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ФИО: Ястребов Олег Александрович
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**Federal State Autonomous Educational Institution of Higher Education
PEOPLES' FRIENDSHIP UNIVERSITY OF RUSSIA
NAMED AFTER PATRICE LUMUMBA
RUDN University
ACADEMY OF ENGINEERING**

(educational division (faculty/institute/academy) as programme developer)

Base department "Machine-building technologies"

(department realizing the PhD program)

COURSE SYLLABUS

Research Methodology

(course title)

Scientific specialty:

2.5.6. Mechanical Engineering Technology

(scientific speciality code and title)

The course instruction is implemented within the PhD programmes:

Mechanical Engineering Technology

(PhD program title)

1. DISCIPLINE (MODULE) GOAL

The purpose of mastering the discipline "Methodology of scientific research" is the preparation for the candidate's examinations, as well as the acquisition of knowledge, skills and experience in the research field, characterizing the stages of the formation of competencies and ensuring the achievement of the planned results of mastering the educational program.

The main objectives of the discipline are:

- teaching the basics of scientific research methodology;
- formation of modern ideas about research related to power engineering;
- formation of ideas about the basic concepts, stages, logic of scientific research;
- explanation of the theoretical foundations of the strategy for conducting scientific research in the field of production, distribution of thermal energy, control of its flows and conversion of other types of energy into heat;
- training in effective monitoring and diagnostics of the most pressing problems in the chosen specialization.
- formation of skills for the correct presentation and design of scientific papers of a different nature;

2. REQUIREMENTS TO PHD-STUDENTS ON FINISHING THE COURSE

Mastering the discipline "Methodology of scientific research" is aimed at preparing for the candidate's examinations, as well as mastering the following competencies:

Know:

- methods for critical analysis and evaluation of modern scientific achievements, as well as methods for generating new ideas in solving research and practical problems, including in interdisciplinary areas
- the main concepts of modern philosophy of science, the main stages of the evolution of science, functions and foundations of the scientific picture of the world
- features of presenting the results of scientific activities in oral and written form when working in Russian and international research teams
- know the main range of problems (tasks) encountered in the chosen field of scientific activity, and the main methods (methods, algorithms) for solving them;
- the main sources and methods of searching for scientific information on the issues under study.
- methodological approaches to conducting theoretical and experimental research;
- principles of organization of theoretical and experimental research.

Be able to:

- analyze alternative options for solving research and practical problems and evaluate the potential gains / losses of the implementation of these options;
- when solving research and practical problems, generate new ideas that can be operationalized based on available resources and constraints.
- use the provisions and categories of the philosophy of science for the analysis and evaluation of various facts and phenomena

- follow the norms accepted in scientific communication when working in Russian and international research teams in order to solve scientific and educational problems;
- make personal choices in the process of working in Russian and international research teams, evaluate the consequences of the decision made and be responsible for it to yourself, colleagues and society
- find (choose) the most effective (methods) for solving the main types of problems (tasks) encountered in the chosen field of scientific activity;
- analyze, systematize and assimilate the best practices in scientific research.

Own:

- analysis of methodological problems that arise when solving research and practical problems, including those in interdisciplinary areas;
- critical analysis and evaluation of modern scientific achievements and results of activities to solve research and practical problems, including in interdisciplinary areas.
- analysis of the main ideological and methodological problems, incl. interdisciplinary character arising in science at the present stage of its development;
- ownership of planning technologies in professional activities in the field of scientific research.
- effective analysis of the main worldview and methodological problems, incl. interdisciplinary nature arising from work on solving scientific and educational problems in Russian or international research teams;
- technologies for evaluating the results of collective activities to solve scientific and educational problems, including those conducted in a foreign language;
- technologies for planning activities in the framework of work in Russian and international teams to solve scientific and scientific and educational problems;
- various types of communications in the implementation of work in Russian and international teams to solve scientific and scientific and educational problems.
- modern methods, tools and technologies of research activities;
- skills in preparing and implementing a program of theoretical and experimental research

3. WORKLOAD OF THE DISCIPLINE AND TYPES OF ACTIVITIES

The total labor intensity of the discipline "Methodology of scientific research" is 1 credit unit.

