

Документ подписан простой электронной подписью  
Информация о владельце:  
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Должность: Ректор  
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**Federal State Autonomous Educational Institution of Higher Education  
PEOPLES' FRIENDSHIP UNIVERSITY OF RUSSIA  
NAMED AFTER PATRICE LUMUMBA  
RUDN University**

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**ACADEMY OF ENGINEERING**

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

**DEPARTMENT OF MECHANICS AND CONTROL PROCESSES**

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(department realizing the PhD program)

**SCIENTIFIC RESEARCH PLAN**

Scientific specialty:

**2.5.16 Dynamics, Ballistics and Control of the Spacecraft and Aircraft Motion**

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(scientific speciality code and title)

The course instruction is implemented within the PhD programmes:

**Dynamics, Ballistics and Control of the Spacecraft and Aircraft Motion**

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(PhD program title)

## 1.DISIPLINE (MODULE)GOAL

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.REQUIREMENTS FOR LEARNING OUTCOMES

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.WORKLOAD OF THE DISCIPLINE AND TYPES OF ACTIVITIES

The total labor input of scientific research is 186credit units (6696ac.h.).

## 4.RESEARCH CONTENTS

*Table 4.1. Stages of scientific research*

Stages	Stage content (types of activities)	Workload,acad. hours
<b>1 course</b>		
Section 1. Postgraduate research activities aimed at preparing a dissertation for defense		1260
	Theme 1: Choosing the topic of the dissertation dissertationplan	
	Theme 2: Structure development and drafting	
	Theme 3: Preparing a review of the dissertation topic	

Stages	Stage content (types of activities)	Workload,acad. hours
	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)	
	<b>Organization and conduct of experiments.</b> 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).	
Section 2: Preparation of publications in which the main scientific results of the thesis are presented	Theme 1: Analysis of domestic and foreign Publications of scientific periodicals included in Scopus databases	216
	Theme 2: Selection of domestic and foreign Publications on the topic of the dissertation	
	Theme 3: Studying the requirements for publications in periodicals of the Web of Science database	
Intermediate attestation		72
<b>TOTAL:</b>		<b>1548</b>
<b>2 course</b>		
Section 1. Postgraduate research activities aimed at preparing a dissertation for defense	<b>Organization and conduct of experiments.</b> Theme 1: Collection, processing and analysis of scientific and Statistical information on the topic of the dissertation work on stock and published works.	1296
	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).	
	<b>Methods and ways of processing empirical materials.</b>	
	Theme 5: Graphic methods of processing materials.	
	Theme 6: Statistical methods of material processing.	
	Theme 7: Computer models.	
	<b>Analysis and interpretation of empirical material.</b> Topic 8: Analysis and interpretation of empirical	

Stages	Stage content (types of activities)	Workload,acad. hours
	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.	
	<b>Preparation of the thesis:</b> Theme 1: Formulation of defensible scientific statements on the topic of the dissertation.	
	Theme 2: WritingDissertationChapters	
	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	216
	Theme 2: Preparing manuscripts of articles for Publication in periodicals of the bases	
	Theme 3: Presentations at scientific conferences and meetings on theses topics	
Intermediate attestation		72
<b>TOTAL:</b>		<b>1584</b>
<b>3course</b>		
Section 1. Postgraduate research activities aimed at preparing a dissertation for defense	<b>Organization and conduct of experiments.</b> Theme 1: Collection, processing and analysis of scientific andStatistical information on the topic of the dissertation work on stock and published works.	1404
	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).	
	<b>Methods and ways of processing empirical materials.</b>	
	Theme 5: Graphic methods of processing materials.	
	Theme 6: Statistical methods of material processing.	
	Theme 7: Computer models.	
	<b>Preparation of the thesis:</b> Theme 1: Formulation of defensible scientific statements on the topic of the dissertation.	
	Theme 2: WritingDissertationChapters	
	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	Theme 1: Selection of domestic and foreign Publications on the topic of the dissertation	216
	Theme 2: Preparing manuscripts of articles for	

