

Subject card

Subject name and code	Electroanalytical methods, PG_00081934						
Field of study	Chemistry						
Date of commencement of studies	October 2026		Academic year of realisation of subject		2027/2028		
Education level	Bachelor's studies		Subject group		Obligatory subject group in the field of study 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	academic		Assessment form		credit		
Conducting unit	Faculty of Chemistry -> Rector						
Name and surname of lecturer (lecturers)	Subject supervisor		dr Anna Wcisło				
	Teachers						
Lesson types	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	0.0	0.0	45.0	0.0	0.0	45
	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	45		8.0		22.0	75
Subject objectives	Familiarizing students with the basics of electroanalytical methods and the stages of the analytical process, developing the ability to conduct basic electrochemical analyzes and their statistical evaluation, developing the ability to independently solve problems when conducting chemical analysis						

Learning outcomes	Course outcome	Subject outcome	Method of verification
	[CHEML3_U02] Performs analyses using experimental methods and draws conclusions based on them.	The student uses appropriate electroanalytical techniques to solve a given analysis problem. The student interprets measurement results obtained during electrochemical analysis. The student analyzes the composition of the solution based on electroanalytical techniques.	[SU2] presentation/project/paper/report [SU8] observation of student's independent or team work
	[CHEML3_W04] Characterises the basic methods of chemical compound analysis.	The student describes and classifies types of electrochemical methods and discusses their application in the context of experiments. The student defines basic terms used in electrochemical analysis and uses them during laboratory work.	[SW4] test/exam - oral or written
	[CHEML3_K05] Observes established procedures in laboratory work and is responsible for the safety of her/his and others' work.	The student knows the health and safety rules and is able to organize the work station in accordance with them in the electroanalytical laboratory. Additionally, the student is guided by the principle of saving materials and resources.	[SK8] observation of student's independent or team work
	[CHEML3_U05] Uses basic statistical methods and IT techniques to describe chemical processes and analyse experimental data.	The student is able to select the appropriate computational method for the instrumental technique and research equipment used. The student interprets and critically evaluates the results of the calculations. The student is able to apply and conduct an appropriate discussion of errors.	[SU2] presentation/project/paper/report [SU3] text preparation/written work
	[CHEML3_W10] Enumerates and describes the basic aspects of the construction, operation and use of measuring apparatus and equipment used in experimental works in the field of chemistry and related sciences.	The student describes the structure and principles of operation of electrochemical devices, such as a potentiostat, conductivity meter, laboratory power supply and galvanostat.	[SW4] test/exam - oral or written
	[CHEML3_K02] Works individually demonstrating initiative and independence of activity and cooperates in a team fulfilling various roles in it.	The student communicates effectively in a group, drawing on the experience of others, works individually, shows initiative and independence, and cooperates in a team, taking on various roles in it.	[SK8] observation of student's independent or team work
	[CHEML3_U03] Selects the appropriate equipment and laboratory apparatus for conducting uncomplicated chemical experiments.	The student selects electrodes and uses them in electrochemical analysis.	[SU6] demonstration of practical skills [SU8] observation of student's independent or team work
	[CHEML3_U07] Prepares documented elaboration on a specific problem in the field of selected chemical and physical issues.	The student prepares the results of the analysis, including a description of the experiment, calculations, and interpretation.	[SU2] presentation/project/paper/report

Subject contents	1. Potentiometric measurements: types of electrodes, ion-selective electrodes, measurement techniques. 2. pH-metric measurements. Calibration of combined electrode and titration of weak and strong acids, 3. Electrogravimetric measurements: electrolytic determination of copper and nickel in solution, electrolytic separation. 4. Conductometric measurements: determination of conductivity of various electrolytes. 5. Voltammetric methods: experimental methods, principles of measuring system construction, measurement techniques and methods, reversibility of the electrode process. Determination of model redox systems using cyclic voltammetry. 6. Additional aspects: • Titrimetric analysis. Automation and computerization of electrochemical methods. • Assessment of the suitability of a given electrochemical method in the context of the purpose and scope of the analysis. • Acquiring skills in selecting, operating equipment and appropriate electroanalytical techniques to perform a specific electroanalytical determination. • Learning to obtain electrochemical data, assessing their accuracy. Assessment of precision of markings.														
Prerequisites and co-requisites	knowledge of the basics of general and analytical chemistry, ability to write equations for oxidation-reduction reactions,knowledge of work and safety rules in a chemical laboratory;														
Assessment methods and criteria	<table><tr><th>Subject passing criteria</th><th>Passing threshold</th><th>Percentage of the final grade</th></tr><tr><td>Entrance tests (5)</td><td>51.0%</td><td>50.0%</td></tr><tr><td>Work during classes (exercise report)</td><td>30.0%</td><td>30.0%</td></tr><tr><td>Computation test</td><td>51.0%</td><td>20.0%</td></tr></table>	Subject passing criteria	Passing threshold	Percentage of the final grade	Entrance tests (5)	51.0%	50.0%	Work during classes (exercise report)	30.0%	30.0%	Computation test	51.0%	20.0%		
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Recommended reading	Basic literature	1. Cygański Podstawy metod elektroanalitycznych, WNT, Warszawa 2. Z. Galus Elektrochemiczne metody wyznaczania stałych fizykochemicznych, PWN, Warszawa 3. W. Szczepaniak Metody instrumentalne w analizie chemicznej, PWN, Warszawa 4. J. Minczewski Chemia analityczna t. III, PWN, Warszawa													
	Supplementary literature	• Z. Galus Teoretyczne podstawy elektroanalizy chemicznej, PWN, Warszawa • A. Kiszka Elektrochemia cz. I i II, WNT, Warszawa • L. Sobczyk, A. Kiszka, K. Gatner, A. Koll Eksperymentalna chemia fizyczna, PWN, Warszawa • K. Kraman Zastosowania elektrod jonoselektywnych, WNT, Warszawa													
	eResources addresses														
Example issues/ example questions/ tasks being completed															
Work placement	Not applicable														

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