DESCRIPTION OF THE SAFE_16 MODULE IMPLEMENTED AS PART OF THE INTENSIVE FORM OF EDUCATION (IFoE)

<table>
<tr><td>Module Name</td><td colspan="4">Unconventional methods of food preservation and their impact on human health and the environment</td></tr>
<tr><td>Language of Instruction</td><td colspan="4">english</td></tr>
<tr><td>Module Purpose</td><td colspan="4">The aim of this module is to familiarize students with modern food preservation technologies that offer an alternative to traditional methods (pasteurization, sterilization, and freezing). Participants will gain knowledge of the mechanisms behind innovative technological solutions, such as high hydrostatic pressure (HPP), pulsed electric field (PEF), UV radiation, ultrasound, ozonation, and cold plasma.
The module focuses on assessing the effectiveness of these methods in eliminating microorganisms, preserving the nutritional value and sensory characteristics of food, and analyzing their impact on human health. A key element of the course is also reflection on environmental aspects, including energy consumption, pollutant emissions, and the potential for reducing food waste.
Students will acquire the skills to critically evaluate unconventional food preservation methods in terms of their safety, effectiveness, and compliance with sustainability principles.</td></tr>
<tr><td>Module Content</td><td colspan="4">Lectures will discuss the theoretical foundations of unconventional food preservation methods, such as high hydrostatic pressure (HPP), pulsed electric field (PEF), UV radiation, ultrasound, ozonation, and cold plasma. The microbiological, sensory, and toxicological aspects of using these technologies will also be discussed, as well as their importance in the context of sustainable development and food safety.
Practical sessions will enable students to analyze the effectiveness of selected preservation methods based on scientific data, interpret the results of quality and shelf life studies, and assess the impact of the technology on human health and the environment. Students will work in teams to present arguments for selecting the technology in the context of specific food products and industrial requirements.</td></tr>
<tr><td rowspan="2">Description of learning outcomes</td><td>Effect Symbol</td><td>Effect Name Methods</td><td>Verification and Documentation</td><td>Reference to Directional Effect Set</td></tr>
<tr><td colspan="4">KNOWLEDGE (graduate knows and understands)</td></tr>
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	W1	Knows and understands the principles of operation of unconventional food preservation methods (e.g. HPP, PEF, UV, ultrasound, ozonation, cold plasma) and their impact on microflora, nutritional value and sensory properties of products.	A written paper covering topics presented during the course.	SAFE_W01
	W2	Understands the health and environmental impacts of using unconventional food preservation methods, taking into account consumer safety, toxicological risks, energy consumption, pollutant emissions, and impact on sustainable development.	A written paper covering topics discussed during the course.	SAFE_W02
	SKILLS (graduate can)			
	U1	They can analyze the effectiveness and safety of alternative food preservation methods based on scientific data and assess their impact on human health and the environment.	Group work, participation in discussions – assessment of activity in class (answers to questions introducing the exercises), colloquium.	SAFE_U02

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	U2	They can interpret research results regarding the quality, shelf life, and nutritional value of products processed using alternative preservation methods, and select the appropriate technology based on the type of food and the desired results.	Team work, participation in topic analysis – assessment of teaching activity (answers to questions introducing the exercises), colloquium.	SAFE_U03
	SOCIAL COMPETENCES (graduate is ready to)			
	K1	Demonstrates a responsible attitude in making technological decisions, taking into account health and environmental aspects, and the principles of sustainable development in food production and processing.	Evaluation of the student's performance as a leader and member of a team performing an exercise or project.	SAFE_K01
Module crediting method	Passing with a grade			
ECTS credit balance (total, developing practical skills, from classes conducted using distance learning methods and techniques)	Number of contact hours/ECTS points		Number of non-contact hours/ECTS points	
	Lecture 1 hour 0.04 ECTS points Classes 2 hour 0.08 ECTS points		Literature reading 0.5 hour 0.02 ECTS points Preparing a presentation 0.5 hour 0.02 ECTS points Preparing for credit 1 hour 0.04 ECTS points	
	Total contact hours 3 hr. 0,12 pt. ECTS		**Total non-contact hours 2 hr. 0,08 pt. ECTS**	

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Staffing	PhD. Eng. Agnieszka Starek-Wojcicka, associate professor
Information on the infrastructure ensuring the implementation of learning outcomes	Classes will be held in food technology laboratories and multimedia classrooms, enabling the implementation of learning outcomes in knowledge, skills, and social competencies. Students will have access to modern equipment used in food preservation processes and specialized equipment for microbiological and chemical analysis. Classes will be conducted in classrooms equipped with multimedia technologies, supporting interactive learning. The university ensures accessibility for people with disabilities – the buildings have ramps, elevators, adapted restrooms, hearing systems, and electronic teaching materials.
Planned teaching methods	Lectures using multimedia techniques will take place in the classroom. Exercises using active methods will take place in the laboratory (practical exercises, discussions, teamwork in groups, reports on exercises, and a colloquium).
Recommended reading list	Barba, F.J., de Souza Sant'Ana, A., Orlien, V., Koubaa, M. (2017). Innovative Technologies for Food Preservation. Academic Press (Elsevier). Goyal, M.R., Mishra, S.K., Birwal, P. (2022). Food Processing and Preservation Technology: Advances, Methods, and Applications. Apple Academic Press. Rahman, M. S. (Ed.). (2020). Handbook of food preservation. CRC press. Higgins, O. (2024). Alternative Food Preservation Techniques: The No Freezing and Canning Guide. Independently published.

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