Table 3.1. Types of educational work by periods of mastering the postgraduate program

| Type of study work | | TOTAL , acc.h. | semester |
|---|---------|-------------------|-----------|
| | | | 1 |
| <i>Contact work, acc .</i> | | 18 | 18 |
| including: | | | |
| Lectures (LK) | | 12 | 12 |
| Practical/seminar sessions (SZ) | | 6 | 6 |
| <i>Independent work of students, acc .</i> | | 18 | 18 |
| <i>Control (test with assessment), acc .</i> | | | |
| The total complexity of the discipline | ac.h. _ | 36 | 36 |

| Type of study work | TOTAL , acc.h. | semester |
|--------------------|-------------------|----------|
| | | 1 |
| credit.ed . | 1 | 1 |

4. CONTENT OF THE DISCIPLINE

Table 4.1. The content of the discipline (module) by type of educational work

| Name of the discipline section | Contents of the section (topic) | Type of study work |
|--|--|--------------------|
| Methodological foundations of research work | The structure of scientific knowledge. Forms of organization of scientific knowledge. Sources and research conditions. Concepts and functions of the methodology in relation to power engineering | LK, SZ |
| Fundamentals of organizing scientific research | Definition of the object, subject, hypothesis, purpose and objectives of the study in relation to turbomachines and piston engines. Research methodology, research topic and its relevance. Formulation of contradictions and the main problem. Research methods and techniques applicable to geosciences. Methods of theoretical research. Statistical methods and means of formalization | LK, SZ |
| Logic in research work | Stages of designing the logic of research: staging, actual research and design and implementation | LK, SZ |
| Presentation of scientific work | Formulation of research results. Presentation of research work. Scientific text: characteristic. Types, forms of presentation. Formulation of research results. Presentation of research work. Scientific text: characteristic. Types, forms of presentation. Thesis as a specific type of scientific text | LK, SZ |

5. EQUIPMENT AND TECHNOLOGY SUPPORT REQUIREMENTS

Table 5.1. Logistics of discipline

| | |
|--|-------------------------------|
| Auditorium with logistic list | Location |
| Lecture room No. 109 Equipment and furniture: - portable multimedia projector; - Interactive whiteboard SmartBoard 660; - tables and benches, chairs. | Moscow, Podolskoe sh., 8/5 |
| Training room for practical training, current control and intermediate certification No. 112 Equipment and furniture: - personal computers with access to the Internet; - work tables, benches, chairs. | Moscow, Podolskoe sh., 8/5 |

| | |
|--|-------------------------------|
| Educational and methodical office for independent, research work of students No. 112 Equipment and furniture: - personal computers with access to the Internet; - work tables, benches, chairs. | Moscow, Podolskoe sh., 8/5 |
|--|-------------------------------|

* - the audience for independent work of students is required!

6. METHODOLOGICAL SUPPORT AND LEARNING MATERIAL

Main readings:

1. Azarskaya , M.A. Research work at the university: textbook / M.A. Azarskaya , V.L. Pozdeev; Volga State Technological University. - Yoshkar-Ola: PSTU, 2016. - 230 p. : ill. - Bibliography : p. 166-168. - ISBN 978-5-8158-1785-2; The same [Electronic resource]. - URL: <http://biblioclub.ru/index.php?page=book&id=461553>

2. Lapaeva , M.G. Methodology of scientific research: textbook / M.G. Lapaeva , S.P. Lapaev ; Ministry of Education and Science of the Russian Federation, Federal State Budgetary Educational Institution of Higher Education "Orenburg State University". - Orenburg: OSU, 2016. - 249 p.: ill. - Bibliography . in book. - ISBN 978-5-7410-1791-3; The same [Electronic resource]. - URL: <http://biblioclub.ru/index.php?page=book&id=485476>

