

Документ подписан простой электронной подписью
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**Federal State Autonomous Educational Institution of Higher Education
PEOPLES' FRIENDSHIP UNIVERSITY OF RUSSIA
RUDN University
ENGINEERING ACADEMY**

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

RESEARCH PLAN

Recommended by the Didactic Council for the Education Field of:

1.1.7 Theoretical mechanics, machine dynamics

field of studies / speciality code and title

The student's internship is implemented within the professional education programme of higher education:

Theoretical mechanics, machine dynamics

higher education programme profile/specialisation title



1. GOAL(S) OF SCIENTIFIC RESEARCHES

The purpose of scientific research (implementation of scientific (research) activities) is to prepare a thesis for the degree of Candidate of Sciences (hereinafter - thesis) for the defense.

- the list of planned results on the results of scientific research;
- the scope of scientific research;
- an approximate plan of scientific research;
- the plan of preparation of the thesis and publications, in which the main scientific results of the thesis are set out;
- the list of stages of mastering the scientific component of the postgraduate program, the distribution of these stages and the final certification of graduate students.

2. PLANNED RESULTS OF SCIENTIFIC RESEARCH

The solution of a scientific problem of importance for the development of the corresponding branch of science or the development of a new scientifically justified technical, technological or other solution of significant importance for the development of the country.

Preparation of the thesis for the defense includes the implementation of an individual plan of scientific activity, writing, registration and presentation of the thesis for the final attestation.

Plan of scientific activity includes a sample plan of scientific research, plan of dissertation preparation and publications, in which the main scientific results of the dissertation are set out, as well as a list of stages of mastering the scientific component of the graduate program, the distribution of these stages and the final certification of graduate students.

The plan of scientific activities of a particular student is approved in the individual plan of scientific activities of the graduate student, the requirements to which are established by the relevant local normative act of PFUR.

3. SCOPE OF SCIENTIFIC RESEARCH

The total labor input of scientific research is 210 credit units (7560 ac.h.).

4. STAGES OF SCIENTIFIC RESEARCH*

Table 5.1. Stages of scientific research

Name of stage	Content of the stage (topics, activities)	Labor intensity, ac.h.
1 course		
Section 1. Postgraduate research activities aimed at preparing a dissertation for defense	Theme 1: Choosing the topic of the dissertation dissertation plan	1476
	Theme 2: Structure development and drafting	



Name of stage	Content of the stage (topics, activities)	Labor intensity, ac.h.
	<p>Theme 3: Preparing a review of the dissertation topic</p> <p>Theme 4: Making a bibliography on the topic of the dissertation based on stock materials, monographs, scientific collections, domestic and foreign periodicals, as well as Internet resources (not less than 150 sources)</p> <p>Organization and conduct of experiments. Theme 1: Collection, processing and analysis of scientific and statistical information on the topic of the dissertation work on stock and published works.</p> <p>Theme 2: Material, methodology and conditions for conducting experiments</p> <p>Theme 3: Primary documentation of observations and experimental data.</p> <p>Theme 4: Gathering empirical material (based on observations, experimental data).</p>	
Section 2: Preparation of publications in which the main scientific results of the thesis are presented	<p>Theme 1: Analysis of domestic and foreign Publications of scientific periodicals included in Scopus databases</p> <p>Theme 2: Selection of domestic and foreign Publications on the topic of the dissertation</p> <p>Theme 3: Studying the requirements for publications in periodicals of the Web of Science database</p>	216
Intermediate attestation		72
TOTAL:		1764
2 course		
Section 1. Postgraduate research activities aimed at preparing a dissertation for defense	<p>Organization and conduct of experiments. Theme 1: Collection, processing and analysis of scientific and Statistical information on the topic of the dissertation work on stock and published works.</p> <p>Theme 2: Material, methodology and conditions for conducting experiments</p> <p>Theme 3: Primary documentation of observations and experimental data.</p> <p>Theme 4: Gathering empirical material (based on observations, experimental data).</p> <p>Methods and ways of processing empirical materials. Theme 5: Graphic methods of processing materials. Theme 6: Statistical methods of material processing. Theme 7: Computer models.</p>	1404



