



## 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:  | W10IME-SD0089W / MEQ100383W   |                                     |
| Course leader:   | Associate professor, Mariusz PTAK                                     |                                     |
| Faculty of the course leader:  | W10 Faculty of Mechanical Engineering                                 |                                     |
| Email address of the course leader:  | mariusz.ptak@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

- 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



### 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). Lecture and group discussion.  | 2               | lecture         |
| 2   | Searching for, evaluating and organizing information from scientific databases. Methodology of research work. Lecture and group discussion.   | 2               | lecture         |
| 3   | Experiment planning and basics of dimensional analysis. Lecture and group discussion.   | 4               | lecture         |
| 4   | Presentation of research results. Lecture and group discussion.   | 2               | lecture         |
| 5   | How to prepare a good scientific article? Stages of creating an article in the light of the results obtained. Analysis of selected publishing platforms and review templates. Lecture and group discussion.   | 4               | lecture         |
| 6   | Preparation of applications (projects, grants) for research funding. Lecture and group discussion.  | 4               | lecture         |
| 7   | Scientific cooperation. Lecture and group discussion.   | 2               | lecture         |
| 8   | Knowledge transfer and commercialization of research results. Lecture and group discussion.   | 2               | lecture         |
| 9   | Presentation on a selected topic related to the planned PhD thesis. Seminar.  | 8               | seminar         |
| 10  | Preparation of a report documenting the implementation of tasks related to: information retrieval, methodology and planning of scientific research, writing scientific papers, writing grant applications, scientific cooperation, knowledge transfer and commercialization of research results. Self work. | 2               | lecture         |

### 4. Prerequisites

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

1. Knowledge of a given discipline at the second level of studies.
2. Pre-defined research topic of PhD.

### 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   |                                     |
|--------|--|-------------------------------------|
|        | <i>KNOWLEDGE. Doctoral student knows and understands:</i>  |                                     |
| 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:<br>- define the purpose and subject of scientific research, formulate a research hypothesis,<br>- develop research methods, techniques and tools, and use them creatively,<br>- draw conclusions on the basis of scientific research;<br>critically analyse and evaluate the results of scientific research, expertise and other creative work and their contribution to knowledge development;<br>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:<br>- carrying out scientific activities in an independent manner,<br>- 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.*

Various forms of presentations



## 7. Teaching methods

*Short description of the method(s) used to evaluate the learning outcomes assigned to the course, e.g., exam, test, report, presentation, etc.*

Lecture, Presentation, Discussion, Self-work

## 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] Berger R.E., A scientific approach to writing for engineers and scientists. Wiley-IEEE Press, 2014.
- [2] Patel N.K., Technical Presentations. IEEE-USA, E- Books, 2012.
- [3] Paul O., The student's guide to research ethics. Open University Press, McGraw-Hill Education, 2010.
- [4] Schimel J., Writing Science: How to write papers that get cited and proposals that get funded. Oxford University Press, 2012]

## 9. Other remarks

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