



## Subject card

Subject name and code	Analytical Chemistry, PG_00037483						
Field of study	Biotechnology						
Date of commencement of studies	October 2020	Academic year of realisation of subject			2021/2022		
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	2	Language of instruction			Polish		
Semester of study	4	ECTS credits			6.0		
Learning profile	general academic profile	Assessment form			exam		
Conducting unit	Department of Analytical Chemistry -> Faculty of Chemistry						
Name and surname of lecturer (lecturers)	Subject supervisor	prof. dr hab. inż. Żaneta Polkowska					
	Teachers	prof. dr hab. inż. Żaneta Polkowska mgr inż. Filip Pawlak Laura Banaszkiwicz dr hab. inż. Mariusz Marć dr inż. Małgorzata Rutkowska dr inż. Bartłomiej Cieślik dr inż. Weronika Hewelt-Belka dr inż. Tomasz Majchrzak Kaja Kalinowska dr inż. Natalia Jatkowska prof. dr hab. inż. Piotr Konieczka					
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		70.0	150	
Subject objectives	Acquire the necessary knowledge in the field of analytical chemistry, including basic steps of the analytical process, the principles of sampling and preparation of samples for analysis and the theoretical analysis of selected methods of classical and instrumental.						
Learning outcomes	Course outcome	Subject outcome			Method of verification		
	K6_W09	He can use basic concepts in the field of analytical techniques			[SW1] Assessment of factual knowledge		
	K6_U09	He can use analytical techniques			[SU4] Assessment of ability to use methods and tools [SU3] Assessment of ability to use knowledge gained from the subject [SU1] Assessment of task fulfilment		
	K6_W02	Has an ordered knowledge of analytical chemistry			[SW1] Assessment of factual knowledge		
Subject contents	Subject content: Analytical Chemistry. Types of analytical information, criteria of division and selection of analytical methods. Basic steps of analytical process. Collecting and preparation of representative samples. Theoretical and methodological backgrounds of classical quantitative analysis. Gravimetric methods, titrimetric methods (neutralization, oxidation/reduction, precipitation and complex-formation titrations), Theoretical and methodological backgrounds of instrumental quantitative analysis. Electrogravimetry, elemental analysis, of organic compounds, spectroscopic methods of analysis, chromatography, electroanalytical methods. Evaluation of reliability of the results, types of errors, error propagation, uncertainty of results, presentation of results, comparison of accuracy and precision						
Prerequisites and co-requisites	Knowledge of some reactions and physicochemical phenomena						

Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Midterm colloquium	60.0%	10.0%
	Oral exam	60.0%	10.0%
	Written exam	60.0%	30.0%
	Practical exercise	100.0%	50.0%
Recommended reading	Basic literature	Wykaz literatury podstawowej: 1. J. Minczewski, Z. Marczenko, Chemia analityczna, PWN, Warszawa 1985 2. A. Hulanicki, Reakcje kwasów i zasad w chemii analitycznej, PWN, Warszawa 1992 wyd. 3 zm. 3. B. Bobrański, Analiza ilościowa związków organicznych. PWN, Warszawa 1979. 4. K. Eckschlager, Błędy w analizie chemicznej, PWN, Warszawa 1974. 5. Z. Galus, Ćwiczenia rachunkowe z chemii analitycznej, PWN, Warszawa 1972. 6. A. Cygański, Chemiczne metody analizy ilościowej, WNT, Warszawa 1992. 7. K. Danzer, E. Than, D. Moloch, Analityka, WNT, Warszawa 1980. 8. J. Czermiński i współautorzy, Metody statystyczne dla chemików, PWN, Warszawa 1986.	
	Supplementary literature	Wykaz literatury uzupełniającej: 1. Podstawy analityki [red. J. Łukasik], Akademia Medyczna w Gdańsku, Gdańsk 1990. 2. G.W. Ewing, Metody instrumentalne w analizie chemicznej, PWN, Warszawa 1980. 3. T.H. Gouw, Nowoczesne metody instrumentalne analizy, WNT, Warszawa 1976. 4. J. Kryściak, Chemiczna analiza instrumentalna, PZWL, Warszawa 1989. 5. Metody instrumentalne w kontroli zanieczyszczeń środowiska [red. J. Namieśnik], Wyd. Pol.Gdańskiej, Gdańsk 1992 6. H.W. Willard, L.L. Merritt, J.A. Dean, F.A. Settle, Instrumental Methods of Analysis, Wadsworth, Belmont 1981. 7. Fizykochemiczne metody kontroli zanieczyszczeń środowiska, [red] J. Namieśnik i Z. Jamrógiewicz, WN-T, Warszawa 1998. 8. M. Jarosz, E. Malinowska, Pracownia chemiczna analizy instrumentalnej, Wydawn. Szkolne i Pedagogiczne, Warszawa 1994 17. D.A. Skoog, D.M. West, F.J. Holler, S.R. Crouch, Podstawy chemii analitycznej, PWN, Warszawa 2006	
	eResources addresses		
Example issues/ example questions/ tasks being completed	Analysis of weight: Factors affecting the solubility and purity of the deposits, the optimal conditions for the precipitation of sludge, sludge separation. Sources of error and methods of avoiding them. Precipitation from a homogeneous solution. Characteristics and range of applications of weight.		
	Acid-base titration: Distribution methods. General equation of titration curves alkacymetrycznego, case titration of a strong acid. Titration in non-aqueous environments. Visual indicators endpoint.		
	Redoxometry: Distribution of methods, analytical reactions, equations of the titration curves, the indicators, the impact of various factors on the reaction.		
	Titration of precipitation: Equations of the titration curve. Adsorption ratios endpoint.		
	Complexometry: Equations titration curves. Indicators. Kompleksony and kompleksonometria.		
Work placement	Not applicable		