



## COURSE CARD

### 1. Basic information

Course name in English:	Quality management in an accredited testing lab in practice	
Course name in Polish:	Zarządzanie jakością w akredytowanym laboratorium badawczym w praktyce	
Number of hours:	30	
Type of course:	Elective course	
Form of course:	mixed forms (combination of lecture, seminar and laboratory)	
Code of course:	W03INC-SD0111W / CIQ100406W	
Course leader:	Dr inż. Małgorzata Mironiuk	
Faculty of the course leader:	W3 Faculty of Chemistry	
Email address of the course leader:	malgorzata.mironiuk@pwr.edu.pl	
Scientific discipline(s) assigned to the course (doctoral students representing the marked disciplines can participate in the course):	Architecture and urban planning	<input type="checkbox"/>
	Automation, electronic, and electrical engineering	<input type="checkbox"/>
	Information and communication technology	<input type="checkbox"/>
	Biomedical engineering	<input type="checkbox"/>
	Chemical engineering	<input checked="" type="checkbox"/>
	Civil engineering and transport	<input type="checkbox"/>
	Mechanical engineering	<input type="checkbox"/>
	Environmental engineering, mining, and energy	<input type="checkbox"/>
	Mathematics	<input type="checkbox"/>
	Chemical sciences	<input checked="" type="checkbox"/>
	Physical sciences	<input type="checkbox"/>
	Management and quality studies	<input type="checkbox"/>

### 2. Objectives

### 3. Content

*Detailed information about the course content, including topics and form of classes.*

No.	Topic	Number of hours	Form of classes
1	Laboratory management system based on ISO/IEC 17025: requirements for testing and calibration laboratories with respect to the requirements for the management and technical activities	2	lecture
2	Validation of test methods and assurance of the quality of measurements: validation rules; developing a plan and scope of validation, characterization of testing	2	lecture



	method;		
3	Preparation of samples for analysis: preparation samples for analysis, preparation the analytical sample; dry and wet digestion techniques; digestion samples by microwave mineralization; effect of sample preparation on the results of the analysis	2	lecture
4	Management systems: Principles of implementing management systems, creating documentation, keeping records.	2	seminar
5	Confirmation of validity of test results. Proficiency tests and interlaboratory comparisons. Measurement traceability. The role of certified reference materials.	2	seminar
6	Internal audits. Corrective Action.	2	seminar
7	Risk management.	2	seminar
8	Microwave mineralization of samples. Determination of nitrogen forms by titration methods: sample preparation; check the performance of the method; quality control tests	3	laboratory
9	Quantitative analysis by ICP-OES: identification of the matrix composition; preparation of calibration standards; calibration curve; selection wavelength; spectrometer design; preparation of matrix calibration standards; quantitative analysis of the elemental composition; interference identification; quality control tests	3	laboratory
10	Determination of mercury by AAS method: basic of atomic absorption spectrometry; determination of mercury content by atomic absorption spectrometry using an amalgamation technique; checks; quality control tests	3	laboratory
11	Determination of carbon and nitrogen by elemental analysis method: principle of elemental analysis; CN elemental analyzer design; compacting the samples in the form of tablets using a tin foil; determination of the daily correction factor; quality control tests	3	laboratory
12	Preparation of documentation - analytical report for external clients in ISO 17025: performance report based on conducted proceedings - from receipt of the order to forward the tests report to the client / execution of the order of business entity	2	seminar
12	Summarizing the results, formulating conclusions. Evaluation of the course.	2	seminar

#### 4. Prerequisites

*List of prerequisites relating to knowledge, skills and other competences for course participants.*

- [1] Basic knowledge of issues related to the management systems
- [2] Basic knowledge of analytical chemistry



[3] Basic knowledge of chemical calculations (conversions concentrations, etc.)

## 5. Learning outcomes

List of learning outcomes at level 8 of the Polish Qualifications Framework assigned to the course (mark the learning outcomes in the last column).

