COURSE OF STUDY *Master's degree: Food Science and Technology (LM-70)*

ACADEMIC YEAR *2023-2024*

ACADEMIC SUBJECT *Instrumental analyses for food quality (3 ECTS) - I.C. Foods and applied nutrition (9 ECTS)*

General information	
Year of the course	Second
Academic calendar (starting and ending date)	First semester (September 25th, 2023 – January 19th, 2024)
Credits (CFU/ETCS):	3
SSD	Food Science and Technology (AGR/15)
Language	Italian
Mode of attendance	No Compulsory

Professor/ Lecturer	
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Department and address	DIP. DISSPA – Università degli Studi di Bari – Via Amendola 165/a
Virtual room	Microsoft Teams: code *zo3c1fz*
Office Hours (and modalities: e.g., by appointment, on line, etc.)	Monday to Friday by appointment only.

Work schedule			
Hours			
Total	Lectures	Hands-on (laboratory, workshops, working groups, seminars, field trips)	Out-of-class study hours/ Self-study hours
75	16	14	45
CFU/ETCS			
3	2	1	

Learning Objectives	The course aims to provide knowledge on non-destructive spectroscopic techniques for monitoring the quality and authenticity of foods, as well as on instrumental analytical techniques for evaluating the structural and sensory characteristics of foods. The knowledge will be completed by a presentation of the main multivariate analysis tools useful for processing complex data.
Course prerequisites	Knowledge of the main technologies and food chains. Basic knowledge of mathematics, statistics, chemistry, and physics. Knowledge of food chemistry, food composition, and quality evaluation indices. Knowledge of analytical chemistry. The exam does not include mandatory prerequisites.

Teaching strategies	The topics of the course will be covered with the help of presentations, videos, and other teaching materials useful for completing the learning and acquisition of knowledge. Furthermore, the practical activities in the laboratory and in the classroom by free software will allow you to practically perform some of the analytical methods and calculations studied during the course.

Expected learning outcomes in terms of	
Knowledge and understanding on:	• Knowledge of the main non-destructive spectroscopic methods used for the rapid evaluation of the composition, quality and authenticity of foods • Knowledge of analytical methods for evaluating the structural and rheological properties of food products and ingredients • Knowledge of statistical approaches for the processing of multivariate analytical data • Knowledge of procedures for the development of rapid and non-destructive methods of analysis of ingredients and foods • Knowledge of multivariate data processing software
Applying knowledge and understanding on:	• Ability to define the experimental conditions for the acquisition of spectroscopic and structural data of ingredients and foods • Ability to process analytical signals using suitable multivariate analysis techniques • Ability to plan sampling according to the specific problem to be addressed (regression, classification, etc.)
Soft skills	• Making informed judgments and choices: o Ability to interpret the analytical outputs obtained o Ability to evaluate the goodness of sampling and hypothesize additions according to the goal to be achieved o Ability to autonomously evaluate the quality of a food product and to make comparisons on the basis of the analytical results achieved • Communicating knowledge and understanding: o Ability to describe the analytical methods considered in the course o Ability to argue about the characteristics of the different analytical methods considered in the course in relation to specific situations o Ability to express the theoretical concepts acquired orally and in writing, using appropriate scientific language o Ability to produce examples of application of the techniques considered to solve problems of quality and authenticity of food products • Capacities to continue learning: o Ability to hypothesize new and different fields of application of the studied techniques o Ability to hypothesize different data processing strategies to address food quality and authenticity issues o Ability to deepen and update their knowledge of non-destructive analytical methods and structure analysis
Syllabus	
Content knowledge	• Non-destructive spectroscopic and optical analysis methods: principles, theoretical background and instrumentation: - NIR - IR - Imaging - Colour • Elements of chemometrics for the exploration and processing of multivariate data. • Analysis of structure and rheology. - Texture evaluation methods; instrumentation; compression, penetration, cutting, compression-extrusion, bending, tension, adhesion tests; food applications. - Introduction to the rheology of food products; instrumentation; food applications.

	• Elements of instrumental-sensory analysis. - Principles of CG-olfactometry, nose and electronic tongue.
Texts and readings	• Cabras P., Tuberoso C.I.G. Analisi dei Prodotti Alimentari. Piccin edizioni 2010. • Skoog, Holler, Crouch. Chimica analitica strumentale. Edises 2009. • Stewart, G. F., Schweigert, B. S., Hawthorn, J., & Bourne, M. (2012). Food texture and viscosity: Concept and measurement. Academic Press. • Brereton, R. G. (2007). Applied chemometrics for scientists. John Wiley & Sons. • Lecture notes and teaching material distributed during the course.
Notes, additional materials	• Scientific papers
Repository	All teaching material will be available to students on web platforms (class Teams code *zo3c1fz*).

Assessment	
Assessment methods	The exam consists of an oral interview relating to the topics developed during the frontal teaching hours and the practical laboratory and classroom activities. It aims to evaluate the knowledge acquired about the protocols and the salient aspects (advantages and disadvantages, criticalities) of the spectroscopic, structural, and rheological analyses used for the evaluation of the composition, quality, and authenticity of foods. Sufficiency is guaranteed by a basic knowledge of the aspects mentioned, associated in any case with an appropriate mastery of the specific technical-scientific language. For students enrolled in the year of the course in which the teaching is carried out, an intermediate evaluation test (so-called exemption) is foreseen, which consists of a written test with closed and open answers on topics developed by the date of the intermediate evaluation test (art. 4 of the Teaching Regulations of the Master's Degree Course in Food Science and Technology). The intermediate exam is evaluated out of thirty and in case of a positive outcome, in the final oral exam the interview will focus on the remaining part of the teaching contents. The outcome of the intermediate test is communicated by publication on the student's electronic register and contributes to the evaluation of the exam by calculating the weighted average and is valid for one academic year. The profit exam for foreign students can be carried out in English according to the methods described above.
Assessment criteria	• Knowledge and understanding: o Clear and critical exposition of the characteristics of the analytical methods considered and of the relative instrumentation o Clear and critical exposition of possible sampling strategies for specific purposes o Clear and critical exposition of possible multivariate data analysis procedures for specific purposes • Applying knowledge and understanding: o Presentation of possible analytical protocols for the development of approaches to non-destructive analysis of foods and ingredients o Presentation of possible structural and rheological analysis protocols for specific types of food and food ingredients o Presentation of advantages and disadvantages of the studied techniques o Preparation of suitable sampling and analytical procedures to respond to specific requests (food quality or authenticity) • Autonomy of judgment: o Critical evaluation of the goodness of the analytical data obtained

	through the considered techniques ○ Evaluation of the most suitable sampling process functional to the achievement of a specific objective • Communicating knowledge and understanding: ○ Clear and effective exposition of the salient features of the analytical methods studied ○ Exposition using appropriate and specific language of the subject of study ○ Ability to use examples to describe the analytical methods studied and their possible real applications • Communication skills: ○ Communicating the theoretical concepts acquired using the appropriate scientific language and lexicon • Capacities to continue learning: ○ Hypotheses about new applications of the techniques studied to solve specific problems ○ Ability to understand, adapt and apply analytical procedures already developed in new contexts ○ Imagine the replacement of classic analysis procedures with innovative ones
Final exam and grading criteria	The evaluation of the student's preparation takes place based on pre-established criteria in accordance with what is reported in the Academic Regulations of the Degree Course in Food Science and Technology (art. 4). The examination Commission has a score ranging from a minimum of 18 up to a maximum of 30 points for the positive evaluation of the profit. With the unanimity of the members, the Commission can grant honours, in cases where the final mark is equal to 30.
Further information	
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