![Wrocław University of Science and Technology – Doctoral School]

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:	mixed forms (combination of lecture, seminar and laboratory)
Code of course:	
Course leader:	*Prof. Izabela Michalak*
Faculty of the course leader:	W3 Faculty of Chemistry
Email address of the course leader:	izabela.michalak@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	☒
	Automation, electronic, electrical engineering and space technologies	☒
	Information and communication technology	☒
	Biomedical engineering	☒
	Chemical engineering	☒
	Civil engineering, geodesy and transport	☒
	Materials engineering	☒
	Mechanical engineering	☒
	Environmental engineering, mining, and energy	☒
	Mathematics	☒
	Chemical sciences	☒
	Physical sciences	☒
	Management and quality studies	☒

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, selection of most appropriate journals, correspondence with editors and reviewers;
- participation in conferences – preparation of posters and oral communications;
- preparing applications for research funding and scholarships from various sources of funding;
- scientific cooperation in research teams, including international cooperation; searching best experts, research centers for individual training, job and postdoctoral fellowship offers;
- transfer and commercialization of research results;

- career planning, CV writing and interview preparation;
- 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. Explanation of course objectives	2	lecture
2	Scientific research methodology	2	lecture
3	Systematic tracking of scientific literature; creating search queries. Current databases – Web of Knowledge, Scopus, Google Scholar, etc.	2	lecture
4	How to write a scientific publication – discussion of the structure of a research publication; different publication templates depending on the publisher	2	lecture
5	Submission of the manuscript – selecting the most appropriate journal; writing a cover letter; corresponding with editors and responding to questions from reviewers and the editor	2	lecture
6	Participation in conferences – selection of the appropriate conference (conference rank); preparation of posters and oral communications	2	lecture
7	Preparing applications for research funding and scholarships from various sources; national and international research funding bodies; searching grant databases	2	lecture
8	Presentation and evaluation of scientific achievements	2	lecture
9	CV writing; searching for scholarships and job offers; preparing for job interviews; career planning	2	lecture
10	Scientific cooperation, including international cooperation and cooperation with industry	2	lecture
11	Commercialization; Patent and dissertation databases	2	lecture
12	Ethical problems in science; parasitic journals and conferences	2	lecture
13	Individual research plan and mid-term evaluation	2	lecture
14	Short presentation of individual research topics with discussion	2	lecture
15	Short presentation of individual research topics with discussion	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.
Basic computer skills.

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;	☐
SzD_W4	research methodology;	☒
SzD_W5	the rules for the dissemination of scientific results, including in open access mode;	☒
SzD_W6	the fundamental dilemmas of modern civilization;	☒
SzD_W7	the legal and ethical conditions of scientific activity;	☐
SzD_W8	the economic and other relevant conditions of scientific activity;	☒
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.	☒
	SKILLS. Doctoral student is able to:	
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;	☒
SzD_U3	communicate on specialised topics to the extent that they enable an active participation in the international scientific community;	☐
SzD_U4	disseminate research results, including in popular forms;	☒
SzD_U5	initiate debates and participate in a scientific discourse;	☐
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;	☐
SzD_U7	plan and implement an individual or collective research or creative activity, including in an international environment;	☒
SzD_U8	independently plan and act for one's own development and inspire and organize the development of others;	☐
SzD_U9	plan classes or groups of classes and implement them using modern methods and tools.	☐
	SOCIAL COMPETENCES. Doctoral student is ready to:	

SzD_K3	fulfilling the social obligations of researchers and creators, initiate public interest 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.	☒

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] R.E. Berger, "A Scientific Approach to Writing for Engineers and Scientists", Wiley-IEEE Press 2014.
[2] J. Schimel, "Writing Science: How to Write Papers That Get Cited and Proposals That Get Funded".
[3] N. Patel, "Technical Presentations", IEEE Books.
[4] J. Measey, "How to Write a PhD in Biological Sciences, A Guide for the Uninitiated", CRC Press Taylor & Francis, 2022.
[5] M. Carter, "Designing Science Presentations", Academic Press, 2013.
[6] On Being Scientist: A Guide to Responsible Conduct in Research: Third Edition, National Academy of Sciences (2009).
[7] Legal acts.
[8] Search tools, e.g., Web of Science, scholar.google, ieeexplore.com, Scopus, https://www.semanticscholar.org/, https://www.researchgate.net/.
[9] Regulations of research funding institutions (NCN, NCBR, FNP, EU).
[10] Literature related to a particular scientific discipline.

9. Other remarks

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