GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Analytical measurement techniques, PG_00062760		
Field of study	Technologies for Industry 5.0		
Date of commencement of studies	October 2024	Academic year of realisation of subject	2025/2026
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	3.0
Learning profile	general academic profile	Assessment form	exam
Conducting unit	Division of Electrochemistry and Surface Physical Chemistry -> Institute of Nanotechnology and Materials Engineering -> Faculty of Applied Physics and Mathematics		
Name and surname of lecturer (lecturers)	Subject supervisor	dr inż. Marta Prześniak-Welenc	
	Teachers		

Lesson types and methods of instruction

Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
Number of study hours	15.0	0.0	15.0	0.0	0.0	30

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	30	5.0	40.0	75

Subject objectives

The aim of the course is to familiarize students with the basics and advanced analytical techniques used in industry.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K6_W03] demonstrates knowledge on materials used in industrial technologies, their structure and fabrication, knows the principles of conducting research, analyzing it and creating technical documentation	The student demonstrates knowledge of materials used in industrial technologies, their structure and manufacturing processes, as well as an understanding of research methods, data analysis, and technical documentation creation.	[SW1] Assessment of factual knowledge
[K6_U03] has the ability to plan, prepare and carry out engineering activities using practical knowledge and understanding of the specificity of materials, devices and tools, processes and technologies, and prepare a substantive report	The student is able to plan, prepare, and execute engineering activities using practical knowledge and understanding of the specifics of materials, equipment, and tools, processes and technologies, and to prepare a substantive report.	[SU4] Assessment of ability to use methods and tools [SU1] Assessment of task fulfilment

Subject contents	**Lecture 1 (1h): The Role and Tasks of Analytical Techniques in Industry** **Lecture 2 (1h): Basic Concepts** (qualitative analysis, quantitative analysis, LOD, LOQ, at-line analysis system, in-line, on-line, off-line) **Lecture 3 (1h): Types of Samples and Analytical Techniques** (classical and instrumental methods, sample states) **Lecture 4 (1h): Introduction to Instrumental Analysis Methods** **Lecture 5 (1h): Electroanalytical Methods** (potentiometry, pH-metry, conductometry) **Lecture 6-7 (2h): Spectroscopic Methods UV-Vis and IR** **Lecture 8-9 (2h): Atomic Spectroscopy** (ICP-OES, AES) **Lecture 10 (1h): Introduction to Chromatographic Methods** **Lecture 11 (1h): Liquid Chromatography (LC) and Ion Chromatography (IC)** **Lecture 12-13 (2h): Coupled Techniques GC-MS, LC-MS** **Lecture 14 (1h): Quality Control in Production and Good Laboratory Practice (GLP)** **Lecture 15 (1h): Summary and Discussion**
Prerequisites and co-requisites	Basic knowledge of general chemistry.

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
Written egzam	50.0%	100.0%

Recommended reading

Basic literature	P. Konieczka i inni, Ocena i kontrola jakości wyników analitycznych, Gdańsk 2004. J. Namieśnik, Rola i zadania chemii analitycznej w zakresie technologii chemicznej, Przemysł Chemiczny, 94/2, 2015.
Supplementary literature	Metody spektroskopowe w chemii analitycznej, A Cygański
eResources addresses	Adresy na platformie eNauczanie:

Example issues/ example questions/ tasks being completed	**Sample Topics:**
	• Definitions of qualitative and quantitative analysis.
	• Differences between LOD (Limit of Detection) and LOQ (Limit of Quantitation).
	• Types of analytical systems: off-line, at-line, on-line, in-line.
	• Methods of Instrumental Analysis
	  • Classification of instrumental analysis methods: electroanalytical, spectroscopic, chromatographic.
	  • Basic principles of electroanalytical, spectroscopic, and chromatographic methods.
	  • Spectroscopic methods: UV-Vis, IR, atomic spectroscopy (ICP-OES, AES).
	  • Chromatographic methods: gas chromatography (GC), liquid chromatography (LC), ion chromatography (IC).
	  • Combined techniques: GC-MS, LC-MS.
	Sample Questions:
	• What are the main differences between qualitative and quantitative analysis?
	• What do LOD and LOQ mean, and how do they affect the results of an analysis?
	• What are the advantages and disadvantages of different types of analytical systems: off-line, at-line, on-line, in-line?
	• What are the basic principles of electroanalytical methods, such as pH-metry and conductometry?
	• How does UV-Vis spectroscopy differ from IR spectroscopy in terms of applications and techniques?

Work placement	Not applicable

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