



## Subject card

Subject name and code	Industrial analytics , PG_00038543						
Field of study	Chemical Technology						
Date of commencement of studies	February 2024	Academic year of realisation of subject			2023/2024		
Education level	second-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	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	prof. dr hab. inż. Andrzej Wasik					
	Teachers	prof. dr hab. inż. Andrzej Wasik dr inż. Tomasz Dymerski dr hab. inż. Mariusz Marć dr inż. Małgorzata Rutkowska dr inż. Bartłomiej Cieślik dr inż. Weronika Hewelt-Belka 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	TAcquiring the necessary knowledge in the field of - preparation of samples for analysis; - chromatographic techniques separations and their application to solve industrial problems; - quantitative marking selected analytes; - calculating the results of quantitative analyzes using mathematical methods and graphic images and their statistical interpretation; - validation of methods (use of reference materials, etc.);- problems related to transferring aspects of laboratory analysis to an industrial scale.						

Learning outcomes	Course outcome	Subject outcome	Method of verification
	K7_W04	The student is able to solve analytical problems with the use of elemental analysis of organic compounds; can use appropriate separation techniques with particular emphasis on chromatographic techniques	[SW2] Assessment of knowledge contained in presentation
	K7_U05	Student is able to properly prepare samples for analysis and perform analysis using chromatographic, spectrophotometric and electrochemical techniques; is able to calculate the results of quantitative analyzes using mathematical and graphic methods and interpret them statistically; carry out validation of methods using reference materials, organize and use the results of inter-laboratory tests.	[SU4] Assessment of ability to use methods and tools [SU5] Assessment of ability to present the results of task
	K7_U10	The student is able to carry out research with the use of selected modern analytical techniques and measuring devices	[SU4] Assessment of ability to use methods and tools [SU3] Assessment of ability to use knowledge gained from the subject
	K7_K03	The student is able to interact and work in a group, assuming various roles in it. Is able to properly define the priorities for the implementation of the task set by himself or others	[SK5] Assessment of ability to solve problems that arise in practice
Subject contents	During the course, the application of basic and advanced analytical techniques will be presented, i.e. elemental analysis, GC, LC, extraction techniques, etc. to solve industrial problems. Industrial analytics problems and ways to solve them will be presented. The lectures will include content presented by invited people working in industry (issues related to the nature of their laboratories, cooperation with analytical laboratories, challenges of transferring the micro scale to the macro scale, obtaining financial commitments from various sources for the implementation of research goals coupled with industrial units). The classes will include presenting problems (case studies) and methods of solving them.		
Prerequisites and co-requisites	Passed subjects: Inorganic Chemistry, Organic Chemistry, Physical Chemistry, Physics, Analytical Chemistry. Basic knowledge of analytical chemistry.		
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Lecture: exams and short tests	60.0%	50.0%
	Laboratory: Tests and reports	60.0%	50.0%

Recommended reading	Basic literature	<p>1 J. Minczewski, Z. Marczenko, Chemia analityczna, tom 3, wyd. 9 i 10, zm., PWN, Warszawa 2005.</p> <p>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.</p> <p>3 P. Konieczka P., Namieśnik J., Zygmunt B., Bulska E., Świtaj-Zawadka A., Naganowska A., Kremer E., Rompa M., Ocena i kontrola jakości wyników pomiarów analitycznych, WN-T, Warszawa 2007.</p> <p>4 Fizykochemiczne metody kontroli zanieczyszczeń środowiska, [red.] J. Namieśnik i Z. Jamrógiewicz, WN-T, Warszawa 1998.</p> <p>5 A. Cygański, Metody spektroskopowe w chemii analitycznej, WN-T, Warszawa 1993.</p> <p>6 N.S. Połuektow, Analiza metodą fotometrii płomieniowej, WN-T, Warszawa 1969.</p> <p>7 M. Pinta, Absorpcyjna spektrometria atomowa. Zastosowania w chemii analitycznej, PWN, Warszawa 1977.</p> <p>8 Z. Marczenko, Spektrofotometryczne oznaczanie pierwiastków, PWN, Warszawa 1979.</p> <p>9 A. Cygański, Metody elektroanalityczne, WN-T, Warszawa 1995.</p> <p>10 Z. Witkiewicz, Podstawy chromatografii, WN-T, Warszawa 2000.</p> <p>11 Z Witkiewicz, J. Hetper, Chromatografia gazowa, WN-T, Warszawa 2001.</p> <p>12 B. Bobrański, Analiza ilościowa związków organicznych, PWN, Warszawa 1979.</p> <p>13 Chromatografia cieczowa, [red.] M. Kamiński, CEEAM, Gdańsk 2004.</p> <p>14 Spektrometria atomowa, [red.] E. Bulska, K. Pyrzyńska, Malmut, Warszawa 2007.</p>
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	Supplementary literature	<p>1 M. Jarosz, E. Malinowska, Pracownia chemiczna. Analiza instrumentalna, wyd. 2 uzup., WSiP, Warszawa 1999.</p> <p>2 W. Szczepaniak, Metody instrumentalne w analizie chemicznej, PWN, Warszawa 1999.</p> <p>3 K. Danzer, E. Than, D. Moloch, Analityka. Przegląd systematyczny, WN-T, Warszawa 1993.</p> <p>4 J. Czermiński i współautorzy, Metody statystyczne dla chemików, PWN, Warszawa 1986.</p> <p>5 G.W. Ewing, Metody instrumentalne w analizie chemicznej, PWN, Warszawa 1980.</p> <p>6 T.H. Gow, Nowoczesne metody instrumentalne analizy, WN-T, Warszawa 1976.</p> <p>7 H.W. Willard, L.L. Merritt, J.A. Dean, F.A. Settle, Instrumental Methods of Analysis, Wadsworth, Belmont 1981.</p> <p>8 Z. Marczenko, Spektrofotometryczne oznaczanie pierwiastków, PWN, Warszawa 1979.</p> <p>9 A. Cygański, Metody elektroanalityczne, WN-T, Warszawa 1995.</p> <p>10 Z. Galus, Teoretyczne podstawy elektroanalizy chemicznej, PWN, Warszawa 1977.</p> <p>11 Metody analitycznej spektrometrii atomowej, [red.] W. Żywnicki, J. Borkowska-Burnecka, E. Bulska, E. Szmyd, Malmut, Warszawa 2010.</p>
	eResources addresses	<p>Adresy na platformie eNauczanie:  Analityka przemysłowa - Moodle ID: 36474  <a href="https://enauzanie.pg.edu.pl/moodle/course/view.php?id=36474">https://enauzanie.pg.edu.pl/moodle/course/view.php?id=36474</a></p>
Example issues/ example questions/ tasks being completed	Describe the problems encountered by an analytical chemist in an industrial laboratory. Present methods for solving them. Discuss the analytical procedure for determining selected metals in samples after incineration of industrial waste. Discuss issues related to indoor air analysis. Discuss issues related to overcoming barriers to cooperation between university and industrial units.	
Work placement	Not applicable	