Politechnika Wrocławska

Introduction

Łukasz Sadowski
lukasz.sadowski@pwr.edu.pl

Wroclaw University of Science and Technology
Faculty of Civil Engineering
Department of Materials Engineering and Construction Processes

Course card

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:	Łukasz Sadowski	
Faculty of the course leader:	W2 Faculty of Civil Engineering	
Email address of the course leader:	lukasz.sadowski@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, and electrical engineering	☒
	Information and communication technology	☒
	Biomedical engineering	☒
	Chemical engineering	☒
	Civil engineering and transport	☒
	Mechanical engineering	☒
	Environmental engineering, mining, and energy	☒
	Mathematics	☒
	Chemical sciences	☒
	Physical sciences	☒
	Management and quality studies	☒

Prerequisites and learning outcomes

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

- Having a basic knowledge of a given discipline at the second level of studies.
- Having a predefined research topic related to realized PhD thesis.

Learning outcomes (knowledge):

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.	☒

Prerequisites and learning outcomes

Learning outcomes (skills):

	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.	☐

Prerequisites and learning outcomes

Learning outcomes (social competences):

	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.	☒

Literature:

- Berger, R. (2014). A Scientific Approach to Writing for Engineers and Scientists. Wiley-IEEE Press.
- Kraicer, J. (1997). The art of grantsmanship. Toronto: University of Toronto.
- Legal acts.
- Search tools, e.g., http://scholar.google.pl/, https://www.researchgate.net, https://www.scopus.com, http://www.sciencedirect.com/, http://www.link.springer.com/.
- Databases of patent offices.
- Literature related to a particular scientific discipline.
- Regulations of research funding institutions (MNiSW, NCN, NCBR, FNP).

Other remarks:

- Course in English, own laptop is welcome.

Course objectives

- To acquaint with the principles of operation of the doctoral school, basic legal acts, scientific fields and disciplines, the path of the academic career and the principles of promotion.
- To gain skills of searching for scientific knowledge.
- To gain skills related to related to methodology and conducting scientific research.
- To gain skills required to prepare the presentation of the results of scientific research including copyright, public presentations and presentation of academic achievements.
- To gain skills necessary to prepare and write scientific articles.
- To gain skills required to acquire funds for research and to prepare applications for research funding.
- To gain skills of scientific cooperation in research teams, including international ones.
- Acquainting with the basic principles of ethics in scientific research.
- To gain basic knowledge in the field of knowledge transfer and commercialization of research results.

Content of the course

No.	Topic	Number of hours	Form of classes
1	Academic career (principles of a doctoral school, basic legal acts, scientific fields and disciplines, academic career path, principles of promotion)	2	lecture
2	Searching for scientific knowledge	2	lecture
3	Methodology and conducting scientific research	2	lecture
4	Presentation of the results of scientific research, copyrights in presentations, public presentations and presentation of academic achievements	4	lecture
5	Preparation and writing of scientific articles	4	lecture
6	Acquiring funds for research and preparation of applications for research funding	2	lecture
7	Scientific cooperation in research teams, including international ones	2	lecture
8	Ethics in scientific research	2	lecture
9	Knowledge transfer and commercialization of research results	2	lecture
10	Delivering a multimedia presentation on a selected topic related to the planned PhD thesis	6	seminar
11	Preparation of final report	-	Select form
12	Review of final report	2	seminar
13	Total hours	30	Select form

Course evaluation

Scoring for a:

- presentation on a selected topic related to the planned doctorate (**P**, from 0 to 2 points),
- summary report (**R**, from 0 to 2 points),
- activity in group discussions (**Q**, 0.5 points for each question asked for the presentation, not more than 1 point for all questions asked; does not apply on the day of presentation).

Course grade = P+R+Q

Additional task to increase the grade by 0.5:

- Prepare scientific article to 1 of the 3 selected high quality scientific journals. Attach * pdf of the submitted article. Discuss the review process and your experiences.

Summary report

Should be prepared according to the table of contents below. The report should be sent in **PDF format (file size max. 2 MB) to the e-mail lukasz.sadowski@pwr.edu.pl** at the latest during the last class:

1. Searching for scientific knowledge:

- Characterize your research using 4 keywords and list the 10 most cited articles in your field found in Scopus,
- Provide the addresses of 3 researchers' websites in your field.
- List 3 doctoral dissertations of scientists in their field.
- List 3 patents in their field.

2. Methodology and research planning:

- Formulate a research problem in one sentence.
- Identify the resources needed to conduct your research and how to obtain them.
- Develop a list of literature sources showing how to conduct research and analyze data on the subject of your research.
- Develop a schedule for carrying out your research.
- Develop a list of possible risks to carry out your research.

Summary report

3. Presentation of research results, copyrights in presentations, public speeches, presentation of scientific achievements:

- Prepare a multimedia presentation for 20 minutes on the topic of the doctorate.
- Set up your own profile on Google Scholar, ResearchGate and Orcidc.
- Select and observe the 10 Lead Scientist Profiles on ResearchGated.
- Find 5 "master" scientist WWW pages.
- Choose 1 best method of presenting your achievements in a given field (e.g. scientific profile, own website, etc.).
- Find 5 authors from your own field with the best achievements in databases (Hirsh index, number of citations).

4. Preparation and writing of scientific articles:

- Present the best article you have read so far and justify why this article is the best.
- Present the worst article you have read so far and justify why this article is the worst.
- Analyze the speed of the review process and the position on the list of the Ministry of Higher Education in selected 10 scientific journals in your field.
- Select 3 scientific journals in your field with the fastest review process and the highest number of points from the Ministry of Higher Education.

Summary report

5. Acquiring funds for research and preparing applications for research funding:

- Carefully read the documentation related to the Preludium competitionand prepare a list of questions / issues for discussion related to this competition (a few sentences).
- Check other possibilities of obtaining funds for research for PhD students, possibly prepare a list of questions / issues for discussion related to these competitions (a few sentences).

6. Scientific cooperation in research teams, including international ones:

- Specify with which research teams from outside the Wrocław University of Science and Technology the scientific cooperation is planned during the implementation of the doctorate
- Specify with which companies the scientific cooperation is planned during the doctorate implementation

Now: Round table introductions

Every student introduce shortly himself/herself

Academic rules and etiquette

Scientific titles and degrees:

inż., mgr inż., mgr, dr inż., dr hab. inż., prof. dr hab. inż.

Academic positions:

- professor (profesor: prof. dr hab. inż.) – full profesor,
- university professor (profesor uczelni: dr hab. inż.) – associate profesor,
- assistant professor (adiunkt: dr. inż. lub dr hab. inż),
- assistant lecturer (asystent: mgr. inż.),

How to address a person: by academic degree or position. For example, how to address a university professor with dr hab. inż.?

How to write emails?

Students with disabilities and special needs

Students who, due to their health condition, disability or other objective reasons, may have special needs related to classes leading, crediting method or materials preparation are asked to report for consultations or after the classes, write such information in a private chat or write an e-mail about the matter. I will try to ensure that during my classes everyone has an equal right to gain knowledge and its' crediting.