Symbol	Learning outcome	
	<b>KNOWLEDGE. Doctoral student knows and understands:</b>	
SzD_W3	the main trends in the development of the scientific or artistic disciplines covered in the curricula;	<input type="checkbox"/>
SzD_W4	research methodology;	<input checked="" type="checkbox"/>
SzD_W5	the rules for the dissemination of scientific results, including in open access mode;	<input type="checkbox"/>
SzD_W6	the fundamental dilemmas of modern civilization;	<input type="checkbox"/>
SzD_W7	the legal and ethical conditions of scientific activity;	<input type="checkbox"/>
SzD_W8	the economic and other relevant conditions of scientific activity;	<input type="checkbox"/>
SzD_W9	basic principles of knowledge transfer to the economic and social spheres and commercialisation of results of scientific activity and know-how related to these results.	<input checked="" type="checkbox"/>
	<b>SKILLS. Doctoral student is able to:</b>	
SzD_U2	use knowledge from different fields of science or art to creatively identify, formulate and innovatively solve complex problems or perform research tasks, in particular: - define the purpose and subject of scientific research, formulate a research hypothesis, - develop research methods, techniques and tools, and use them creatively, - draw conclusions on the basis of scientific research; critically analyse and evaluate the results of scientific research, expertise and other creative work and their contribution to knowledge development; transfer the results of scientific activities to the economic and social spheres;	<input checked="" type="checkbox"/>
SzD_U3	communicate on specialised topics to the extent that they enable an active participation in the international scientific community;	<input checked="" type="checkbox"/>
SzD_U4	disseminate research results, including in popular forms;	<input type="checkbox"/>
SzD_U5	initiate debates and participate in a scientific discourse;	<input type="checkbox"/>
SzD_U6	be able to speak a foreign language at B2 level of the Common European Framework of Reference for Languages to a level that enables them to participate in the international scientific and professional environment;	<input type="checkbox"/>
SzD_U7	plan and implement an individual or collective research or creative activity, including in an international environment;	<input type="checkbox"/>
SzD_U8	independently plan and act for one's own development and inspire and organize the development of others;	<input type="checkbox"/>
SzD_U9	plan classes or groups of classes and implement them using modern methods and tools.	<input type="checkbox"/>
	<b>SOCIAL COMPETENCES. Doctoral student is ready to:</b>	
SzD_K3	fulfilling the social obligations of researchers and creators, initiate public interest	<input checked="" type="checkbox"/>



	activities, thinking and acting in an entrepreneurial way;	
SzD_K4	maintaining and developing the ethos of research and creative environments, including: - carrying out scientific activities in an independent manner, - respecting the principle of public ownership of research results, taking into account the principles of intellectual property protection.	<input type="checkbox"/>

## 6. Evaluation

*Short description of the method(s) used to evaluate the learning outcomes assigned to the course, e.g., exam, test, report, presentation, etc.*

presentation, activity in workshops, preparation of a report

## 7. Teaching methods

*Short description of the teaching methods used during the course, e.g., multimedia presentation, discussion, literature studies, developing written documents, own work, etc.*

multimedia presentation, discussion, literature studies, developing written documents, own work, laboratory work, conducting research, group work, workshops

## 8. Literature

*List of primary and secondary literature used to prepare the course and including additional knowledge for participants, e.g., books, textbooks, research papers, standards, web pages, etc.*

- [1] PN-EN ISO/IEC 17025
- [2] Polish Centre for Accreditation Documents: DA-01, TO-02, DA-05, DA-06, DA-08, DAB-07 / available on the internet /
- [3] Bulska Ewa, Metrologia Chemiczna Sztuka Prowadzenia Pomiarów, Publishing Malamute, Warsaw 2008
- [4] Information bulletins POLLAB
- [5] Scientific and technical journals: Accreditation and Quality Assurance; Acta Analytica; Chemical industry, etc.

## 9. Other remarks

*Additional remarks, comments, (e.g., language of the course)*