COURSE OFFERED

Name of the course	Polish	**Nowoczesne metody chemii analitycznej**
	English	**Modern Methods in Analytical Chemistry**

1. LOCATION OF THE COURSE OF STUDY WITHIN THE EDUCATION SYSTEM

1.1. Section	Exact and Natural Sciences
1.2. Discipline	Chemical Sciences
1.3. Type of education	Stationary
1.4. Level of education	Doctoral School
1.5. Person preparing the course description	Prof. Dr. hab. Zdzisław Migaszewski
1.6. Contact	Zdzisław.Migaszewski@ujk.edu.pl

2. GENERAL CHARACTERISTICS OF THE COURSE OF STUDY

2.1. Type of course	Disciplinary subject
2.2. Language of the course	English

3. DETAILED CHARACTERISTICS OF THE COURSE OF STUDY

3.1. Type of classes		Lecture
3.2. The number of hours		15 h
3.3. Location of classes		Classes in the UJK teaching room
3.4. Type of assessment		Exam
3.5. Didactic methods		Presentation in PowerPoint and discussion
3.6. Literature	**basic**	Maj-Żurowska M., Pyrzyńska K., Wagner B., Palińska-Saadi A. 2022. Współczesna chemia analityczna. Wyd. Nauk. PWN. Warszawa. Szczepaniak |W. 2022. Metody instrumentalne w chemii analitycznej. Wyd. Nauk. PWN. Warszawa. Cygański A. 2018. Metody spektroskopowe w chemii analitycznej. Wyd. Nauk. PWN. Warszawa. Migaszewski Z.M., Gałuszka A. 2016. Geochemia Środowiska. Wyd. Nauk. PWN. Warszawa.
	supplementary	Evans E.H., Foulkes M.E. 2020. Chemia analityczna; podejście praktyczne. Wyd. Nauk. PWN. Warszawa. Hulanicki A. 2001. Współczesna Chemia Analityczna. Wybrane zagadnienia. Wyd. Nauk. PWN. Warszawa. Scientific papers from different geochemistry journals "*Applied Geochemistry*", "*Elements*", "*Journal of Geochemical Exploration*", "*Environmental Geochemistry and Health*".

4. OBJECTIVES, SYLLABUS CONTENT AND INTENDEND LEARNING OUTCOMES

4.1. Course objectives (including the form of classes)

C01. The principal objective of the subject is to get the knowledge to doctoral students about the selection of appropriate analytical methods of trace element determinations in environmental samples, i.e., waters, sewages, sediments, soils, minerals, rocks and plants.

C02. Introducing doctoral students to the Quality and Assurance Control in Analytical laboratories

C03. Familiarizing doctoral students with the phase analyzed, including chemical microanalyses (e.g., SEM-EDS, EMPA, SHRIMP)

C04. Understanding a complex role of chemical, mineralogical and isotopic analyses

4.2. Syllabus content

1. Systems of Quality and Assurance Control in analytical laboratories
2. Sampling and field analytics (portable measuring instruments)
3. Modern instrumental analytical methods of trace element determinations in the laboratory:

- Sample preparation in the laboratory
- Selection criteria for analytical techniques and procedures
- Speciation analysis
- Spectroscopic methods and techniques
- Instrumental neutron activation analysis (INAA)

4. Phase analysis and element microanalysis

- Optical and electron microscopy
- X-ray diffraction (XRD) and Raman laser microspectrometry
- Laser, electron and ion microprobes

5. Isotope analysis

- Stable isotope determinations

5. SUBJECT LEARNING OUTCOMES

Learning outcomes	A doctoral student who has passed the subject:	Reference to the learning outcomes of Doctoral School (according to the training program at the Doctoral School)
in the area of KNOWLEDGE:		
W01	has the widened knowledge in the area of analytical methods of trace element determinations, including theoretical basis, general and selected detailed issues	SD_W01
W02	has the advanced knowledge of trends in determinations of trace elements and mineral phases in environmental samples	SD_W02
W03	formulates significant, contemporary and unsolved issues in the area of method selection for trace element determinations in environmental samples	SD_W07
in the area of SKILLS:		
U01	is able to define the objectives and research subject, formulate scientific hypotheses for analytical methods employed in PhD dissertations	SD_U01
U02	is able to put to use the knowledge of different analytical methods, formulate and creatively resolve complex problems or accomplish research tasks	SD_U03

in the area of SOCIAL COMPETENCE:		
K01	is able to think in an enterprising way and actively act in the selection of research methods and interpretation of results obtained	SD_K04

6. METHODS OF ASSESSMENT OF THE INTENDED LEARNING OUTCOMES

SUBJECT LEARNING OUTCOMES	METHOD OF ASSESSMENT (+/-)																				
	Oral/written exam			Test			Project			Activity in class			Own work			Group work			Others		
	Type of classes			*Type of classes*			*Type of classes*			*Type of classes*			*Type of classes*			*Type of classes*			*Type of classes*		
	L	*C*	*S*	*L*	*C*	*S*	*L*	*C*	*S*	*L*	*C*	*S*	*L*	*C*	*S*	*L*	*C*	*S*	*L*	*C*	*S*
W01	+					+				+			+								
W02	+					+				+			+								
U01	+					+				+			+								
U02	+					+				+			+								

7. CRITERIA OF ASSESSMENT OF THE INTENDED LEARNING OUTCOMES

Form of classes	Grade	Criterrion of assessment
Lecture (L)	3.0	receiving 50-60% of the total points from the answers of graded credit and the PowerPoint presentation
	3.5	receiving 61-70% of the total points from the answers of graded credit and the PowerPoint presentation
	4.0	receiving 71-80% of the total points from the answers of graded credit and the PowerPoint presentation
	4.5	receiving 81-90% of the total points from the answers of graded credit and the PowerPoint presentation
	5.0	receiving 91-100% of the total points from the answers of graded credit and the PowerPoint presentation

Accepted for execution

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