

**Federal State Autonomous Educational Institution of Higher Education  
PEOPLES' FRIENDSHIP UNIVERSITY OF RUSSIA  
NAMED AFTER PATRICE LUMUMBA  
RUDN University**

**Engineering Academy**

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

**Department of Construction Technology and Structural Materials**

(department realizing the PhD program)

**COURSE SYLLABUS**

**Methodology of Scientific Research**

(course title)

Scientific specialty:

**2.1.1. Building designs, buildings and constructions**

**2.1.6. Hydrotechnical structures, hydraulics and engineering hydrology**

**2.1.7. Technology and management in construction**

**2.1.9. Structural mechanics**

(scientific speciality code and title)

The course instruction is implemented within the PhD programmes:

**Building designs, buildings and constructions**

**Hydrotechnical structures, hydraulics and engineering hydrology**

**Technology and management in construction**

**Structural mechanics**

(PhD program title)

### 1. DISCIPLINE (MODULE) GOAL

The objective of mastering the discipline «Methodology of Scientific Research» is to gain knowledge, skills, and experience in the field of calculation of structures and structures that characterize the stages of competence formation and ensure the achievement of the planned results of the development of the educational program and also preparation for the candidate's examinations and obtaining knowledge, skills and experience in the field of construction.

### 2. REQUIREMENTS FOR LEARNING OUTCOMES

Mastering the discipline «Methodology of Scientific Research» is aimed at preparing for passing candidate exams, as well as mastering the following competencies:

1. knowledge of the methodology of theoretical and experimental research in the field of construction;
2. mastery of the culture of scientific research in the field of construction, including the use of the latest information and communication technologies;
3. ability to comply with scientific ethics and copyright standards;
4. ability to professionally operate modern research equipment and instruments;
5. knowledge of methods for developing scientific and methodological foundations for research, improvement, theoretical, experimental and feasibility studies for the use of various technical solutions and technologies in construction.

### 3. WORKLOAD OF THE DISCIPLINE AND TYPES OF ACTIVITIES

The overall workload of the discipline «Methodology of Scientific Research» is 2 credit units (72 academic hours).

Types of activities	Total ac. hrs.	Semesters
		2
<i>Classroom activities (total), including:</i>	36	36
в том числе:		
Lectures (LC)	24	24
Laboratory activities (LA)	–	–
Practical lessons/Seminars (PC)	12	12
<i>Independent work</i>	36	36
<i>Intermediate certification (test with assessment/exam)</i>	–	–
Overall workload	ac. hrs.	72
	credits	2

### 4. DISCIPLINE CONTENTS

Name of the discipline section	Contents of the section (topic)	Type of study work
Section 1. Theoretical research	<p>Topic 1.1. Science as a continuously developing system of knowledge of the objective laws of nature, society and thinking. The purpose of science. Scientific research. Objectives of scientific research.</p> <p>Topic 1.2. Fundamentals of scientific research methodology. Theoretical research. Applied research. Technical and technological development. Purpose of development.</p> <p>Topic 1.3. Scientific and technical information. Scientific direction. Scientific problem. Formulating the problem and putting forward a hypothesis. Scientific theme.</p>	LC, PC
Section 2. Planning experiments and observations	Topic 2.1. Fundamentals of experimental research methodology. Goals and objectives of	LC, PC

