

**COURSE OF STUDY** *Food Science and Technology (LM70)*
**ACADEMIC YEAR** 2023-2024

**ACADEMIC SUBJECT** *Upcycling of waste and by-products for use in foods (3 ECTS) -  
I.C. Sustainability of agri-food supply chains (9 ECTS)*

General information	
Year of the course	<i>Second</i>
Academic calendar (starting and ending date)	<i>I semester (25/09/2023-19/01/2023)</i>
European Credit Transfer and Accumulation System (ECTS)	3 ECTS
Language	<i>Italian</i>
Attendance	<i>No Compulsory</i>

Professor/ Lecturer	
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Department and address	<i>DISSPA</i>
Virtual headquarters	<i>Microsoft Teams</i>
Tutoring (time and day)	Tuesday-Friday 9.00-16.00

Work schedule			
Total	Lectures	Hands on (Laboratory, working groups, seminars, field trips)	Out-of-class study hours/Self-study hours
<b>Hours</b>			
75	16	14	45
<b>ECTS</b>			
3	2	1	

<b>Learning Objectives</b>	Knowledge about the techniques of extraction of functional molecules and bioactive compounds from waste and by-products of the food industry and the possibility of use in food also with a view to improving nutritional properties and shelf-life.
<b>Course prerequisites</b>	Knowledge of chemistry, biochemistry and plant production. Knowledge of the main constituents of food.
<b>Teaching strategy</b>	Lectures will be presented through PC assisted tools (PowerPoint, video). Field and laboratory classes, reading of regulations will be experienced. Lecture notes and educational supplies will be provided by means of online platforms
<b>Expected learning outcomes in terms of Expected learning outcomes in terms of</b>	
<b>Knowledge and understanding on:</b>	Knowledge about the techniques of extraction of functional molecules and bioactive compounds from waste and by-products of the food industry and the

	possibility of use in food also with a view to improving nutritional properties and shelf-life.
<b>Applying knowledge and understanding on:</b>	<ul style="list-style-type: none"> <li>○ knowledge of the qualitative characteristics of the by-products deriving from the productive processes object of the teaching</li> <li>○ Ability to describe the methods used to exploit waste/by-product</li> <li>○ Knowledge the functional and extractable molecules from waste/by-product</li> <li>○ Knowledge of the functional molecules applications in food</li> </ul>
<b>Soft skills</b>	<ul style="list-style-type: none"> <li>• Making informed judgements and choices <ul style="list-style-type: none"> <li>○ Ability to critically analyze methodologies and processes developed to solve practical problems related to the exploitation of by-products</li> <li>○ Ability to correctly orient the search for suitable means to treat waste and by-products in order to obtain functional molecules to be used in food sector</li> </ul> </li> <li>• Communicating knowledge and understanding <ul style="list-style-type: none"> <li>○ Ability to describe possible technologies to exploit waste and by-products</li> </ul> </li> </ul> <p>Capacities to continue learning</p> <ul style="list-style-type: none"> <li>○ Ability to deepen and update the knowledge on the reuse of waste and by-products and its use for formulating high added value food</li> </ul>
<b>Syllabus</b>	
<b>Contents</b>	Environmental impact of food production and basic principles of the circular economy: main strategies to manage and exploit plant waste and by-products. Technological processes for the management of waste and by-products from different agro-food chains: pre-treatment of waste and vegetable by-products; extraction of functional and bioactive molecules. Applications in the food sector: use of waste and by-products and/or extracted molecules as functional ingredients for the production of high added value foods and for the formulation of innovative packaging.
<b>Books and bibliography</b>	Notes from lectures and laboratory classes. Presentations (in pdf) provided by the teacher. <ul style="list-style-type: none"> <li>• “Food Waste Recovery. Processing Technologies and Industrial Techniques”. Ed. Charis M. Galanakis, Academic press Elsevier, (2015)</li> <li>• Reviews scientifiche da letteratura di settore Per approfondimenti:</li> <li>• Belitz, H.-D., Grosch, W., &amp; Schieberle, P. (2009). Food chemistry. Springer.</li> <li>• Wong D. W. S., Mechanism and Theory in Food Chemistry. Springer, 1989.</li> </ul>
<b>Additional materials</b>	<i>Notes, slides and other bibliographic materials will be furnished during the course</i>
<b>Assessment</b>	
Methods of assessment	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). 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. The exam for foreign students may be conducted in English as described above.
Assessment criteria	Knowledge and understanding

	<ul style="list-style-type: none"> <li>○ Describe the main methods of treatment and/or extraction of functional molecules from waste and by-products of the agro-food supply chains</li> </ul> <p>Applying knowledge and understanding</p> <ul style="list-style-type: none"> <li>○ Describe how functional molecules from food waste and by-products are recovered and applied</li> </ul> <p>Making informed judgements and choices</p> <ul style="list-style-type: none"> <li>○ Express reasonable assumptions to improve the characteristics of food with added ingredients from waste and by-products presented as case studies</li> </ul> <p>Communicating knowledge and understanding</p> <ul style="list-style-type: none"> <li>○ Describe methods of recovery of functional molecules of waste and by-products and phenomena affecting foods presented as case studies</li> </ul> <p>Capacities to continue learning</p> <ul style="list-style-type: none"> <li>○ Envisaging a possible approach for the exploitation of a waste/by-product</li> </ul>
<p>Criteria for assessment and attribution of the final mark</p>	<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>
<p><b>Additional information</b></p>	