GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Analytical Chemistry, PG_00053525		
Field of study	Biomedical Engineering, Biomedical Engineering, Biomedical Engineering		
Date of commencement of studies	October 2022	Academic year of realisation of subject	2024/2025
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	5	ECTS credits	6.0
Learning profile	general academic profile	Assessment form	exam
Conducting unit	Department of Chemistry and Technology of Functional Materials -> Faculty of Chemistry		
Name and surname of lecturer (lecturers)	Subject supervisor	dr hab. inż. Ewa Wagner-Wysiecka	
	Teachers	dr hab. inż. Ewa Wagner-Wysiecka dr hab. inż. Andrzej Nowak dr inż. Radosław Pomećko dr hab. inż. Anna Skwierawska	

Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	30.0	15.0	30.0	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	15.0	60.0	150

Subject objectives	The aim of the course is to familiarize students with the issues of modern analytical chemistry and analytical problem-solving methodology.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K6_U51] can conduct laboratory work connected with chemistry and biochemistry, specific to biomedical engineering	The student explains the chemical basics, describes the types of apparatus used in a given analytical method and explains the principle of its operation. Student defines an analytical problem. I plan to conduct an experiment and collect data. The student measures using selected equipment. Analyzes the obtained data and assesses the reliability of the obtained result. Justifies the use of quality assurance systems. Explains the basic issues related to the problems of environmental and process analytics. Understands the essence of the use of modern analytical methods in biomedical engineering.	[SU2] Assessment of ability to analyse information [SU1] Assessment of task fulfilment
[K6_W52] Knows and understands, to an advanced extent, selected aspects of chemistry and biochemistry, constituting general knowledge related to the field of study	The student has knowledge of the procedures related to the basic methods of quantitative analysis. Is able to carry out basic determinations, collect and correctly analyze the results obtained. Is able to determine the areas of application of chemical analytical methods in biomedical engineering.	[SW3] Assessment of knowledge contained in written work and projects [SW1] Assessment of factual knowledge

Subject contents

Lecture: Definition and role analytical chemistry. The basic terms. The division, choice and elaboration of the analytical method. Statistical methods in analytical chemistry. The types of the samples, sampling, separation and preconcentration methods. Trace analysis. Methods for gases determination. Classical analysis. Titrimetric methods: acid-base titration, complexometry, redoxymetry, precipitation titration. Spectroscopic methods of analysis: UV-Vis, IR, luminescence, emission, atomic absorption, spectroscopies, turbidimetry, naphelometry, magnetic resonance spectroscopy, mas spectrometry, X-ray spectroscopy. Thermoanalytical methods. Electroanalytical methods: potentiometry, electrogravimetry, coulometry, polarography, voltamperometry, conductometry. Chromatographic methods: GC, HPLC. Kinetic methods of analysis. Miniaturization in analytical chemistry. Elements of environmental analysis. Elements of process analytical chemistry. Quality assurance systems. Tutorial: Statistical analysis of data. Solutions. Units for expressing concentrations and calculating concentrations. Acid-base reactions. Buffers. Acid-base titration, titration curves, titration error. Complexometry: complex stability constants. Complexometric titration. Reactions of precipitation of solids. Precipitation titration. Redox reactions. Equilibria in redox systems. Redox titration. Gas laws. Analysis of gases. The analysis of the composed material. Evaluation of the results. Laboratory:Safety in laboratory. Calibration, standards preparation, sampling. Volumetric analysis precipitation titration. Gravimetric analysis. UV-Vis spectroscopy. Spectrofluorimetry IR spectroscopy. High performance chromatography. Potentiometry. Optimizing in analytical chemistry.

Prerequisites and co-requisites

Matters realized during the subject "Chemistry"

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
Test: material covering problems disscused during excercises	51.0%	30.0%
Written exam	51.0%	40.0%
Lab problems tests, correctly done excercises, repors	51.0%	30.0%

Recommended reading

Basic literature	1. J. Minczewski, Z. Marczenko Chemia analityczna t.1 i t.2 . PWN, W-wa, 2007 2. W. Szczepaniak Metody instrumentalne w analizie chemicznej. PWN, W-wa, 2007 3. D. Kealey, P.J. Haines Chemia analityczna. PWN, W-wa, 2005; 4. T. Lipiec, Z. Szmal Chemia analityczna z elementami analizy instrumentalnej. PZWL, W-wa,1997 5. D.A. Skoog, D.M. West, F.J. Holler, S.R. Crouch Podstawy chemii analitycznej. PWN, W-wa, 2006 6. A. Cygański, B. Ptaszyński, J. Krystek Obliczenia w chemii analitycznej . WNT, W-wa, 2000 7. A. Cygański chemiczne metody analizy ilościowej. WNT, W-wa, 1999 8. Ćwiczenia rachunkowe z chemii analitycznej. Praca zbiorowa pod redakcją Z. Galusa, PWN, W-wa, 1993
Supplementary literature	1. Miniaturyzacja w chemii analitycznej praca zbiorowa pod red. Z. Brzózki. Oficyna Wydawnicza Politechniki Warszawskiej , W-wa 2005 2. A. Cygański Metody spektroskopowe w chemii analitycznej . WNT, W-wa, 2002 3. A. Cygański Podstawy metod elektroanalitycznych. WNT, W-wa, 1999 4. A. Hulanicki Reakcje kwasów i zasad w chemii analitycznej. PWN, W-wa, 1992.
eResources addresses	Adresy na platformie eNauczanie:

Example issues/ example questions/ tasks being completed	1. What is volumetric analysis, what is the analytical signal? Explain the terms: titrant, titrant titer, titration,basic substance, end point of titration, equivalence point, titration curve, titration: direct, indirect, reversetitration.2. Electrogravimetry as an analytical technique on the borderline between classical and instrumentalmethods: principles of measurement, examples of application.3. What is the basis of quantitative analysis byUV-Vis spectroscopy? (Lambert-Beer's law, deviations from this law, the law of additivity of absorption). Givean example of determinations using UV-Vis spectroscopy.4. Division of chromatographic methods by type ofmobile phase similarities and differences.5. Principles of XRF method determinations and area of application.6. Ion-selective electrodes: division, principle of operation, characteristics, areas of application.7. Explain theterms Good Manufacturing Practice (GMP), Good Laboratory Practice (GLP) - discuss their meaning andindicate the areas where these principles are implemented.
Work placement	Not applicable

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