

Course title:	Research trends in the analysis of physical properties, structure and stability of food
Course title in Polish:	Współczesne trendy badawcze w analizie właściwości fizycznych, struktury i stabilności żywności
Course for discipline:	food and nutrition technology

Semester:	4	Status of course:	faculty	Language:	english
Academic year:	2026/27	Catalog number:	100/2025/26		

Coordinator of course:	dr. Karolina Szulc
Lecturer od course:	Employees of the Department of Food Engineering
Executing unit:	Institute of Food Sciences, WULS-SGGW
Ordering unit:	Doctoral School SGGW
Assumptions, goals and description of the course:	<p>Course Objectives and Tasks: Expanding knowledge and developing doctoral students' research skills in the field of contemporary instrumental methods used in the analysis of the physical properties, structure, and stability of food, including determination procedures, processing of measurement results, research problems, potential applications, and their use in research and development.</p> <p>Course Topics: Basic and advanced methods for determining food texture using a texturometer. Testing the strength of materials using a Universal Testing Machine. Rotational and oscillatory rheometry in the study of viscoelastic properties of food using a rheometer. Microtomography and microscopic techniques in the study of food structure. Imaging and analysis of the structure of various materials using microtomography and multiple microscopes. Investigation of the crystal structure and recrystallization of ice in frozen food using microscopic image analysis. Optical and thermal techniques in the study of multiphase food systems. Detection, identification, and analysis of the stability of food systems over a wide range of concentrations and particle sizes. Detection and identification of phase transitions.</p>
Didactic form, number of hours:	exercises, 15 hours
Teaching methods:	Research workshops using new research equipment, presentations using audiovisual techniques, experience/experiment, discussion, problem solving, case study, individual consultations.
Limit of people in the group:	8

Learning outcomes

KNOWLEDGE - the graduate knows and understands:	SKILLS - the graduate is able to:	COMPETENCES - the graduate is ready to:
To the extent enabling to revise the existing pradigms in the field/discipline - the world achievements, gathering theoretical background as well as general and selected detailed issues	Carry out critical assessment of the scientific research findings and expert activities and their contribution to the knowledge development in the field/discipline	Critically evaluate the achievements in the field/discipline represented
Major general development trends in the field/discipline		Recognise knowledge in solving cognitive and practical problems characteristic for the area of research (field/discipline) and in an interdisciplinary aspect
		Support the ethos of scientific circles and conduct independent research
The method of verification of learning outcomes:	Active participation in experiments performed during classes. Presentation of measurement results, with particular attention paid to the analysis and interpretation of obtained results, and the ability to formulate conclusions.	
Form of documentation of achieved learning outcomes:	written reports	
Elements and weights of the final grade:	presentation of measurement results 80%, activity during classes 20%	
Place of the course:	Laboratories of the Department of Food Engineering, Institute of Food Sciences, WULS-SGGW	

Basic and supplementary literature

<p>Basic literature: Figura L.O. & Teixeira A.A. (2023). Food physics. Physical properties - measurement and applications. Springer Cham. Bhandari B.R., & Roos Y.H. (Eds.). (2016). Non-equilibrium states and glass transitions in foods: processing effects and product-specific implications. Woodhead Publishing. McClements D.J. (2015). Food emulsions: principles, practices, and techniques. CRC Press.</p> <p>Supplementary literature: Scientific publications on topics covered in the classes.</p>
Comments:

Estimated number of hours of work of the doctoral student necessary to achieve the assumed learning outcomes:	30
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Learning outcomes reference to the second degree characteristics of the National Qualification Framework (level 8) covering doctoral competences:

Symbol:	Learning outcomes:	8 level NQF
SD1_KW01	To the extent enabling to revise the existing pradigms in the field/discipline - the world achievements, gathering theoretical background as well as general and selected detailed issues	P8S_WG
SD1_KW02	Major general development trends in the field/discipline	P8S_WG
SD1_KU05	Carry out critical assessment of the scientific research findings and expert activities and their contribution to the knowledge development in the field/discipline	P8S_UW

SD1_KK01	Critically evaluate the achievements in the field/discipline represented	P8S_KK
SD1_KK03	Recognise knowledge in solving cognitive and practical problems characteristic for the area of research (field/discipline) and in an interdisciplinary aspect	P8S_KK
SD1_KK08	Support the ethos of scientific circles and conduct independent research	P8S_KR