Federal State Autonomous Educational Institution for Higher Education
Peoples' Friendship University of Russia named after Patrice Lumumba
(RUDN University)

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

Department "Power Engineering"
(department realizing the PhD program)

SCIENTIFIC RESEARCH PLAN

Scientific specialty:

2.4.7 Turbomachines and piston engines
(scientific speciality code and title)

The course instruction is implemented within the PhD programmes:

Turbomachines and piston engines
(PhD program title)

2026

1. DISIPLINE (MODULE) GOAL

The purpose of performing scientific research (carrying out scientific (research) activities) is the preparation of a dissertation for the scientific degree of a candidate of sciences (hereinafter referred to as a dissertation) for defense.

a list of planned results based on the results of scientific research;

- volume of scientific research;
- an approximate plan for the implementation of scientific research;
- a plan for the preparation of a dissertation and publications that set out the main scientific results of the dissertation;
- a list of stages in the development of the scientific component of the postgraduate program, the distribution of these stages and the final certification of postgraduate students.

2. REQUIREMENTS FOR LEARNING OUTCOMES

Solving a scientific problem that is important for the development of the relevant branch of science, or developing a new scientifically based technical, technological or other solution that is essential for the development of the country.

Preparation of a dissertation for defense includes the implementation of an individual plan of scientific activity, writing, design and submission of a dissertation for final certification.

The plan of scientific activity includes an approximate plan for the implementation of scientific research, a plan for preparing a dissertation and publications that set out the main scientific results of the dissertation, as well as a list of stages in the development of the scientific component of the postgraduate program, the distribution of these stages and the final certification of postgraduate students.

The plan of scientific activity of a particular student is approved in the individual plan of scientific activity of a postgraduate student, the requirements for which are established by the relevant local normative act of the RUDN University.

3. WORKLOAD OF THE DISCIPLINE AND TYPES OF ACTIVITIES

The total labor intensity of scientific research is 210 credits (7560_ac.h.).

4. RESEARCH CONTENTS *

Table 4.1. Stages of scientific research

Stage name	**Stage content (topics, activities)**	Labor **intensity,** acc.h.
1 course		
Section 1. Scientific activity of a postgraduate student aimed at preparing a dissertation for defense	Topic 1. Choice of the topic of dissertation research and approval of the topic of the dissertation.	1152
	Topic 2. Development of the structure and planning of the dissertation work.	

Stage name	Stage content (topics, activities)	Labor **intensity,** acc.h.
	Topic 3. Preparation of a review on the topic of the dissertation.	
	Topic 4. Compilation of a bibliography on the topic of the dissertation based on stock materials, monographs, scientific collections, domestic and foreign periodicals, as well as Internet resources (at least 150 sources).	
	Organization and conduct of experiments	
	Topic 1. Collection, processing and analysis of scientific and statistical information on the topic of dissertation work on stock and published works.	
	Topic 2. Material, methodology and conditions for conducting experiments.	
	Topic 3. Primary documentation of observations and experimental data.	
	Topic 4. Collection of empirical materials (based on the results of observations, experimental data).	
Section 2. Preparation of publications that present the main scientific results of the dissertation	Topic 1. Analysis of domestic and foreign editions of scientific periodicals included in the Scopus database .	108
	Topic 2. The choice of domestic and foreign publications for publication on the topic of the dissertation.	
	Topic 3. Studying the requirements for publications in periodicals of Web databases of science .	
Section 3. Preparation of applications for patents for inventions, utility models, industrial designs, breeding achievements, certificates of state registration of programs, etc.	Topic 1. Studying the rules and methods for preparing applications for patents for inventions, utility models, industrial designs, selection achievements, certificates of state registration of programs, etc.	108
	Topic 2. Selection of suitable research areas for patents, utility models, industrial designs, certificates of state registration of programs on the official websites of the Russian Academy of Sciences, RFBR, etc.	
Intermediate certification		72
	TOTAL:	**1440**
2 course		
Section 1. Scientific activity of a postgraduate student aimed at preparing a dissertation for defense	**Organization and conduct of experiments** Topic 1. Collection, processing and analysis of scientific and statistical information on the topic of dissertation work on stock and published works.	1728

