



# "Methodology of scientific research"

## The syllabus of the discipline

### Details of the discipline

Level of higher education	Third (postgraduate)
Field of expertise	13 - Mechanical engineering
Specialty.	133 - Industrial machinery engineering
Educational program	"Industrial Engineering"
Status of the educational component	Normative
Scope of the discipline	150 hours/ 5 ECTS credits
Year of study, semester	1st year, fall semester
Form of study	Full-time (daytime)
Class schedule	1 lecture and 1 practical lesson every two weeks
Semester control / control measures	Examination/ICR
Language of instruction	English
Information about the course leader / teachers	phD, Associate Professor, Seminsky Oleksandr Olehovych, <a href="mailto:forstd@ukr.net">forstd@ukr.net</a> , <a href="mailto:@mahnv_kpi">@mahnv_kpi</a>
Placement of the course	<a href="http://ci.kpi.ua">http://ci.kpi.ua</a>

### Program of the discipline

#### 1. Description of the discipline, its purpose, subject matter and learning outcomes

The discipline "Methodology of Scientific Research" begins the normative part of the training of Doctors of Philosophy. The material of this discipline is used as a basis for the study of professional educational components and the implementation of an individual training program for applicants.

**The purpose of the discipline** is to master the methods of researching processes in industrial engineering, as well as approaches and skills for presenting the results of scientific activities.

The discipline forms the following **competencies**:

- the ability to search, process and analyze information from various sources, generate new ideas and solve complex problems of industrial engineering;
- the ability to solve problems in the field of industrial engineering based on a systematic scientific outlook and general cultural outlook, in compliance with the principles of academic integrity;
- the ability to perform original research, achieve scientific results that create new knowledge in mechanical engineering and related interdisciplinary areas and can be published in leading scientific journals in mechanical engineering and related fields;
- ability to critically analyze, evaluate and synthesize new and complex ideas in the field of industrial engineering and related interdisciplinary issues;
- the ability to continuously develop and improve oneself;
- the ability to generate new ideas for the development of the theory and practice of industrial engineering, to identify, pose and solve research problems, evaluate and ensure the quality of research.

The **program learning outcomes** after studying the discipline include:

- have conceptual and methodological knowledge in mechanical engineering and on the boundaries of subject areas, as well as research skills sufficient to conduct scientific and applied research at the level of the latest world achievements in the relevant field, obtain new knowledge and/or implement innovations;
- develop and investigate conceptual, mathematical and computer models of processes and systems, effectively use them to obtain new knowledge and/or create innovative products in mechanical engineering and related interdisciplinary areas;
- be able to plan and carry out experimental and/or theoretical research in industrial engineering and related interdisciplinary areas using modern tools and in compliance with professional and academic ethics, critically analyze the results of their own research and the results of other researchers in the context of the entire body of modern knowledge on the problem under study;
- be able to use innovative methods of activity for the implementation of scientific research.

## **2. Prerequisites and post-requisites of the discipline (place in the structural and logical scheme of study in the relevant educational program)**

The discipline forms the basis for the study of other disciplines necessary to gain in-depth knowledge of the specialty and helps to ensure the scientific component of the PhD program. The level of training required to study the discipline is determined by the results of entrance examinations.

## **3. Content of the discipline**

The topics of the training sessions include information on organizational and methodological support for scientific research, the design and presentation of their results, and the preparation of a dissertation for the degree of Doctor of Philosophy.

## **4. Training materials and resources**

### **Basic literature:**

1. Methodology of scientific research [Electronic resource] : a textbook for the preparation of doctors of philosophy in specialties 161 Chemical technology and bioengineering, 162 Biotechnology and bioengineering, 163 Biomedical engineering / Igor Sikorsky Kyiv Polytechnic Institute ; compiled by Astrelin I. M., Kosohina I.V., Kyrii S.O. - Electronic text data (1 file: 8.9 MB) - Kyiv : Igor Sikorsky Kyiv Polytechnic Institute, 2021. 121 p. - Title from the screen.

