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:	W07ISG-SD0122W / IGQ100423W
Course leader:	Dr hab. inż., Renata Krzyżyńska, prof. uczelni
Faculty of the course leader:	W7 Faculty of Environmental Engineering
Email address of the course leader:	Renata.krzyzynska@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

C1 To gain basic knowledge on academic career.

C2 To gain skills related to searching for, evaluating and organizing information from scientific databases.

C3 To gain skills related to methodology of research work.

C4 To gain skills required to prepare a presentation of a scientific work.

C5 To gain skills required to write a scientific publication.

C6 To gain skills required to prepare applications for research funding and scholarships from various sources of funding.

C7 To gain skills of scientific cooperation in research teams, including international cooperation.

C8 To gain basic knowledge on knowledge transfer and commercialization of research results.

C9 Stimulation of their own creativity and entrepreneurship.

C10 Encouraging and motivating PhD students thinking outside the box, creative thinking and openness to cooperation with the business community.

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

No.	Topic	Number of hours	Form of classes
1	Academic career (doctoral school principles, legal acts, academic career path, promotion rules). The Polish, European and World higher education system area. Lecture and group discussion	2	lecture
2	Searching for, evaluating and organizing information from scientific databases. Lecture and group discussion.	2	lecture
3	Methodology of research work. Methods of creative work. Inventiveness, creative work and problem solving. Brainstorm. Lecture and group discussion.	2	lecture
4	Innovation. Cooperation between science and business.	2	lecture
5	Striving for academic excellence 1. Best practices. Research Integrity. Creativity and Californian enthusiasm. Lecture and group discussion.	2	lecture
6	Striving for academic excellence 2. Best practices. Crossroads of science and business. Technology Parks. Lecture and group discussion.	2	lecture
7	Presentation of scientific work. Lecture and group discussion.	2	lecture
8	Writing of scientific papers. Lecture and group discussion.	2	lecture
9	Financing research. Preparation of applications (projects, grants) for research funding. Lecture and group discussion.	2	lecture
10	Scientific cooperation. Team building. Lecture and group discussion.	2	lecture
11	Knowledge transfer and commercialization of research results. Protection of intellectual property rights. Lecture and group discussion.	2	lecture
12	Presentation on a selected topic related to the planned PhD thesis. Seminar.	8	seminar
13	Preparation of a report documenting the implementation of tasks related to: information retrieval, methodology and planning of scientific		project

	research, writing scientific papers, writing grant applications, scientific cooperation, knowledge transfer and commercialization of research results. Self work.		

4. Prerequisites

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

1. Pre-defined research topic of PhD
2. Involvement

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.

Report, presentation and activity during the lectures

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.

N1. Lecture

N2. Presentation

N3. Discussion

N4. Self work

N5. Group work, some classes may take place outside the WUST (e.g. meetings at the headquarters of innovative high-tech companies, start-ups or dedicated workshops / conferences)

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.

PRIMARY LITERATURE:

[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] Crossing the chasm, Marketing and selling High-Tech Products to Mainstream Customers, Geoffrey A. Moore, HarperCollins Publishers Inc. 2011

[5] Building Creative Competence in Globally Distributed Courses through Design Thinking, Comunicar, 37, v. XIX, 2011

[6] Game Storming, A Playbook for Innovators, Rulebreakers, and Changemakers, Dave Gray, Sunni Brown, James Macanufo, O'Reilly Media, Inc. 2010

[7] Nature Masterclasses https://masterclasses.nature.com

SECONDARY LITERATURE:

[8] Legal acts

[9] Search tools, e.g., scholar.google, ieeexplore.com

[10] Literature related to a particular scientific discipline

[11] Regulations of research funding institutions (NCN, NCBR, FNP)

9. Other remarks

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