Syllabus

Course Description

Course Title	Environmental chemistry towards food processing
Course Code	44702
Course Title Additional	
Scientific-Disciplinary Sector	AGRI-06/B
Language	English
Degree Course	Master in Food Sciences for Innovation and Authenticity
Other Degree Courses (Loaned)	
Lecturers	Prof. Youry Pii, Youry.Pii@unibz.it https://www.unibz.it/en/faculties/agricultural-environmental-food-sciences/academic-staff/person/33704
Teaching Assistant	
Semester	Second semester
Course Year/s	1st
CP	8
Teaching Hours	48
Lab Hours	42
Individual Study Hours	120
Planned Office Hours	24
Contents Summary	- Elements of risk assessment of contaminants and residues in foods - Analytical techniques for contaminants detection - Biological and molecular assayes - Environmental contaminants in food - Residues in food - Process Contaminants - Genetic contamination of food
Course Topics	Introduction to the Environmental Chemistry and to the Environmental pollutants.

	Risk assessment of contaminants and residues in foods. Techniques for the detection of contaminants and residues in foods (gas chromatography-mass spectrometry, HPLC-MS, bioassays, electrochemical biosensors, PCR-based methods). Major contaminants in food: organic contaminants (e.g. dioxins, PCBs, PCNs), veterinary drug residues, agrochemicals residues, heat-generated toxicants, heavy metals and metalloids, microplastics, mycotoxins, phycotoxins and plant-derived contaminants. Genetic contamination of food. Case studies about the contamination of different classes of food commodities.
Keywords	Environmental contaminant, process contaminant, residues, agrochemicals, veterinary drugs, bioassays
Recommended Prerequisites	Basic knowledge of inorganic and organic chemistry, cell biology and microbiology
Propaedeutic Courses	None
Teaching Format	The course combines lectures, practical sessions, and laboratory activities: Lectures (48 hours): frontal lessons in which the main topics are presented and discussed. Lectures are highly participatory, and students are expected to engage actively through questions, discussions, and in-class exercises. Practical and laboratory sessions (34 hours): hands-on activities aimed at applying and consolidating theoretical knowledge. Seminar project: students will work on a project to be presented in the form of a didactic seminar, encouraging critical analysis and teamwork. The topic of the seminar project will be decided by the student in agreement with the teacher. Teaching materials will be presented mainly through PowerPoint slides. All slides will be uploaded in advance on the Microsoft Teams platform, ensuring that students can access them before class. All the frontal lectures will be recorded and made available on the Microsoft Teams platform. The course adopts innovative teaching methods, including

	collaborative problem-solving through group activities and the use of advanced information and communication technologies, such as artificial intelligence tools, to enhance learning outcomes and student engagement.
Mandatory Attendance	No
Specific Educational Objectives and Learning Outcomes	Knowledge and understanding: Deep understanding of the technological, microbiological, biochemical, chemical, and physical principles underlying food transformation processes and responsible for food product degradation, ensuring their stability and prolonging their shelf life. Knowledge of analytical methods for determining the authenticity, functionality, and microbiological safety of food products, as well as the related methodological tools for risk assessment. These knowledge areas will be developed through an educational program that integrates theoretical teaching activities with classroom tutorials, including examples, practical applications, individual and group work, and assessments aimed at encouraging active participation and independent solution development. These knowledge areas will be developed through an educational program that integrates theoretical teaching activities with practical activities, such as laboratory exercises, computer simulations, simulations of food processes using pilot plants, and company visits. Ability to apply knowledge and understanding: Ability to select and manage operations related to the traceability, authenticity, and microbiological safety of ingredients, semi-finished products, and food products, including quality assurance systems and product and process certification. Ability to plan and develop analytical techniques, innovative products, and processes using a multidisciplinary approach, with particular attention to local food productions. Making judgements: At the end of the course, graduates will be able to analyse the main issues affecting food production systems. They will be able to identify corrective solutions to resolve any non-conformities, optimise and innovate transformation processes, and improve food quality, guaranteeing authenticity.

	The assessment of the independent judgement acquired by students is entrusted to the individual teachers responsible for the training activities, who will assess it through oral and/or written reports on specific topics and/or through exams. Communication skills: Use of the English language, both written and spoken, at a B2 level, with a command of technical and scientific vocabulary related to food science. Present the contents of a scientific or technical report in a clear and understandable manner, even to a non-specialist audience. Structure and draft scientific and technical documentation describing project activities. Prepare and present technical reports in English on specialist topics; Interact and collaborate in the design and development of products and processes with peers and industry experts. Learning skills: The degree course provides graduates with the cognitive skills, logical tools and familiarity with new information technologies necessary to ensure continuous updating of knowledge, both in their specific professional field and in the field of scientific research.
Specific Educational Objectives and Learning Outcomes (additional info.)	
Assessment	The final examination will consist of a written test structured as multiple-choice questions and the presentation of the seminar project prepared during the practical activity in class. Within the multiple choice test, each item will present one correct answer among several alternatives. The examination is intended to evaluate the breadth and depth of knowledge acquired by students, as well as their capacity to recall, integrate, and apply concepts addressed during lectures, practical sessions, and laboratory activities. The multiple choice test will consist of 31 questions.

	The scoring system will assign +1 point for each correct response, –0.25 points for each incorrect response, and 0 points for omitted answers. The seminar presentation will be used as an integrative form of evaluation. It will allow students to demonstrate their ability to synthesize and critically interpret course topics, apply knowledge to practical contexts, and exercise independent judgement in selecting and presenting relevant information. At the same time, it will serve to assess communication skills—clarity, structure, and use of technical language in English—as well as learning skills, such as working independently or in groups and integrating information from different sources. The overall grade will be determined by weighting 70% of the written exam result and 30% of the seminar presentation result.
Evaluation Criteria	Students will be evaluated on their knowledge and understanding of environmental chemistry, food contaminants, and analytical detection techniques, as well as their ability to apply this knowledge to risk assessment and food safety. Critical thinking and independent judgement will be assessed through the analysis of case studies on food contamination and the proposal of appropriate solutions. Communication skills will be evaluated through the clarity and accuracy of written and oral presentations in English, while learning skills will be reflected in the ability to integrate information, connect theory with practice, and work both independently and collaboratively.
Required Readings	D. Schrenk “Chemical Contaminants and Residues in Food” Woodhead Publishing ISBN 978-0-85709-058-4.¿ Charles L. Wilson “Microbial food contamination” CRC Press ISBN-13: 978-0-8493-9076-0. Power Point slides used for the frontal lectures and scientific literature supplied by the teacher during the course
Supplementary Readings	

Further Information	
Sustainable Development Goals (SDGs)	Zero hunger, Good health and well-being, Life on land, Responsible consumption and production, Clean water and sanitation