2. Methodology of scientific research in the industry: a workshop [Electronic resource] : a textbook for students majoring in 151 "Automation and computer-integrated technologies" / Igor Sikorsky Kyiv Polytechnic Institute ; compiled by N. Burau, V. Antoniuk, D. Pivtorak - Electronic text data (1 file: 471.92 Kb) - Kyiv : Igor Sikorsky Kyiv Polytechnic Institute, 2021. 58 p. - Title from the screen.

3. Methodology of research activity. Study guide [Electronic resource] : study guide for applicants for the degree of Doctor of Philosophy, under the educational and scientific program "Publishing and Printing", specialty 186 "Publishing and Printing" / Igor Sikorsky Kyiv Polytechnic Institute ; comp. Electronic text data (1 file: 0.56 MB) - Kyiv : Igor Sikorsky Kyiv Polytechnic Institute, 2021. 56 p. - Title from the screen.

### **Additional literature and information resources:**

1. Methodology of scientific research: a textbook / V.S. Antoniuk, L.G. Polonsky, V.I. Averchenkov, Y.A. Malakhov - K.: NTUU "KPI", 2015. 276 p.

2. Yurynets V. E. Methodology of scientific research: a textbook / V. E. Yurynets - Lviv: Ivan Franko National University of Lviv, 2011. 178 p.

3. Prathapan K. Research Methodology for Scientific Research. Prathapan. - Dreamtech Press, 2019. - 272 p.
4. The Procedure for Awarding Academic Degrees, approved by the Resolution of the Cabinet of Ministers of Ukraine of July 24, 2013, No. 567, as amended in 2015, 2017, and 2020.
5. DSTU 3582-97. Abbreviations of words in the Ukrainian language. General requirements and rules. Effective from 01.07.1998. - K.: Gosstandart of Ukraine, 1998. - 27 p.
6. DSTU GOST 7.1:2006. Bibliographic record. Bibliographic description: general requirements and rules of compilation (GOST 7.1-2003, IDT) - Official edition. - Kyiv: Derzhspozhyvstandart Ukrainy, 2007. - 124 p. - (System of standards on information, library and publishing).
7. Portal for facilitating the procedure of registration of scientific sources in accordance with the requirements of the Higher Attestation Commission (HAC) of Ukraine and passing the normative control when writing publications, term papers, diploma papers, dissertations and other scientific works [Electronic resource]: [www.vak.org.ua/](http://www.vak.org.ua/).
8. Financing of scientific research in Ukraine and the world [Electronic resource]: <http://edclub.com.ua/analytika/finansuvannya-naukovyh-doslidzen-v-ukrayini-ta-sviti>.
9. Google Scholar or Google Academy: a search engine and non-profit bibliometric database that indexes scientific publications and provides data on their citation <https://scholar.google.com.ua/>.
10. Elsevier [Electronic resource]: <http://www.elsevier.com>.
11. Science Direct [Electronic resource]: <https://www.sciencedirect.com/>.
12. ORCID [Electronic resource]: <http://www.orcid.org>.
13. Scopus for authors [Electronic resource]: <https://www.scopus.com/home.uri?zone=header&origin=>.
14. Scientometric databases. URL: <http://www.nbuv.gov.ua/node/1367/>.

## Educational content

### 5. Methods of mastering the discipline (educational component)

#### Calendar and thematic plan

<i>Week</i>	<i>The content of the training work</i>	<i>SRS (122 hours according to the curriculum)</i>
1, I week	<b>Lecture 1:</b> Scientific cognition and the development of scientific creativity.	Study the topic of the class. Work with the recommended literature.
2, II week	<b>Practical session 1:</b> Requirements for dissertation research.	Study the topic of the class. Work with the recommended literature.
3, I week	<b>Lecture 2.</b> Classification and characterization of research works.	Study the topic of the class. Work with the recommended literature.
4, II week	<b>Practical lesson 2.</b> The structure of scientific research.	Study the topic of the class. Work with the recommended literature.
5, I week	<b>Lecture 3:</b> Formulating an idea and defining research methods.	Study the topic of the class. Work with the recommended literature.
6, II week	<b>Practical session 3:</b> Using specialized publishing systems in the design of scientific publications.	Study the topic of the class. Work with the recommended literature.