Name of stage	Content of the stage (topics, activities)	Labor intensity, ac.h.
	<p>Analysis and interpretation of empirical material. Topic 8: Analysis and interpretation of empirical Computer-based materials for local objects. Theme 9: Identification and formulation of natural laws characteristic of local objects. Theme 10. Analysis and interpretation of empirical materials based on computer technology for regional sites. Theme 11. Identification and formulation of natural laws characteristic of regional objects.</p> <p>Preparation of the thesis: Theme 1: Formulation of defensible scientific statements on the topic of the dissertation. Theme 2: Writing Dissertation Chapters Theme 3: Making a list of literary sources and making references to them in the text dissertation</p>	
Section 2: Preparation of publications in which the main scientific results of the thesis are presented	<p>Theme 1: Selection of domestic and foreign Publications on the topic of the dissertation Theme 2: Preparing manuscripts of articles for Publication in periodicals of the bases Theme 3: Presentations at scientific conferences and meetings on these topics</p>	216
Intermediate attestation		72
	TOTAL:	1692
3 course		
Section 1. Postgraduate research activities aimed at preparing a dissertation for defense	<p>Organization and conduct of experiments. Theme 1: Collection, processing and analysis of scientific and Statistical information on the topic of the dissertation work on stock and published works. Theme 2: Material, methodology and conditions for conducting experiments Theme 3: Primary documentation of observations and experimental data. Theme 4: Gathering empirical material (based on observations, experimental data).</p> <p>Methods and ways of processing empirical materials. Theme 5: Graphic methods of processing materials. Theme 6: Statistical methods of material processing. Theme 7: Computer models.</p> <p>Analysis and interpretation of empirical material. Topic 8: Analysis and interpretation of empirical Computer-based materials for local objects. Theme 9: Identification and formulation of natural laws characteristic of local objects.</p>	1872



Name of stage	Content of the stage (topics, activities)	Labor intensity, ac.h.
	Theme 10. Analysis and interpretation of empirical materials based on computer technology for regional sites. Theme 11. Identification and formulation of natural laws characteristic of regional objects. Preparation of the thesis: Theme 1: Formulation of defensible scientific statements on the topic of the dissertation. Theme 2: Writing Dissertation Chapters Theme 3: Making a list of literary sources and making references to them in the text dissertation	
Section 2: Preparation of publications in which the main scientific results of the thesis are presented	Theme 1: Selection of domestic and foreign Publications on the topic of the dissertation Theme 2: Preparing manuscripts of articles for Publication in periodicals of the bases Theme 3: Presentations at scientific conferences and meetings on these topics	216
Intermediate attestation		72
	TOTAL:	2160
4 course		
Section 1. Postgraduate research activities aimed at preparing a dissertation for defense	Preparation of the dissertation: Theme 1: Writing Dissertation Chapters Theme 2: Making a list of literary sources and making references to them in the text of the dissertation Theme 3: Preparation of the Dissertation Text Theme 4: Preparation of the text of the abstract Theme 5: Preparation of the Report and Preliminary Defense of the Dissertation Theme 6: Preparation of Documents Required for Defense at the Academic Dissertation Council Theme 7: Selecting the opposing scientific organization and providing it with the materials of the thesis Theme 8: Selection of scientific opponents and providing them with materials of the dissertation work. Theme 9: Placement of the text of the dissertation in Internet resources, according to the requirements of the BAK Theme 10. Distribution of thesis abstracts for feedback from scientific organizations and specialists. Theme 11. Preparing a Report for the Dissertation Defense at the Academic Dissertation Council	1656
Section 2: Preparation of publications in which the main scientific results of the thesis are presented	Theme 1: Selection of domestic and foreign Publications on the topic of the dissertation Theme 2: Preparing manuscripts of articles for Publication in periodicals of the bases	216