Stage name	Stage content (topics, activities)	Labor **intensity,** acc.h.
	Topic 2. Material, methodology and conditions for conducting experiments. Topic 3. Primary documentation of observations and experimental data. Topic 4. Collection of empirical materials (based on the results of observations, experimental data).	
	Methods and ways of processing empirical materials Topic 1. Graphic methods of processing materials. Topic 2. Statistical methods of processing materials. Topic 3. Computer models.	
	Analysis and interpretation of empirical materials	
	Dissertation preparation: Topic 1. Formulation of defended scientific positions on the topic of the dissertation. Topic 2. Writing dissertation chapters. Topic 3. Drawing up a list of literary sources and making references to them in the dissertation text.	
Section 2. Preparation of publications that present the main scientific results of the dissertation	Topic 1. The choice of domestic and foreign publications for publications on the topic of the dissertation.	108
	Topic 2. Preparation of manuscripts of articles for publication in periodicals of databases.	
	Topic 3. Speech at scientific conferences and meetings on dissertation topics.	
Section 3. Preparation of applications for patents for inventions, utility models, industrial designs, breeding achievements, certificates of state registration of programs, etc.	Topic 1. Review of scientific open and stock sources in the direction of planned developments.	108
	Topic 2. Preparation of hardware required for scientific research.	
	Topic 3. Conducting experimental work.	
	Topic 4. Processing of the received data and clarification of the regularities of the processes established during the experiments.	
	Topic 5. Applying for patents, grants, programs, models, etc. according to completed research.	
Intermediate certification		72
	TOTAL:	**2016**
3 course		
Section 1. Scientific activity of a postgraduate student aimed at preparing a dissertation for defense	**Dissertation preparation:**	1872
	Topic 1. Formulation of defended scientific positions on the topic of the dissertation.	
	Topic 2. Writing dissertation chapters.	
	Topic 3. Drawing up a list of literary sources and making references to them in the dissertation text.	

Stage name	Stage content (topics, activities)	Labor **intensity,** acc.h.
Section 2. Preparation of publications that present the main scientific results of the dissertation	Topic 1. The choice of domestic and foreign publications for publications on the topic of the dissertation.	108
	Topic 2. Preparation of manuscripts of articles for publication in periodicals of databases.	
	Topic 3. Speech at scientific conferences and meetings on dissertation topics.	
Section 3. Preparation of applications for patents for inventions, utility models, industrial designs, breeding achievements, certificates of state registration of programs, etc.	Topic 1. Review of scientific open and stock sources in the direction of planned developments.	108
	Topic 2. Preparation of hardware required for scientific research.	
	Topic 3. Conducting experimental work.	
	Topic 4. Processing of the received data and clarification of the regularities of the processes established during the experiments.	
	Topic 5. Applying for patents, grants, programs, models, etc. according to completed research.	
Intermediate certification		72
	TOTAL:	**2160**
4 course		
Section 1. Scientific activity of a postgraduate student aimed at preparing a dissertation for defense	**Dissertation preparation:**	1656
	Topic 1. Writing dissertation chapters.	
	Topic 2. Drawing up a list of literary sources and making references to them in the dissertation text.	
	Topic 3. Preparation of the dissertation text.	
	Topic 4. Preparation of the text of the abstract.	
	Topic 5. Preparation of a report and preliminary defense of a dissertation.	
	Topic 6. Preparation of documents required for defense at the Academic Dissertation Council.	
	Topic 7. Choosing an opposing scientific organization and providing it with dissertation materials.	
	Topic 8. Choosing scientific opponents and providing them with dissertation materials.	
	Topic 9. Placement of the text of the dissertation in the Internet resources, in accordance with the requirements of the Higher Attestation Commission.	
	Topic 10. Distribution of dissertation abstracts for feedback from scientific organizations and specialists.	
	Topic 11. Preparation of a report for the defense of a dissertation at the Academic Dissertation Council.	