<i>Week</i>	<i>The content of the training work</i>	<i>SRS (122 hours according to the curriculum)</i>
7, I week	<b>Lecture 4.</b> Scientific issues and justification of the relevance of the research topic.	Study the topic of the class. Work with the recommended literature.
8, II week	<b>Practical session 4.</b> Using specialized publishing systems in the design of scientific publications (continued).	Study the topic of the class. Work with the recommended literature.
9, I week	<b>Lecture 5.</b> Formulation of the purpose and objectives of scientific research. object and subject of scientific research.	Study the topic of the class. Work with the recommended literature.
10, II week	<b>Practical session 5.</b> Scientometrics and scientometric databases.	Study the topic of the class. Work with the recommended literature.
11, I week	<b>Lecture 6.</b> Expected research results, their scientific novelty and practical significance.	Study the topic of the class. Work with the recommended literature.
12, II week	<b>Practical lesson 6.</b> Modular control work.	Preparing for a module test.
13, I week	<b>Lecture 7.</b> Publication of research results.	Study the topic of the class. Work with the recommended literature.
14, II week	<b>Final class.</b> Discussion of the practical application of the learned methods within the framework of dissertation research topics.	Preparing for the final lesson.

## 6. Independent work of a student/graduate student

The types of independent work are indicated in the table in paragraph 5, in accordance with the academic weeks and scheduled classes. During the study of the discipline, postgraduate students work through the material presented, taking into account the specifics of the topics of their dissertation research and develop methods for conducting them.

## Policy and control

### 7. Policy of the academic discipline (educational component)

System of requirements for graduate students:

- **rules for attending classes** - attendance at all types of classes (lectures, practical classes) is mandatory both in classrooms and in distance learning. In the latter case, classes are held in Zoom conferences and graduate students "attend" them by connecting to the links provided by teachers;
- **rules of behavior in the classroom** - not to interfere with other graduate students' listening to lectures or working in practical classes by unnecessary activities, conversations (including by phone). In the classroom and during distance learning at home, follow safety rules;
- **rules for crediting practical classes and awarding points for their completion** - the teacher evaluates the work of the graduate student during the class, the quality and timeliness of the presentation of the results of the task;
- **rules for the defense of individual assignments** - presentations of the possibilities of the studied methods within the framework of dissertation research topics are held at the last of the practical classes with a mandatory discussion of the presented results;

- **rules for awarding incentive and penalty points** - no incentive points are provided; 3 penalty points are awarded for absence from class without a valid reason, late completion of practical assignments or late presentation;

- **policy of deadlines and retakes:**

1) all assignments are submitted and evaluated exclusively during classroom sessions;

2) retakes of the exam are carried out according to the schedule established at the university level within the timeframe determined by the teacher and communicated to the graduate students when the rating scores are announced;

- **policy on academic integrity** - graduate students are required to comply with the provisions of the Honor Code and the requirements of academic integrity during the educational process.

## 8. Types of control and rating system for assessing learning outcomes (RSO)

**Current control:** evaluation of work in practical classes (completion of tasks in each class is evaluated up to 6 points, the maximum for all practical classes is 36 points), preparation and module control work, which is evaluated with a maximum of 24 points.

**Calendar control:** is carried out twice a semester on weeks 7-8 and 14-15 as a monitoring of the current state of fulfillment of Silabus requirements - a graduate student receives "satisfactory" during the first and second calendar control if his or her current rating is at least 0.5 of the maximum number of points possible at the time of control.

**Semester control** is conducted in the form of an exam in the form of a presentation on the topic of dissertation research. The maximum number of points that can be obtained for passing the exam is 40.

**Conditions of admission to semester control:**

- admission to the exam is possible only in case of successful completion of all practical classes and passing the module test;

- postgraduate students who received a total rating score of < 25 during the semester are not allowed to take the exam.

**Table of correspondence between rating points and grades on the university scale:**

<i>Number of points</i>	<i>Assessment.</i>
100-95	Excellent
94-85	Very good
84-75	Okay.
74-65	Satisfactory
64-60	Enough
Less than 60	Unsatisfactory
The conditions for admission are not met	Not allowed

## 9. Additional information on the discipline (educational component)

Retakes are conducted according to a "soft" scheme (with the points gained during the semester). In this case, 6 penalty points are awarded for each retake.

**The silhouette of the discipline:**

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