



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:		
Course leader:	dr hab. inż. Grzegorz Soboń, prof. uczelni	
Faculty of the course leader:	W12 Faculty of Electronics, Photonics and Microsystems	
Email address of the course leader:	grzegorz.sobon@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

The main objectives of the course are:

- Understanding the foundations of scientific research: defining the scientific method and formulating research questions and hypotheses,
- Conducting effective literature reviews (using scientific databases, perform critical analysis, using management tools);
- Develop research methodologies and design experiments (selecting methods with attention to reproducibility, rigor and statistical validity);
- Apply research ethics (identify and avoid scientific misconduct)
- Acquiring practical skills in writing scientific publications and presentation of scientific results;
- Learn about planning and managing doctoral research;
- Getting familiar with technology transfer and commercialization of research results.



3. Content

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

No.	Topic	Number of hours	Form of classes
1	Introduction to the “research journey”	2	lecture
2	Education of doctoral students in Poland – legal aspects	2	lecture
3	How to search for knowledge? Literature search and review strategies	2	lecture
4	Scientific research methodology; Research planning and time management	2	lecture
5	Data analysis, statistics, and visualization; tools for technical writing and collaboration	4	lecture
6	How to write a scientific paper and get accepted: style, structure, and clarity	4	lecture
7	The Peer Review process and publishing	2	lecture
8	Building your research identity and networking	2	lecture
9	Financing research, applying for projects	2	lecture
10	Technology transfer and commercialization	2	lecture
11	Presenting your research: guidelines for oral and poster presentations	2	lecture
12	Student Presentations I	2	lecture
13	Student Presentations II + Wrap-up Discussion	2	lecture

4. Prerequisites

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

The participant should have a preliminary idea of his own research topic (e.g., a basic hypothesis or topic that she/he wants to investigate during doctoral studies), and a general knowledge of research topics in her/his scientific discipline.

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	
	KNOWLEDGE. Doctoral student knows and understands:	
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.

1) Presentation during the classes, 2) Final 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.



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] Peter J. Feibelman, "A PhD Is Not Enough! A Guide to Survival in Science", Basic Books, 2011
- [2] Piotr Wasylczyk, Piotr Siuda, "Publikacje naukowe", PWN 2018
- [3] Robert E. Berger, "A Scientific Approach to Writing for Engineers and Scientists", Wiley-IEEE Press 2014.
- [4] Joshua Schimel, "Writing Science: How to Write Papers That Get Cited and Proposals That Get Funded", Oxford University Press.

9. Other remarks

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