	<p>experimental research. Experiment planning. Planning matrix.</p> <p>Topic 2.2. Random balance method. Random balance method. Construction of interpolation models. Process optimization (planning extreme experiments). Regression analysis. Factor experiment.</p> <p>Topic 2.1. Fundamentals of experimental research methodology. Goals and objectives of experimental research. Experiment planning. Planning matrix.</p>	
Section 3. Experimental studies	<p>Topic 3.1. Natural experiments. Artificial experiments. Computational experiments. Laboratory experiment. Natural experiment. Research (search) experiment. Confirmatory experiment.</p> <p>Topic 3.2. Design of methods and selection of equipment. Preparation of samples and elements. Development of a variable control plan.</p> <p>Topic 3.3. Conducting an experiment. Processing and interpretation of results. Preparation of a scientific report.</p>	LC, PC
Section 4. Processing and analysis of research results	<p>Topic 4.1. Comparison of the results of theoretical and experimental studies. Comparison criteria. Criteria for the adequacy of theoretical dependences to experimental ones.</p> <p>Topic 4.2. Mathematical processing of experimental data. Analysis of the results of experimental studies.</p> <p>Topic 4.3. Preparation of research results for publication and scientific periodicals. Scientific and technical report. Abstract.</p>	LC, PC

#### 5. EQUIPMENT REQUIREMENTS AND TECHNOLOGY SUPPORT

Room Type	Room Equipment	Specialized educational / laboratory equipment, software and materials for mastering the discipline
Class for Seminars, Lectures	Room for seminar-type classes, equipped with a set of specialized furniture, board (screen) and technical / multimedia gadgets	Not necessary
Self-Work Class	Room for self-working (can be used for lecture and seminars activities), equipped with a set of specialized furniture, board (screen) and technical / multimedia gadgets and computers with an access to EIPES	Not necessary
Computer class	Computer class for conducting classes, group and individual consultations, ongoing monitoring and intermediate certification, equipped with personal computers (9 pcs.), a whiteboard (screen) and technical means for multimedia presentations.	

## 6. METHODOLOGICAL SUPPORT AND LEARNING MATERIALS

### *Main readings:*

1. Svintsov A.P. Methods for solving scientific and technical problems in construction: Educational and methodological complex. M. Publishing house RUDN. 2018. 101 p.
2. Kashirin V.P. Theory of scientific research / V.P. Kashirin. –Krasnoyarsk: Krasnoyarsk State. Agrarian University, 2007. - 184 p.
3. Sidnyaev N.I. The theory of experiment planning and analysis of statistical data / N. I. Sidnyaev. –M.: Yurait, 2011. - 399 p.

### *Additional readings:*

1. Experimental planning in examples and calculations. / N. I. Bogdanovich and others; - Arkhangelsk: Northern (Arctic) Federal University, 2010. - 126 p.
2. Rykov V.V. Mathematical statistics and experimental planning - M.: MAKS Press, 2010 - 303 p.
3. Kim E. N. Planning and organization of experiment. / E. N. Kim, E. P. Lapteva-Vladivostok: Dalrybvtuz, 2009 - 188 p.
4. Rozhkov N.F. -Planning and organization of a measuring experiment. / N. F. Rozhkov. - Omsk: Omsk State Technical University Publishing House, 2009. - 106 p.
5. Search system "Yandex", SPS "StroyKonsultant", Information and reference system "ZODCHY" Version 9.01.
6. Archi.RU: Portal "Architecture of Russia".
7. Architector.RU: Information and reference site - a systematic presentation of information about building materials, products and problems of modern architecture, Russia.

### *Internet sources:*

ELS RUDN University and third party EBS, to which university students have access based signed contracts:

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

### Databases and search engines:

- Electronic fund of legal and normative-technical documentation, <http://docs.cntd.ru> ;
- Yandex search system <https://www.yandex.ru> ;
- Google search system <https://www.google.com> ;
- Reference database Scopus , <http://www.elsevier.com/locate/scopus>

*Educational and methodological materials for students' self-work studying the discipline / module:*

A course of lectures on the discipline «Methodology of Scientific Research».

## 7. ASSESSMENT TOOLKIT AND GRADING SYSTEM FOR EVALUATION OF PHD STUDENTS' COMPETENCES LEVEL AS COURSE RESULTS

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

### **DEVELOPERS:**

Professor

A.P. Svintsov

### **HEAD OF THE DEPARTMENT**

Director of the department

S.B. Yazyev