

**COURSE OF STUDY** *Bachelor degree: Food Science and Technology (L26)*
**ACADEMIC YEAR** 2023-2024

**ACADEMIC SUBJECT** *Unit operations of food technologies*

General information	
Year of the course	<i>First</i>
Academic calendar (starting and ending date)	<i>Second semester (March 4<sup>th</sup> – June 14<sup>th</sup>, 2024)</i>
Credits (CFU/ETCS):	6
SSD	<i>Food Science and Technology (AGR/15)</i>
Language	<i>Italian</i>
Mode of attendance	<i>No Compulsory</i>

Professor/ Lecturer	
Name and Surname	<i>Francesco Caponio</i>
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Department and address	<i>DIP. DISSPA – Università degli Studi di Bari Aldo Moro</i>
Virtual room	<i>Microsoft Teams</i>
Office Hours (and modalities: e.g., by appointment, on line, etc.)	<i>From Monday to Friday 8.30 a.m. – 1.30 p.m. and 2.30 p.m. – 5.30 p.m. previous agreement, also on line</i>

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

<b>Learning Objectives</b>	The student will acquire knowledge on the fundamental operations carried out in the agro-food industries to allow their correct application. An adequate knowledge of the main unitary operations of food technologies, as well as of the principles and laws, is essential to better understand the problems relating to food processing and storage.
<b>Course prerequisites</b>	Knowledge of the principles of mathematic and physic

<b>Teaching strategie</b>	Lectures will be presented by means of PowerPoint presentations, videos with views of real industrial plants, didactic visit, case-studies and laboratory exercitations.
<b>Expected learning outcomes in terms of</b>	
<b>Knowledge and understanding on:</b>	<ul style="list-style-type: none"> <li>• Knowledge of the main unit operations and processing technologies in food industry.</li> <li>• Knowledge of the couple processing-quality.</li> </ul>

<b>Applying knowledge and understanding on:</b>	<ul style="list-style-type: none"> <li>● Ability to understand structure-function relationships in food systems and their changes during processing.</li> <li>● Ability to apply correct processing conditions to ensure food quality and safety.</li> <li>● Ability to apply theory and laws underlying unit operations to better address processing issues.</li> </ul>
<b>Soft skills</b>	<ul style="list-style-type: none"> <li>● Making informed judgments and choices: <ul style="list-style-type: none"> <li>○ Ability to correctly direct choices and solutions in food processing to ensure high quality standards.</li> <li>○ Ability to evaluate individual unit operations as regards energy consumption and cost minimization.</li> </ul> </li> <li>● Communicating knowledge and understanding: <ul style="list-style-type: none"> <li>○ Ability to communicate the acquired theoretical concepts in oral and written form, using appropriately the scientific language and the specific lexicon.</li> <li>○ Ability to correctly describe unit operations and their relationships with food quality and safety.</li> <li>○ 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.</li> </ul> </li> <li>● Capacities to continue learning: <ul style="list-style-type: none"> <li>○ Ability to deepen and update knowledge of processing-quality interactions.</li> </ul> </li> </ul>
<b>Syllabus</b>	
<b>Content knowledge</b>	<p>Introduction.</p> <p><b>Classification and aims of unit operations. The raw materials and preliminary operations.</b></p> <p>Cleaning, sorting, grading, size reduction.</p> <p><b>Mixing, emulsion and forming.</b></p> <p>Theory of solid and liquid mixing; food emulsions.</p> <p><b>Separation and concentration of food components.</b></p> <p>Milling, filtration, inverse osmosis, ultrafiltration, centrifugation, distillation, solvent extraction.</p> <p><b>Heat transfer in food processing. Processing by application of heat.</b></p> <p>Pasteurisation, sterilisation, evaporation, dehydration, blanching, cooking, frying, thawing.</p> <p><b>Use of low temperature.</b></p> <p>Freeze-drying, refrigeration, freezing.</p>
<b>Texts and readings</b>	<ul style="list-style-type: none"> <li>● Notes of the lectures distributed during the course.</li> <li>● R.P. Singh, D.R. Heldman. Principi di tecnologia alimentare. Casa Editrice Ambrosiana</li> <li>● C. Pompei. Operazioni unitarie della tecnologia alimentare. Casa Editrice Ambrosiana</li> <li>● C. Lerici, G. Lercker. Principi di tecnologie alimentari. Clueb, Bologna</li> <li>● C. Peri. Le operazioni fondamentali della tecnologia alimentare. Cusl, Milano</li> <li>● C. Peri. La filtrazione nelle industrie alimentari. Edizioni Aeb, Brescia</li> <li>● P. Cappelli, V. Vannucchi. Chimica degli alimenti. Conservazione e trasformazioni. Zanichelli, Bologna.</li> </ul>
<b>Notes, additional materials</b>	<ul style="list-style-type: none"> <li>● R.P. Singh, D.R. Heldman. Introduction to food engineering, 3rd edition. Academic Press</li> </ul>

	<ul style="list-style-type: none"> <li>• Fellows. Food Processing technology, 2nd edition. Woodhead Publishing limited.</li> </ul>
<b>Repository</b>	All teaching material will be available to students on Teams platforms.

<b>Assessment</b>	
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 the laboratory/production plants, as reported in the Academic Regulations for the Bachelor Degree in Food Science and Technology (article 9) and in the study plan (Annex A).</p> <p>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 (Art. 4 of the Didactic Regulations of the Bachelor'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 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"> <li>• Knowledge and understanding: <ul style="list-style-type: none"> <li>○ Describing unit operations in food industry and processing-quality interactions.</li> </ul> </li> <li>• Applying knowledge and understanding: <ul style="list-style-type: none"> <li>○ Describing theory and laws underlying unit operations and changes involving food constituents.</li> </ul> </li> <li>• Autonomy of judgment: <ul style="list-style-type: none"> <li>○ The student should be able to formulate reasonable hypotheses on the influence of different technologies on food quality.</li> </ul> </li> <li>• Communicating knowledge and understanding: <ul style="list-style-type: none"> <li>○ Describing the relationships of unit operations with food quality and safety.</li> </ul> </li> <li>• Communication skills: <ul style="list-style-type: none"> <li>○ Communicating the theoretical acquired concepts using the appropriate scientific language and the specific lexicon.</li> </ul> </li> <li>• Capacities to continue learning: <ul style="list-style-type: none"> <li>○ Hypothesizing processing solutions to minimize the impact of processing on food quality, also stimulating group work.</li> </ul> </li> </ul>
Final exam and grading criteria	<p>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 Bachelor Degree in Food Science and Technology. The score is based on predetermined criteria in accordance with the Didactic Regulations of the Bachelor's Degree Course in Food Science and Technology (art. 4).</p>
<b>Further information</b>	