Stage name	Stage content (topics, activities)	Labor **intensity,** acc.h.
Section 2. Preparation of publications that present the main scientific results of the dissertation	Topic 1. The choice of domestic and foreign publications for publications on the topic of the dissertation.	108
	Topic 2. Preparation of manuscripts of articles for publication in periodicals of databases.	
	Topic 3. Speech at scientific conferences and meetings on dissertation topics.	
Section 3. Preparation of applications for patents for inventions, utility models, industrial designs, breeding achievements, certificates of state registration of programs, etc.	Topic 1. Review of scientific open and stock sources in the direction of planned developments.	108
	Topic 2. Preparation of hardware required for scientific research.	
	Topic 3. Conducting experimental work.	
	Topic 4. Processing of the received data and clarification of the regularities of the processes established during the experiments.	
	Topic 5. Applying for patents, grants, programs, models, etc. according to completed research.	
Intermediate certification		36
	TOTAL:	**1944**
	TOTAL:	**7560**

* - the stages of scientific research are FULLY reflected in the review of the student 's supervisor .

5. EQUIPMENT AND TECHNOLOGY SUPPORT REQUIREMENTS AND TECHNICAL SUPPORT OF SCIENTIFIC RESEARCH

Auditorium with logistic list	Location
Educational and methodical office for independent, research work of students and practical classes A set of specialized furniture, demonstration stands, a computer, a monitor, there is a network access to the Internet.	Moscow, Podolskoye shosse, 8, bldg. 5

6. INTERNSHIP LOCATION AND TIMELINE

Scientific research can be carried out both in structural subdivisions of PFUR or in organizations of Moscow (stationary), and at bases located outside of Moscow (exit).

Conducting scientific research on the basis of an external organization (outside RUDN University) is carried out on the basis of an appropriate agreement, which specifies the terms, place and conditions for performing scientific research in the base organization.

The deadlines for the implementation of scientific research correspond to the period indicated in the calendar academic schedule of the postgraduate program. The timing of the internship can be adjusted upon agreement with the Department for the Training of Highly Qualified Personnel of the RUDN University.

7. EDUCATIONAL-METHODOLOGICAL AND INFORMATION SUPPORT

FOR SCIENTIFIC RESEARCH

Main literature:

1. Federal Law of August 23, 1996 No. 127-FZ "On Science and State Science and Technology Policy"
2. Decree of the Government of the Russian Federation of September 24, 2013 No. 842 "On the procedure for awarding academic degrees"
3. Leonova, O.V. Basics scientific research: educational allowance / O.V. Leonov; Ministry transport Russian Federation. - Moscow: Altair-MGAVT, 2013 . - 70 With.: ill., tab., schemes. - Bibliography . V book; That same [Electronic resource]. URL: http://biblioclub.ru/index.php?page=book&id=4298611
4. Gorelov, S.V. Fundamentals of scientific research: textbook / S.V. Gorelov, V.P. Gorelov, E.A. Grigoriev; ed. V.P. Gorelov. - 2nd ed., erased. - Moscow; Berlin: Direct -Media, 2016 - 534 p. Il., tab. - Bibliographer . In book. ISBN 978-5-4475-8350-7; The same [Electronic resource]. – URL : http :// biblioclub . ru / index . php ? page = book & id =443846
5. Kolmatsky , V.I. Planning and organization of scientific research: textbook / V.I. Kolmatsky , S.V. Loginov, G.V. Kolmatsky . - Rostov-on-Don: Phoenix Publishing House, 2014. - 208 p. diagrams, tab. - (Higher education). - Bibliographer . In book. – ISBN 978-5-222-21840-2; The same [Electronic resource]. – URL : http :// biblioclub . ru / index . php ? page = book & id =27159 5

Additional literature:

