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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**

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(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:

**1.2.1. Artificial intelligence and machine learning**

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(scientific speciality code and title)

The course instruction is implemented within the PhD programmes:

**Artificial intelligence and machine learning**

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(PhD program title)

## 1. DISCIPLINE (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 150 credit units (5400 ac.h.).

## 4. RESEARCH CONTENTS

*Table 4.1. Stages of scientific research*

Stages	Stage content (types of activities)	Workload, acad. hours
<b>First Year</b>		
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	
	Theme 3: Preparing a review of the dissertation topic	
	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)	

Stages	Stage content (types of activities)	Workload, acad. hours
	<p><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.</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
	<b>TOTAL:</b>	<b>1764</b>
<b>Second year</b>		
Section 1. Postgraduate research activities aimed at preparing a dissertation for defense	<p><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.</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><b>Methods and ways of processing empirical materials.</b> Theme 5: Graphic methods of processing materials.</p> <p>Theme 6: Statistical methods of material processing.</p> <p>Theme 7: Computer models.</p> <p><b>Analysis and interpretation of empirical material.</b> Topic 8: Analysis and interpretation of empirical Computer-based materials for local objects.</p> <p>Theme 9: Identification and formulation of natural laws characteristic of local objects.</p>	1404

Stages	Stage content (types of activities)	Workload, acad. hours
	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: 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
<b>TOTAL:</b>		<b>1692</b>
<b>Third year</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. 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 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.	1872

Stages	Stage content (types of activities)	Workload, acad. hours
	<b>Preparation of the thesis:</b>	
	Theme 1: Formulation of defensible scientific statements on the topic of the dissertation.	
	Theme 2: Writing Dissertation Chapters	
Section 2: Preparation of publications in which the main scientific results of the thesis are presented	Theme 3: Making a list of literary sources and making references to them in the text dissertation	216
	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	
Intermediate attestation		72
<b>TOTAL:</b>		<b>2160</b>
<b>TOTAL:</b>		<b>5400</b>

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

## 5. EQUIPMENT AND TECHNOLOGY SUPPORT REQUIREMENTS

*The place of scientific research shall comply with the current sanitary and epidemiological requirements, fire safety regulations and standards of health protection of the students.*

*The research plan requires classrooms that meet the safety requirements for academic work, if necessary, a computer room with workstations that provide Internet connection, as well as classrooms with multimedia equipment.*

Auditorium with a list of logistics	Location
<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

## 6. INTERNSHIP LOCATION AND TIMELINE

Scientific research can be carried out both in structural subdivisions of RUDN University 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.

Practice dates can be adjusted in coordination with the Department of Doctoral Studies of the RUDN University

## 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?name=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., revised. - Moscow Berlin Direct-Media, 2016. - 534 p. ill., table. - Bibliography in Ki. - ISBN 978-5- 4475-8350-7 [Electronic resource].<http://biblioclub.ru/index.php?name=book&id=443846>
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 resource]. - URL: <http://biblioclub.ru/index.php?name=book&id=271595>

URL

*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 resource]
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 resource]. - 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](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/>
- 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

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

The report must include information:

- about the degree of readiness of the dissertation;
- on the preparation and publication of articles in journals included in the list of Higher Attestation Commission, Russian Science Citation Index, Scopus, Web of Science and others equated to them and/or approved by the Academic Council of RUDN University;
- on the participation of a PhD 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 interim certification period, the supervisor provides feedback on the quality, timeliness and success of the PhD student's stages of scientific activity.

The results of scientific research for every six months of study are determined by conducting an intermediate certification with grades «excellent», «good», «satisfactory», «unsatisfactory» and in the ECTS system (A, B, C, D, E) in accordance with the rating system.

### DEVELOPERS:

<b>Professor of DMCP</b> _____ position, educational department	_____ signature	<b>I.V. Stepanyan</b> _____ name and surname.
<b>Professor of DMCP</b> _____ position, educational department	_____ signature	<b>A.Yu. Alekseev</b> _____ name and surname.

### HEAD OF EDUCATIONAL DEPARTMENT:

<b>Head of DMCP</b> _____ educational department	_____ signature	<b>Yu.N. Razoumny</b> _____ name and surname.
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