GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Analytics in food industry, PG_00060778						
Field of study	Chemical Technology						
Date of commencement of studies	October 2024		Academic year of realisation of subject	2026/2027			
Education level	first-cycle studies		Subject group	Optional subject group Subject group related to scientific research in the field of study			
Mode of study	Full-time studies		Mode of delivery	at the university			
Year of study	3		Language of instruction	Polish			
Semester of study	6		ECTS credits	3.0			
Learning profile	general academic profile		Assessment form	assessment			
Conducting unit	Department of Chemistry Technology and Biotechnology of Food -> Faculty of Chemistry -> Faculties of Gdańsk University of Technology						
Name and surname of lecturer (lecturers)	Subject supervisor	dr hab. inż. Dorota Martysiak-Żurowska					
	Teachers						
Lesson types	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	15.0	0.0	30.0	0.0	0.0	45
	E-learning hours included: 0.0						
Learning activity and number of study hours	Learning activity	Participation in didactic classes included in study plan		Participation in consultation hours	Self-study		SUM
	Number of study hours	45		5.0	25.0		75
Subject objectives	Presentation of the work specifications for food industry laboratories, which contribute to ensuring food quality and safety, as well as food quality terminology, regulations, and standards governing laboratory operations. Gaining essential knowledge of analytical methods for assessing and verifying the quality of raw materials used in manufactured and stored food products, and the cleanliness of production lines in food industry plants.						

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K6_U06] is able to select the chemical and technological concept of the production method, is able to justify the suitability of the raw materials used, analyses and evaluates the quality of the products obtained, critically analyses the functioning of existing technical solutions and evaluates these solutions	is able to justify the suitability of raw materials used in the food industry and use them to select the appropriate analytical technique for evaluating a given food product.	[SU3] Assessment of ability to use knowledge gained from the subject [SU4] Assessment of ability to use methods and tools [SU5] Assessment of ability to present the results of task
[K6_U11] individually plans and implements his/her own learning	is able to independently identify, critically evaluate and apply the latest analytical methods (e.g. instrumental, molecular, chemometric) not included in the basic curriculum, necessary to solve complex, non-standard research or control problems in the food industry, documenting the process of method selection and verification.	[SU2] Assessment of ability to analyse information [SU3] Assessment of ability to use knowledge gained from the subject [SU4] Assessment of ability to use methods and tools [SU1] Assessment of task fulfilment
[K6_W03] has knowledge of environmental protection in chemical technology, the classification of technological processes in terms of their environmental impact and how to eliminate the environmental impact of technological installations	has knowledge of the impact of analytical methods and quality control technologies in the food industry on the environment, including waste generation, energy and reagent consumption, and is aware of the principles of using environmentally friendly analytical alternatives in line with the concept of green analytical chemistry.	[SW1] Assessment of factual knowledge [SW2] Assessment of knowledge contained in presentation [SW3] Assessment of knowledge contained in written work and projects
[K6_K05] is aware of the social role of a technical university graduate, and in particular understands the need to formulate and communicate to the public, in particular through the mass media, information and opinions on the achievements of technology and other aspects of engineering activity	is able to critically assess the reliability and significance of food laboratory analysis results and, in a manner understandable to non-specialists (e.g., journalists, consumers, decision-makers), formulate and present conclusions regarding safety, quality, and innovation in the food industry, taking into account the professional ethics of an engineer.	[SK4] Assessment of communication skills, including language correctness [SK2] Assessment of progress of work [SK5] Assessment of ability to solve problems that arise in practice

Subject contents

Course content – lecture

- Specifications for on-site laboratories in the food industry, requirements and applicable procedures, terminology, and normative documents defining requirements for management systems implemented in laboratories.

- Standardized methods for sampling raw materials and food products of various states of matter. The issue of sample representativeness in relation to a batch. Documentation, methods for securing and labeling samples.
- Techniques for preparing food samples for laboratory testing.
- Basic and advanced analytical techniques for determining the content of basic food components.
- Analytical tests/methods for verifying the quality of raw materials and products in various food industries (dairy, meat, fish, fat, fruit and vegetable, sugar and confectionery, cereal and bakery products, concentrates, fermentation products, beverages and water for consumption), monitoring stages of food production, monitoring the hygienic and sanitary condition of production plants, and for broadly understood quality control of the finished product. - Food contamination: physical, chemical, and microbiological, their potential sources, and prevention of secondary infections.
- Application of enzymatic nucleic acid amplification (PCR) methods in food contamination testing.
- Food adulteration and methods for detecting adulteration in food products.
- Additional substances permitted for use in food, food fortification, and dietary supplements.
- Functional foods and foods for special nutritional uses.
- Materials and articles intended for contact with food.

Course content – laboratory

Determining the content of selected nutrients in food products. Determining selected contaminants in food products. Determining food additives (colors, preservatives) in food products. Evaluating food product quality based on determined parameters. Monitoring food production processes.

Sample laboratory exercises:
1. Determining the content of basic food components: proteins, saccharides, fats, and water in food products.
2. Monitoring microbiological contamination - selected instrumental methods used to maintain broadly understood food production hygiene.
3. Detecting salmonella/staphylococcus using PCR, detecting meat adulteration, and detecting GMOs.
4. Determining veterinary drug residues in food of animal origin.
5. Determining environmental contaminants in raw materials and food products (pesticide residues, BPA, mycotoxins).
6. Food additives natural and synthetic dyes (in instant products jellies in confectionery) / preservatives (food concentrates, sauces, ready-made meals) / sweeteners (in sugar-free beverages, energy drinks).
7. Determination of nitrate(V) and nitrate(III) content in vegetables and processed meats the origin and purpose of these compounds in food.
8. Food adulteration. Determination of honey adulteration with sucrose and fructose-glucose syrups.
9. Control of food adulteration using the example of detecting adulteration of alcoholic beverages with methanol and fusel oils (high molecular weight alcohols).
10. Fortification substances. Iodine content in table salt (various types) / Determination of calcium supplement in milk and dairy products determining compliance with the regulation on food fortification. 11. Analytical techniques used in food texture profiling

Prerequisites and co-requisites

Knowledge of the following subjects: Laboratory techniques, Organic chemistry, Inorganic chemistry, Physical chemistry, Instrumental analysis and analysis of results

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
Laboratory exercises: reports, performing experiments	60.0%	40.0%
Lecture tests	60.0%	60.0%

Recommended reading

Basic literature

Nogala-Kałucka M. (ed.) Food Analysis. Selected Methods for the Qualitative and Quantitative Marking of Food Components. 2016.

- Current Regulations and Standards.
- Fortuna T. (ed.) Basics of Food Quality Analysis and Assessment. 3rd ed., 2018, University of Agriculture in Krakow Publishing.

Supplementary literature

- Baryłko-Pikielna N., Matuszewska I. Sensory Food Testing. WN PTTŻ, Kraków 2014.

- Malinowska-Pańczyk E., Kołodziejska I. Food Microbiology, PG Publishing House, Gdańsk 2011.
- Gronowska-Senger A. (ed.), Food Analysis. SGGW Publishing House, 2018.
- Kumirska J. et al. Food Analysis. Script on Environmental Protection. UG Publishing House 2010.

eResources addresses

Example issues/ example questions/ tasks being completed

Management systems and procedures applicable to on-site laboratories in the food industry.

Chemical contaminants in food of industrial origin.
Systems ensuring the safe use of permitted food additives.
Methods of food adulteration. Which food groups are most frequently adulterated?

Practical activites within the subject

Not applicable

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