



COURSE CARD

1. Basic information

Course name in English:	Research skills	
Course name in Polish:	Warsztat badacza	
Number of hours:	30	
Type of course:	Research skills	
Form of course:	lecture	
Code of course:	W04ITT-SD0090W / ITQ100381W	
Course leader:	Prof. Krzysztof Walkowiak	
Faculty of the course leader:	W4 Faculty of Information and Communication Technology	
Email address of the course leader:	krzysztof.walkowiak@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 checked="" type="checkbox"/>
	Automation, electronic, electrical engineering and space technologies	<input checked="" type="checkbox"/>
	Information and communication technology	<input checked="" type="checkbox"/>
	Biomedical engineering	<input checked="" type="checkbox"/>
	Chemical engineering	<input checked="" type="checkbox"/>
	Civil engineering, geodesy and transport	<input checked="" type="checkbox"/>
	Materials engineering	<input checked="" type="checkbox"/>
	Mechanical engineering	<input checked="" type="checkbox"/>
	Environmental engineering, mining, and energy	<input checked="" type="checkbox"/>
	Mathematics	<input checked="" type="checkbox"/>
	Chemical sciences	<input checked="" type="checkbox"/>
	Physical sciences	<input checked="" type="checkbox"/>
	Management and quality studies	<input checked="" type="checkbox"/>

2. Objectives

To gain knowledge and skills related to:

- searching for, evaluating and organizing information from scientific databases;
- methodology of research work;
- presentation of a scientific work;
- writing scientific publications;
- preparing applications for research funding and scholarships from various sources of funding;
- scientific cooperation in research teams, including international cooperation;
- transfer and commercialization of research results.

To gain knowledge on academic career including education at the doctoral school.

To gain knowledge on research integrity.



3. Content

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

No.	Topic	Number of hours	Form of classes
1	Introduction	2	lecture
2	Education of doctoral students - legal aspects	2	lecture
3	Presentation and evaluation of scientific achievements	2	lecture
4	Searching for the knowledge necessary to carry out a doctoral dissertation	2	lecture
5	Scientific research methodology	2	lecture
6	How to write a scientific paper	4	lecture
7	How to prepare a presentation of a scientific work	2	lecture
8	Scientific cooperation, including international cooperation and cooperation with industry	2	lecture
9	Financing research, applying for projects	2	lecture
10	Commercialization	2	lecture
11	Scientist career	2	lecture
12	Research integrity	2	lecture
13	Individual research plan and mid-term evaluation	2	lecture
14	Presentations	2	lecture

4. Prerequisites

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

Knowledge of a discipline of education at the second degree level of studies.

Planned topic of the doctoral dissertation.

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	
	<i>KNOWLEDGE. Doctoral student knows and understands:</i>	
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 checked="" type="checkbox"/>
SzD_W6	the fundamental dilemmas of modern civilization;	<input checked="" 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 checked="" 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"/>
	<i>SKILLS. Doctoral student is able to:</i>	
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 type="checkbox"/>
SzD_U4	disseminate research results, including in popular forms;	<input checked="" 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 checked="" 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"/>
	<i>SOCIAL COMPETENCES. Doctoral student is ready to:</i>	
SzD_K3	fulfilling the social obligations of researchers and creators, initiate public interest activities, thinking and acting in an entrepreneurial way;	<input checked="" type="checkbox"/>
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 checked="" 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.

Final report, presentation and activity during the classes

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.

Lecture. Multimedia presentation. Discussion. Own work. Final report.



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] Robert E. Berger, "A Scientific Approach to Writing for Engineers and Scientists", Wiley-IEEE Press 2014.
- [2] Joshua Schimel, "Writing Science: How to Write Papers That Get Cited and Proposals That Get Funded".
- [3] N. Patel, "Technical Presentations", IEEE Books
- [4] Legal acts.
- [5] Search tools, e.g., scholar.google, ieeexplore.com, scopus, <https://www.semanticscholar.org/>, <https://www.researchgate.net/>
- [6] IEEE documents.
- [7] Regulations of research funding institutions (NCN, NCBR, FNP, EU).
- [8] Literature related to a particular scientific discipline.

9. Other remarks

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