1. Boldin A.P. Fundamentals of scientific research and UNIRS [Text]: Textbook / A.P. Boldin, V.A. Maksimov. - 2nd ed., revised . and additional - M.: MADI (GTU), 2002. - 276 p.
2. Fundamentals of scientific research and patent science : teaching aid / comp. V.A. Valkov, V.A. Golovatyuk, V.I. Kochergin, S.G. Schukin. - Novosibirsk: Novosibirsk State Agrarian University, 2013. - 228 p. Access mode: http://biblioclub.ru/index.php?page=book&id=230540
3. Musina, O.N. Fundamentals of scientific research: textbook / O.N. Musina. - Moscow; Berlin: Direct -Media, 2015 p.: ill. - Bibliographer . in book. ISBN 978-5-4475-4614-4; The same [Electronic resource]. – URL : http :// biblioclub . ru / index . php ? page = book & id =278882
4. Azarskaya , M.A. Research work at the university: textbook / M.A. Azarskaya , V.L. Pozdnev ; Volga State Technological University. – Yoshkaz -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

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/
Google search engine https://www.google.ru/
- abstract database SCOPUS http:// www .elsevierscience.ru/ products / scopus /

Educational and methodological materials for scientific research:*

1. Guidelines for the preparation of dissertations, scientific publications.
* - all educational and methodological materials for scientific research are posted in accordance with the current procedure on the practice page **in TEIS** !

8. ASSESSMENT TOOLKIT AND GRADING SYSTEM FOR EVALUATION OF PHD STUDENTS' COMPETENCES LEVELS AS SCIENTIFIC RESEARCH RESULTS

Mandatory activities of the student:
1 year of study:
- preparation and discussion at the department of the concept of the dissertation and approval of the topic;
- preparation of historiographical and experimental/ source base of the research;
- Speech at a scientific conference.
2nd year of study:
- preparation and discussion at the department of part of the dissertation;
- presentation at a scientific conference;
- publication of at least two scientific articles, including one scientific article on the research topic in a publication included in the list of the Higher Attestation Commission and / or RUDN University or SCOPUS, Web of Science and others equated and/or approved by the RUDN University Academic Council.
3rd year of study:
- preparation of the entire dissertation and presentation to the supervisor;
- publication of at least three scientific articles, including two scientific articles on the research topic in publications included in the list of HAC and / or PFUR and SCOPUS, Web of Science , others equivalent to them and / or approved by the RUDN University Academic Council;
- discussion of the dissertation at the meeting of the BUP.
4th year of study:
- preparation of the entire dissertation and presentation to the supervisor;
- publication of at least three scientific articles, including two scientific articles on the research topic in publications included in the list of HAC and / or PFUR and SCOPUS, Web

of Science and others equivalent to them and / or approved by the RUDN University Academic Council;

- discussion of the dissertation at the meeting of the BUP.

Based on the results of the stages of identifying scientific research, the graduate student submits a detailed oral or written report to the supervisor or to the meeting of the PMU. The report includes information characterizing the content of the postgraduate student's work and reflecting the implementation of scientific research.

The report should include information about:

- about the degree of readiness of the dissertation;

– on the preparation and publication of articles in journals included in the list of VAK, RSCI, Scopus , Web of Science and others equivalent to them and / or approved by the RUDN University Academic Council;

– about the participation of a graduate student in scientific and technical events on the topic of his research;

– on participation in the research work of the department (with participation);

- other.

During the period of interim certification, the supervisor provides feedback on the quality, timeliness and success of the postgraduate student's stages of scientific (research) activities.

The results of scientific research for each year of study are determined by conducting an intermediate certification with grading "excellent", "good", "satisfactory", "unsatisfactory" and in the ECT S system (A, B, C, D , E) . The basis for their nomination is the point -rating system adopted at the University.

DEVELOPERS:

Associate Professor of the Department of Power Engineering	Oshchepkov P.P.
Position, BUP	Surname I.O.

HEAD OF BUP:

Head of the Department of Power Engineering	Radin Yu.A.
Name of BUP	Surname I.O.