their selection. ○ Ability to deepen and update knowledge regarding mathematical modelling techniques and predictive microbiology applied to the food industry.
Syllabus	
Content knowledge	<ul style="list-style-type: none"> • Microbial starters for the agro-food productions: dairy products, leavened baked products, fermented meat-based products, fermented beverages, fermented pickles, and functional foods. Illustrative case studies. • Criteria for microbial starters selection. • Microbial starters production. • Scopes and development of predictive microbiology. • Mathematical models and microbial growth. • Microbiological risk and predictive models. • Primary models: microbial growth curves. Gompertz equation, Baranyi and Roberts model, Weibull model. • Secondary models: experimental drawings for the evaluation of multiple effects on microbial growth, Ratkowsky model. • Tertiary models: tools for modeling and databases.
Texts and readings	<ul style="list-style-type: none"> • Lecture notes and lecture materials provided during the course. • Cocolin L., Gobbetti M., Neviani E. "Microbiologia alimentare applicata". Casa Editrice Ambrosiana. Distribuzione Zanichelli. 2022.
Notes, additional materials	<ul style="list-style-type: none"> • Scientific papers • Gardini, F., & Parente, E. (2013). Manuale di microbiologia predittiva. Italia: Springer-Verlag.

Repository	All teaching material will be available to students on web platforms (class Teams code <i>hltde1t</i>).
Assessment	
Assessment methods	<p>The exam consists of an oral dissertation on the topics developed during the theoretical and theoretical-practical lectures in the classroom and in practical activities (laboratory and educational visits).</p> <p>Students may have a middle-term preliminary exam, consisting of a written test, relative to the first part of the program, which will concur to the final evaluation and will be considered valid for one academic year (Art. 4 of the Didactic Regulations of the Master's Degree Course in Food Science and Technology). The result of the mid-term exam is communicated by publication in the student's electronic register and contributes to the assessment of the profit examination by means of calculation of the weighted average.</p> <p>The exam for foreign students may be conducted in English as described above.</p>
Assessment criteria	<ul style="list-style-type: none"> • Knowledge and understanding: <ul style="list-style-type: none"> ○ Describing the criteria for selection of natural and commercial microbial starter for the food industry. ○ Describing the main advanced microbiological methods for the selection and preparation of microbial starter. ○ Describing the main models available for predictive microbiology applied to the food sector. • Applying knowledge and understanding: <ul style="list-style-type: none"> ○ Applying advanced microbiological techniques to the selection and preparation of natural and commercial microbial starter for the food industry. ○ Applying mathematical modelling aimed to describe microbial evolution in food products, depending on known and measurable environmental conditions. • Autonomy of judgment: <ul style="list-style-type: none"> ○ Managing the selection process of the microbial starter according to the process and product variables. ○ Developing and applying formal models to predict the growth response of microorganisms in specific environmental conditions. ○ Providing a critical interpretation of the results of microbiological analyses of food, aimed at the prediction of microbial growth, the evaluation of the effects of sanitization treatments (thermal and non-thermal), the evaluation of the commercial shelf-life of foods and food safety. • Communicating knowledge and understanding: <ul style="list-style-type: none"> ○ Describing, also through applicative cases, the practical aspects and potential consequences of this discipline on the research and development and quality control activities in food industry. • Communication skills: <ul style="list-style-type: none"> ○ Communicating the theoretical acquired concepts using the appropriate scientific language and the specific lexicon of predictive microbiology; • Capacities to continue learning: <ul style="list-style-type: none"> ○ Design a practical approach for the selection of microbial starter according to specific process and product variables. ○ Making hypothesis on the application of mathematical modeling for the interpretation of the results of microbiological analysis carried out on food, the effects of sanitizing treatments, commercial shelf-life and food safety.

Final exam and grading criteria	<p>The assessment of the student's preparation is based on predetermined criteria in accordance with the Didactic Regulations of the Master's Degree Course in Food Science and Technology (art. 4).</p> <p>The Examination Committee has a score ranging from a minimum of 18 to a maximum of 30 points for a positive assessment of the student's performance. By unanimous vote of its members, the Board may award honours in cases where the final mark is 30.</p>
Further information	
	.