3. Mikryukova , T.Yu. Methodology and methods of organization of scientific research: electronic textbook / T.Yu. Mikryukov ; Ministry of Education and Science of the Russian Federation, Federal State Budgetary Educational Institution of Higher Education "Kemerovo State University", Department of General and Developmental Psychology. - Kemerovo: Kemerovo State University, 2015. - 233 p. - Bibliography : p. 210-220. - ISBN 978-5-8353-1784-4; The same [Electronic resource]. - URL: <http://biblioclub.ru/index.php?page=book&id=481576>

Additional readings:

1. Kravtsova, E.D. Logic and methodology of scientific research: study guide / E.D. Kravtsova, A.N. Gorodishcheva ; Ministry of Education and Science of the Russian Federation, Siberian Federal University. - Krasnoyarsk: Siberian Federal University, 2014. - 168 p. : tab., schemes. - ISBN 978-5-7638-2946-4; The same [Electronic resource]. - URL: <http://biblioclub.ru/index.php?page=book&id=364559>

2. Teremov, A.V. Methodology of research activity in education: study guide / A.V. Teremov; Ministry of Education and Science of the Russian Federation, Federal State Budgetary Educational Institution of Higher Education "Moscow State Pedagogical University". - Moscow: MPGU, 2018. - 112 p.: ill. - Bibliography . in book. - ISBN 978-5-4263-0647-9; The same [Electronic resource]. - URL: <http://biblioclub.ru/index.php?page=book&id=500572>

Resources of the information and telecommunications network "Internet":

1. RUDN ELS and third-party ELS, to which university students have access on the basis of concluded agreements:

- RUDN Electronic Library System - RUDN EBS <http://lib.rudn.ru/MegaPro/Web>
- ELS "University Library Online" <http://www.biblioclub.ru>
- EBS Yurayt <http://www.biblio-online.ru>
- ELS "Student Consultant" www.studentlibrary.ru
- EBS "Lan" <http://e.lanbook.com/>
- EBS "Trinity Bridge"

2. Databases and search engines:

- electronic fund of legal and normative-technical documentation <http://docs.cntd.ru/>
- Yandex search engine [https:// www .yandex.ru/](https://www.yandex.ru/)
- Google search engine <https://www.google.ru/>
- abstract database SCOPUS [http:// www .elsevierscience.ru/ products / scopus /](http://www.elsevierscience.ru/products/scopus/)

Educational and methodological materials for independent work of students in the development of the discipline/module:*

1. A course of lectures on the discipline "Methodology of scientific research".
2. Guidelines for self-study

* - all educational and methodological materials for independent work of students are placed in accordance with the current procedure on the page of the discipline in TUIS!

7. ASSESSMENT TOOLKIT AND GRADING SYSTEM FOR MIDTERM ATTESTATION OF STUDENTS IN THE DISCIPLINE (MODULE)

Assessment toolkit and a grading system to evaluate the level of competences (competences in part) formation as the course results are specified on the TUIS platform.

* - OM and BRS are formed on the basis of the requirements of the relevant local normative act of the Peoples' Friendship University of Russia.

DEVELOPERS:

**Associate Professor, Ph.D.,
Department of Mechanical
Engineering Technologies**

Allenov D.G.

Position, department

Signature

Surname I.O.

HEAD OF THE DEPARTMENT:

**Department of Mechanical
Engineering Technologies**

Boronina L.V.

Name of the department

Signature

Surname I.O.

HEAD OF THE EDUCATIONAL PROGRAMME:

**professor, doctor of technical
sciences,**

Malkova M.Yu.

**Department of Mechanical
Engineering Technologies**

Position, department

Signature

Surname I.O.