Name of stage	Content of the stage (topics, activities)	Labor intensity, ac.h.
	Theme 3: Presentations at scientific conferences and meetings on these topics	
Intermediate attestation		72
TOTAL:		1944

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

5. MATERIAL AND TECHNICAL SUPPORT FOR SCIENTIFIC RESEARCH

Auditorium with a list of logistics	Location
Study room for independent, scientific and methodical research work of students and practical classes Set of specialized furniture: student's workplace (10 pcs.), teacher's workplace (1 pc), chalkboard. Demonstration stands, computer, monitor, there is a network access to the Internet.	Moscow, Ordzhonikidze st. 3

6. WAYS OF CONDUCTING SCIENTIFIC RESEARCH

Scientific research can be carried out both at RUDN structural divisions or in Moscow organizations (stationary) and at bases outside Moscow (off-site).

Research at an outside organization (outside PFR) is carried out on the basis of a corresponding contract, which specifies the terms, place and conditions of the research at the base organization.

The timing of the research corresponds to the period specified in the academic calendar of the graduate program. The terms of the internship can be adjusted in coordination with the PFUR Department for training of higher-education personnel.

7. SCIENTIFIC RESEARCH EQUIPMENT AND TECHNOLOGY SUPPORT REQUIREMENTS

The infrastructure and technical support necessary for the internship implementation include: laboratories/ specially equipped classrooms/ polygons/ measuring and computing complexes/ vehicles/ industrial equipment and devices/ household premises that comply with current sanitary and fire safety standards.

8. RESOURCES RECOMMENDED FOR SCIENTIFIC RESEARCH

Main readings:

1. Федеральный закон от 23 августа 1996 г. № 127-ФЗ «О науке и государственной научно-технической политике»
2. Постановления Правительства РФ от 24 сентября 2013 г. № 842 «О порядке присуждения ученых степеней»
3. Шкляр, М.Ф. Основы научных исследований: учебное пособие / М.Ф. Шкляр. - 6-е изд. - Москва Издательско-торговая корпорация «Дашков и К°», 2017. - 208 с. - (Учебные издания для бакалавров). - Библиогр. с. 195-196. -



- ISBN 978-5-394- 02518-1; То же [Электронный ресурс]. - URL:<http://biblioclub.ru/index.php?name=book&id=450782>
4. Горелов, С.В. Основы научных исследований учебное пособие / С.В. Горелов, В.П. Горелов, Е.А. Григорьев, под ред. В.П. Горелова. - 2-е изд., стер. - Москва Берлин Директ-Медиа, 2016. - 534 с. ил., табл. - Библиогр. в ки. - ISBN 978-5-4475-8350-7 То же [Электронный ресурс]. - URL: <http://biblioclub.ru/index.nhn?name=book&id=443846>
5. Комлацкий, В.И. Планирование и организация научных исследований учебное пособие / В.И. Комлацкий, С.В. Логинов, Г.В. Комлацкий. - Ростов-на-Дону Издательство «Феникс», 2014. - 208 с. схем., табл. - (Высшее образование). - Библиогр. в ки. - ISBN 978-5-222-21840-2 То же [Электронный ресурс]. - URL: <http://biblioclub.ru/index.php?name=book&id=271595>

Additional readings:

1. Мусина, О.Н. Основы научных исследований учебное пособие / О.Н. Мусина. - Москва, Берлин Директ-Медиа, 2015. - 150 с. ил. - Библиогр. в ки. - ISBN 978-5-4475-4614-4 То же [Электронный ресурс]. - URL: <http://biblioclub.ru/index.php?name=book&id=461553>
2. Азарская, М.А. Научно-исследовательская работа в вузе учебное пособие / М.А. Азарская, В.Л. Поздеев Поволжский государственный технологический университет. - Йошкар-Ола : ПГТУ, 2016. - 230 с. ил. - Библиогр. с. 166-168. - ISBN 978-5-8158-1785-2 То же [Электронный ресурс]. - URL: <http://biblioclub.ru/index.php?name=book&id=461553>

