General Information	
Academic subject	Starters selection and predictive microbiology
Degree course	Master degree: Food Science and Technology (LM70)
Curriculum	
ECTS credits	6 ECTS (5 ECTS Lectures + 1 ECTS Laboratory)
Compulsory attendance	No
Language	Italian

Subject teacher	Name Surname	Mail address	SSD
	Pasquale Filannino	pasquale.filannino1@uniba.it	AGR/16

ECTS credits details			
Basic teaching activities	5 ECTS Lectures	1 ECTS Laboratory	

Class schedule	
Period	Second semester
Year	First
Type of class	Lectures- Laboratory

Time management	
Hours	150
In-class study hours	54
Out-of-class study hours	96

Academic calendar	
Class begins	March 1st, 2021
Class ends	June 11th, 2021

Syllabus	
Prerequisites/requirements	Knowledge of Biochemistry, General Microbiology, Food Chemistry. Knowledge of the main food technologies and food supply chains. Basic knowledge of Mathematics and Statistics.
Expected learning outcomes	*Knowledge and understanding* o Knowledge of the criteria for selection of natural and commercial microbial starter for the food industry; o Knowledge of the main advanced microbiological methods for selection and production of microbial starter; o Knowledge of the main models available for predictive microbiology applied to the food sector. *Applying knowledge and understanding* o Mastership of advanced microbiological techniques for the selection and preparation of natural and commercial microbial starter for the food industry o Mastership of mathematical modelling techniques able to describe the microbial evolution in food products, depending on known and measurable environmental conditions *Making informed judgements and choices* o Ability to manage the selection process of microbial starter according to the process and product variables. o Ability to develop and apply models and to predict the growth of microorganisms in certain environmental conditions o 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* o Ability to communicate the acquired theoretical concepts in oral and written form, using appropriately the scientific language and the specific lexicon of predictive microbiology o 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 of continue learning* o Ability to deepen and update knowledge regarding the application of starter microorganisms in the food industry, and the criteria for their selection o Ability to deepen and update knowledge regarding mathematical modelling techniques and predictive microbiology applied to the food industry. The expected learning outcomes, in terms of knowledge and skills, are shown on Annex A of the Teaching Regulations of the Master's Degree Program (expressed through the European Descriptors of the qualification).
Contents	• Microbial starters for the agro-food production: dairy products, fermented beverages, leavened baked products, fermented meat-based products, wine, and fermented vegetables. 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, Barany model logistic equation, Weibull model. • Secondary models: experimental drawings for the evaluation of multiple effects on microbial growth, Ratkowsky model. • Tertiary models: tools for modeling and databases.
Course program	
Bibliography	• Scientific papers • Gardini, F., & Parente, E. (2013). Manuale di microbiologia predittiva. Italia: Springer-Verlag.
Notes	• Lecture notes and educational supplies provided during the course
Teaching methods	Lectures will be presented through digital tools (PowerPoint presentation, video). Laboratory classes will be performed.
Assessment methods (indicate at least the type written, oral, other)	The exam consists of an oral dissertation on the topics developed during the theoretical and theoretical-practical lectures in the classroom and in the laboratory/production plants, as reported in the Academic Regulations for the Master Degree in Food Science and Technology (article 9) and in the study plan (Annex A). Students attending at the lectures 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 a year.

	The evaluation of the preparation of the student occurs on the basis of established criteria, as detailed in Annex B of the Academic Regulations for the Master Degree in Food Science and Technology. Non-Italian students may be examined in English language, according to the aforesaid procedures.
Evaluation criteria	*Knowledge and understanding* o Describing the criteria for selection of natural and commercial microbial starter for the food industry; o Describing the main advanced microbiological methods for the selection and preparation of microbial starter; o Describing the main models available for predictive microbiology applied to the food sector. *Applying knowledge and understanding* o Applying advanced microbiological techniques to the selection and preparation of natural and commercial microbial starter for the food industry; o Applying mathematical modelling aimed to describe microbial evolution in food products, depending on known and measurable environmental conditions. *Making informed judgements and choices* o Managing the selection process of the microbial starter according to the process and product variables. o Developing and applying formal models to predict the growth response of microorganisms in specific environmental conditions o 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* o Communicating the theoretical concepts acquired using the appropriate scientific language and the specific lexicon of predictive microbiology; o 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. *Capacities of continue learning* o Design a practical approach for the selection of microbial starter according to specific process and product variables. o 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.
Further information	Visiting hours: from Monday to Thursday 9.00 a.m. – 17.30 p.m. by appointment only.