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:	Elective course	
Form of course:	mixed forms (combination of lecture, seminar and laboratory)	
Code of course:	W03INC-SD0088W, W03NCH-SD0091W	
Course leader:	*Dr hab. inż. Marcin Poręba, prof. PWr*	
Faculty of the course leader:	W3 Faculty of Chemistry	
Email address of the course leader:	marcin.poreba@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

This course is designed for first-year PhD students to build essential research skills for academic and professional success. It focuses on finding and evaluating scientific information from sources like research papers, patents, dissertations, and grant databases. Students will learn how to create effective database search queries and write and refine research papers. The course also covers choosing the right journals, handling correspondence with editors, and applying for grants, fellowships, and conference support. Students will plan their careers, learn to build collaborations, and find experts or research centers for training, jobs, or postdoctoral opportunities. Practical skills include writing CVs, preparing for interviews, and networking professionally. The course addresses ethical issues in research and teaches students to use advanced tools like national supercomputer resources and specialized databases. Grading is based on a report that critically evaluates various sources of

information—such as reviews, books, patents, and grants—related to the student's PhD topic, with a focus on applying these skills to their research

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 course and the path of a scientist.** Overview of course goals, structure, and setting up computer accounts. Discuss the mindset, qualities, and skills required for a successful career in science, alongside the philosophy of scientific inquiry and the research lifecycle.	2	lecture
2	**Understanding research types and collaboration.** Exploration of basic, applied, interdisciplinary, and collaborative research, including the growing importance of team science in modern research.	2	lecture
3	**Systematic literature tracking and search strategies.** Techniques for tracking scientific literature, composing effective search queries, and using tools like Current Contents, Web of Knowledge, Scopus, and Google Scholar.	2	lecture
4	**Structure and composition of research papers.** Guidelines for writing and refining research papers, including manuscript preparation, journal selection, and managing correspondence with editors and reviewers.	2	lecture
5	**Research metrics and assessing quality.** Understanding citation metrics, impact factors, altmetrics, and other measures to evaluate the quality and impact of research papers and researchers.	2	lecture
6	**Ethics and integrity in research.** Addressing ethical challenges, including scientific misconduct, conflicts of interest, predatory journals, and responsibilities in co-authorship and collaboration.	2	lecture
7	**Exploring grants and research funding.** Searching grant databases, preparing grant and fellowship applications, and understanding funding opportunities for academic and professional growth.	2	lecture
8	**Presenting research efffectively.** Preparing posters, oral presentations, and elevator pitches,	2	lecture

	along with best practices for participating in conferences and networking.		
9	**Career development and planning.** Writing professional CVs, searching for job and fellowship opportunities, preparing for interviews, and planning academic and non-academic career paths.	2	lecture
10	**Leveraging advanced research tools.** Using factographic databases like Reaxys, SciFinder, and the Cambridge Structural Database, along with the resources of national supercomputer centers and AI-driven research tools.	2	lecture
11	**Patents, dissertation preparation, and breakthrough topics.** Accessing patent and dissertation databases, identifying breakthrough research areas, and preparing a dissertation aligned with emerging trends.	2	lecture
12	**Peer review and communicating science beyond academia.** Training in peer review, critically evaluating research, and communicating complex ideas effectively to non-specialist audiences and the general public.	2	lecture
13	**Pitch practice: presenting with confidence.** A practice-oriented session where students deliver their pitches, receive constructive feedback, and build confidence in presenting to diverse audiences.	2	seminar
14	**Pitch practice: presenting with confidence.** A practice-oriented session where students deliver their pitches, receive constructive feedback, and build confidence in presenting to diverse audiences.	2	seminar
15	**Pitch practice: presenting with confidence.** A practice-oriented session where students deliver their pitches, receive constructive feedback, and build confidence in presenting to diverse audiences.	2	seminar

4. Prerequisites

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

Participants should have a foundational understanding of academic research processes and an interest in developing their research skills. A basic proficiency in English for reading, writing, and communication is required, along with general computer literacy for online searches and document preparation. Openness to collaboration and group discussions is also encouraged.

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.

a) A written report critically evaluating answers to questions related to the prospective PhD thesis topics, using literature and factographic databases. b) A short multimedia presentation introducing the planned research topic, designed for a general audience. c) A preliminary version of the Individual Research Plan (IRP), outlining the student's proposed research direction and objectives

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.

The course will combine lectures and interactive seminars to provide both foundational knowledge and practical skill development. Short discussions during seminars will encourage critical thinking, peer engagement, and the exchange of ideas. Additionally, hands-on activities such as database searches, report writing, and multimedia presentations will help students apply concepts in real-world scenarios.

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. J. Measey, How to Publish in Biological Sciences, A Guide for the Uninitiated, CRC Press Taylor & Francis, 2023
2. J. Measey, How to Write a PhD in Biological Sciences, A Guide for the Uninitiated, CRC Press Taylor & Francis, 2022
3. D. Lindsay, A guide to scientific writing, Longman, 1984
4. D. Ridley, Finding scientific information –information retrieval, Wiley, 2002
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. M. Heller, Jak być uczonym, Znak, 2013
8. N. Hertz, Eyes wide open, Harper Collins, 2013

9. Other remarks

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

Course conducted in English language