Internet sources

1. Electronic libraries (EL) of RUDN University and other institutions, to which university students have access on the basis of concluded agreements:
- RUDN Electronic Library System (RUDN ELS) <http://lib.rudn.ru/MegaPro/Web>
 - EL "University Library Online" <http://www.biblioclub.ru>
 - EL "Yurayt" <http://www.biblio-online.ru>
 - EL "Student Consultant" www.studentlibrary.ru
 - EL "Lan" <http://e.lanbook.com/>
 - EL "Trinity Bridge"

2. Databases and search engines:

- electronic foundation of legal and normative-technical documentation <http://docs.cntd.ru/>
- Yandex search engine <https://www.yandex.ru/>
- Google search engine <https://www.google.ru/>
- Scopus abstract database <http://www.elsevier.com/locate/scopus/>

The training toolkit and guidelines for a student to do an internship, keep an internship diary and write an internship report:*

1. Safety regulations to do the internship (safety awareness briefing).



2. Machinery and principles of operation of technological production equipment used by students during their internship; process flow charts, regulations, etc. (if necessary).

3. Guidelines for keeping an internship diary and writing an internship report.

*The training toolkit and guidelines for the internship are placed on the internship page in the university telecommunication training and information system under the set procedure.

9. ASSESSMENT TOOLKIT AND GRADING SYSTEM* FOR EVALUATION OF STUDENTS' COMPETENCES LEVEL AS INTERNSHIP RESULTS

Mandatory student activities:

Year 1 of study:

- preparation and discussion in the department of the thesis concept and approval of the topic;

- preparation of historiographic and experimental/source base of research;

- presentation at a scientific conference;

Year 2 of study:

- preparation and discussion in 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 topic of research in a journal included in the list of the Higher Attestation Commission and/or RUDN or SCOPUS, Web of Science and other equivalent and/or approved by the RUDN Academic Council;

Year 3 of study:

- preparation and discussion in 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 topic of research in a journal included in the list of the Higher Attestation Commission and/or RUDN or SCOPUS, Web of Science and other equivalent and/or approved by the RUDN Academic Council;

Year 4 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 topic of research in journals included in the list of the Higher Attestation Commission and/or RUDN and SCOPUS, Web of Science, other, equated to them and/or approved by the RUDN Academic Council;

- passing the discussion of the dissertation at a meeting of the BUP;

As a result of the stages of detection of scientific research graduate student submits to the supervisor or to the meeting of the BUP detailed oral or written report. The report includes information describing the content of the graduate student's work and reflecting the implementation of scientific research.

The report should include information:

- on the degree of readiness of the dissertation;

- Reports on the preparation and publication of articles in journals included in the VAK list, RSCI, Scopus, Web of Science and other equivalent journals and/or approved by the PFUR Academic Council;



- participation of the postgraduate student in scientific and technical events on the topic of his/her research;
- participation in the department's research work (if any);
- other.

The supervisor provides feedback on the quality, timeliness and success of the stages of scientific (research) activities of the graduate student during the period of interim certification.

The results of research for each year of study are determined by conducting interim certification with grades "excellent", "good", "satisfactory", "unsatisfactory" and in the system of ECTS (A, B, C, D, E). The basis for their grading is the University's grading system.

* The assessment toolkit and the grading system are formed on the basis of the requirements of the relevant local normative act of RUDN University (regulations / order).

DEVELOPERS:

**Assistant Professor of the Basic
Department of Nanotechnology
and Microsystem Technology**

position, educational department



signature

M.O. Makeev

name and surname.

**HEAD OF EDUCATIONAL DEPARTMENT:
Head of the Basic Department**

**of Nanotechnology and
Microsystem Technology**

educational department



signature

S.V. Popov

name and surname.

**HEAD OF
HIGHER EDUCATION PROGRAMME:
Professor of the Basic**

**Department of Nanotechnology
and Microsystem Technology**

position, educational department



signature

V.V. Belyaev

name and surname

