GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	INDUSTRIAL ANALYTICS, PG_00064301		
Field of study	Chemical Technology		
Date of commencement of studies	February 2025	Academic year of realisation of subject	2024/2025
Education level	second-cycle studies	Subject group	Optional subject group Specialty 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	1	Language of instruction	Polish
Semester of study	1	ECTS credits	5.0
Learning profile	general academic profile	Assessment form	assessment
Conducting unit	Department of Analytical Chemistry -> Faculty of Chemistry		
Name and surname of lecturer (lecturers)	Subject supervisor	dr hab. inż. Justyna Płotka-Wasylka	
	Teachers	dr hab. inż. Justyna Płotka-Wasylka dr inż. Tomasz Dymerski prof. dr hab. inż. Agata Kot-Wasik prof. dr hab. inż. Andrzej Wasik dr inż. Bartłomiej Cieślik dr inż. Tomasz Majchrzak	

Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	15.0	0.0	60.0	0.0	0.0	75
	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	75	5.0	45.0	125

Subject objectives	he aim of this course is to provide students with advanced theoretical knowledge and practical skills in industrial analytics, essential for solving analytical problems in production and research environments. The course will not only equip students with technical competencies but also **offer direct contact with industry professionals**, allowing them to gain insight into real-world challenges related to the implementation of analytical methods in production plants and control laboratories. In particular, the course covers the following topics: • **Sample preparation for analysis** selection of appropriate techniques and procedures depending on the sample matrix and required analytical parameters. • **Chromatographic separation techniques** application of modern chromatographic methods (e.g., GC, HPLC) in industrial analysis and assessment of their efficiency. • **Quantitative determination of selected analytes** use of instrumental methods for precise and accurate quantification of industrial sample components. • **Calculation of quantitative analysis results** application of mathematical and graphical methods for processing analytical data and their statistical interpretation. • **Validation of analytical methods** evaluation of method quality parameters, use of reference materials, and ensuring the reliability of analytical results. • **Scaling up laboratory analysis to industrial applications** adaptation of analytical procedures to production conditions and identification and elimination of potential challenges related to industrial implementation. Additionally, during the course, students will have the opportunity to **meet and consult with industry representatives**, providing them with practical knowledge of real-world requirements, expectations, and the specifics of working in industrial and control laboratories. This will help them understand which competencies are crucial for an industrial analyst and what challenges arise when implementing analytical methods in real production conditions. The course prepares students comprehensively for work in industrial, control, and research laboratories, while also developing practical skills necessary for effective collaboration with the industrial sector.
Learning outcomes	

Course outcome	Subject outcome	Method of verification
[K7_K03] can interact and work in a group, taking on a variety of roles	The student is able to work in a group by setting appropriate goals and dividing responsibilities; The student is able to complete the assigned group task.	[SK5] Assessment of ability to solve problems that arise in practice [SK1] Assessment of group work skills
[K7_W02] selects appropriate apparatus and materials for the manufacture and processing of consumer goods	The student is able to solve analytical problems occurring in technological processes using a selected analytical technique; is able to apply appropriate separation techniques with particular emphasis on chromatographic techniques	[SW2] Assessment of knowledge contained in presentation [SW1] Assessment of factual knowledge
[K7_U05] uses instrumental methods applied in technology and related fields	The student has knowledge of instrumental techniques that can be used in production and technological processes. The student is able to use appropriate techniques to analyze and monitor technological and process problems.	[SU5] Assessment of ability to present the results of task [SU4] Assessment of ability to use methods and tools [SU3] Assessment of ability to use knowledge gained from the subject
[K7_W01] defines the phenomena, processes and laws of nature used to produce consumer goods and provide services	The student has knowledge of industrial problems and needs with an analytical background.	[SW1] Assessment of factual knowledge