Stages	Stage content (types of activities)	Workload,acad. hours
the thesis are presented	Publication in periodicals of the bases	
	Theme 3: Presentations at scientific conferences and meetings on theses topics	
Intermediate attestation		72
<b>TOTAL:</b>		<b>1692</b>
<b>4course</b>		
Section 1. Postgraduate research activities aimed at preparing a dissertation for defense	<b>Organization and conduct of experiments.</b> Theme 1: Collection, processing and analysis of scientific and Statistical information on the topic of the dissertation work on stock and published works.	1584
	<b>Analysis and interpretation of empirical material.</b> Topic 2: Analysis and interpretation of empirical Computer-based materials for local objects.	
	Theme 3: Identification and formulation of natural laws characteristic of local objects.	
	Theme 4. Analysis and interpretation of empirical materials based on computer technology for regional sites.	
	Theme 5. Identification and formulation of natural laws characteristic of regional objects.	
	<b>Preparation of the thesis:</b> 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	216
	Theme 2: Preparing manuscripts of articles for Publication in periodicals of the bases	
	Theme 3: Presentations at scientific conferences and meetings on theses topics	
Intermediate attestation		72
<b>TOTAL:</b>		<b>1872</b>
<b>TOTAL:</b>		<b>6696</b>

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

## 5.EQUIPMENT AND TECHNOLOGY SUPPORT REQUIREMENTS

Auditorium with a list of logistics	Location
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<b>Study room for independent, scientific and methodical research work of students and practical classes</b> 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
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## 6. INTERNSHIP LOCATION AND TIMELINE

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. EDUCATIONAL-METHODOLOGICAL AND INFORMATION SUPPORT FOR SCIENTIFIC RESEARCH

### *Main readings:*

1. Federal Law of August 23, 1996 No. 127-FZ "On Science and State Scientific and Technical Policy"
2. Decree of the Government of the Russian Federation of September 24, 2013 No. 842 "On the procedure for awarding academic degrees"
3. Shklyar, M.F. Fundamentals of scientific research: textbook / M.F. Shklyar. - 6th ed. - Moscow Publishing and trading corporation "Dashkov and Co", 2017. - 208 p. - (Educational publications for bachelors). - Bibliography.. p. 195-196. - ISBN 978-5-394-02518-1; The same [Electronic resource]. - URL: <http://biblioclub.ru/index.php?nane=book&id=450782>
4. Gorelov, S.V. Fundamentals of scientific research textbook / S.V. Gorelov, V.P. Gorelov, E.A. Grigoriev, ed. V.P. Gorelova. - 2nd ed., erased. - Moscow Berlin Direct-Media, 2016. - 534 p. ill., table. - Bibliography in Ki. - ISBN 978-5-4475-8350-7 [Electronic resource] <http://biblioclub.ru/index.nhn?nane=book&id=443846> URL
5. Komlatsky, V.I. Planning and organization of scientific research textbook / V.I. Komlatsky, S.V. Loginov, G.V. Komlatsky. - Rostov-on-Don Publishing House "Phoenix", 2014. - 208 p. diagrams, table - (Higher education). - Bibliography in Ki. - ISBN 978-5-222-21840-2 Same [Electronic pecypc].- URL: <http://biblioclub.ru/index.php?nane=book&id=271595>

### *Additional readings:*

1. Musina, O.N. Fundamentals of scientific research textbook / O.N. Musina. - Moscow, Berlin Direct-Media, 2015. - 150 p. ill. - Bibliography in Ki. - ISBN 978-5-4475-4614-4 [Electronic pecypc]
2. Azarskaya, M.A. Research work at a university textbook / M.A. Azarskaya, V.L. Pozdeev Volga State Technological University. - Yoshkar-Ola: Perm State Technical University, 2016. - 230 p. ill. - Bibliography.. p. 166-168. - ISBN 978-5-8158-1785-2 Same [Electronic pecypc].- URL: <http://biblioclub.ru/index.php?nane=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](http://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/](https://www.yandex.ru/)
- Google search engine <https://www.google.ru/>
- Scopus abstract database <http://www.elsevierscience.ru/products/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.

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

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:

**Professor of DMCP**

position, educational department

signature

**I.V. Stepanyan**

name and surname.

**Professor of DMCP**

position, educational department

signature

**A.Yu. Alekseev**

name and surname.

## HEAD OF EDUCATIONAL DEPARTMENT:

**Head of DMCP**

educational department

signature

**Yu.N. Razoumny**

name and surname.