Subject contents	**Lecture topics:** Industrial analytics in practice: integration of analytical techniques and their applications in various industrial sectors;Elemental analysis in industrial applications; Applications of gas chromatography in industrial conditions; Applications of gas chromatography in industrial conditions;Sensory revolution in the food industry: electronic nose in food quality control; Fundamentals of industrial food analysis; Industrial revolution in direct analysis: applications of different types of mass spectrometry; Revolution in pharmaceutical analysis: from advanced HPLC to innovative applications of 2D HPLC; The importance of industrial analytics in identifying potential safety hazards of industrial installations - case studies;Analytical methods and practical experiences in air pollution research in Poland **Topics of laboratory classes**: OIL: Quality testing of edible oils, GC-FID: Evaluation of ethanol content in disinfectant liquid, using the GC-FID technique, HPLC-MS-MS: Evaluation of synthetic sweetener content, using the HPLC-MS-MS technique, GC-MS: Evaluation of nicotine content and identification of impurities, using the GC-MS technique, GC-TOFMS: Assessment of freshness and authenticity of food products, using the GC-TOFMS technique, RPLC-Q-TOFMS: Analysis of biopharmaceutical degradation products using the RP-LC-Q-TOF-MS technique, PP: Methods of preparing solid samples for spectroscopic analyses, MIP-OES: Elemental determinations in industrial samples, using the MIP-OES technique, E-nose: Application of an electronic nose prototype, in freshness assessment of poultry meat, UFGC: Analysis and classification of wines, using the UFGC technique, HPLC: Determination of caffeine in selected samples using the HPLC technique,
Prerequisites and co-requisites	Subjects passed: Inorganic Chemistry, Organic Chemistry, Physical Chemistry, Physics, Analytical Chemistry. Knowledge of the basics of analytical chemistry.

Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	lecture: exam	60.0%	50.0%
	lab: tests	60.0%	50.0%
Recommended reading	Basic literature	1 J. Minczewski, Z. Marczenko, Chemia analityczna, tom 3, wyd. 9 i 10, zm., PWN, Warszawa 2005. 2 D.A. Skoog, D.M. West, J.F. Holler, S.R.Crouch, Fundamentals of Analytical Chemistry, (VII ed.), Saunders College Publishing, Philadelphia 1996, Podstawy Chemii Analitycznej, t. 1-2, PWN, Warszawa 2006. 3 P. Konieczka P., Namieśnik J., Zygmunt B., Bulska E., ŚwitajZawadka A., Naganowska A., Kremer E., Rompa M., Ocena i kontrola jakości wyników pomiarów analitycznych, WN-T, Warszawa 2007. 4 Fizykochemiczne metody kontroli zanieczyszczeń środowiska, [red.] J. Namieśnik i Z. Jamrógiewicz, WN-T, Warszawa 1998. 5 A. Cygański, Metody spektroskopowe w chemii analitycznej, WN-T, Warszawa 1993. 6 N.S. Połuektow, Analiza metodą fotometrii płomieniowej, WN-T, Warszawa 1969. 7 M. Pinta, Absorpcyjna spektrometria atomowa. Zastosowania w chemii analitycznej, PWN, Warszawa 1977. 8 Z. Marczenko, Spektrofotometryczne oznaczanie pierwiastków, PWN, Warszawa 1979. 9 A. Cygański, Metody elektroanalityczne, WN-T, Warszawa 1995. 10 Z. Witkiewicz, Podstawy chromatografii, WN-T, Warszawa 2000. 11 Z Witkiewicz, J. Hetper, Chromatografia gazowa, WN-T, Warszawa 2001. 12 B. Bobrański, Analiza ilościowa związków organicznych, PWN, Warszawa 1979. 13 Chromatografia cieczowa, [red.] M. Kamiński, CEEAM, Gdańsk 2004. 14 Spektrometria atomowa, [red.] E. Bulska, K. Pyrzyńska, Malmut, Warszawa 2007.	
	Supplementary literature	Materials in the enauczanie course for the subcjet	
	eResources addresses	Adresy na platformie eNauczanie: ANALITYKA PRZEMYSŁOWA - Moodle ID: 44897 https://enauczanie.pg.edu.pl/moodle/course/view.php?id=44897	
Example issues/ example questions/ tasks being completed	Present the problems encountered by the analytical chemist in the industrial laboratory. Present the methods of solving them. Discuss the analytical procedure for determining selected metals in samples after incineration of industrial waste. Discuss the issues related to the analysis of indoor air. Discuss the issues related to overcoming the barriers of cooperation between university and industry units.		
Work placement	Not applicable		

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