Федеральное государственное автономное образовательное учреждение высшего образования «Российский университет дружбы народов»

Инженерная академия

(наименование основного учебного подразделения (ОУП)-разработчика ОП ВО)

THE WORKING PROGRAM OF THE DISCIPLINE
РАБОЧАЯ ПРОГРАММА ДИСЦИПЛИНЫ

Methodology of Scientific Research

(наименование дисциплины/модуля)

Рекомендована МССН для направления подготовки/специальности:

2.1.1. Building designs, buildings and constructions / Строительные конструкции, зданий и сооружения (англ.)
2.1.9. Structural mechanics / Строительная механика (англ.)

(код и наименование научной специальности)

Освоение дисциплины ведется в рамках реализации основной профессиональной образовательной программы высшего образования (ОП ВО):

2.1.1. Building designs, buildings and constructions / Строительные конструкции, зданий и сооружения (англ.)
2.1.9. Structural mechanics / Строительная механика (англ.)

(наименование программы аспирантуры)

2023 г.

1. Goals of the discipline / цель освоения дисциплины

The purpose of the practice "Independent Research Work (obtaining basic research skills) / Research work (obtaining primary skills of research work)" is to deepen, systematize and consolidate theoretical knowledge, as well as to obtain skills and abilities when performing scientific research necessary for writing a master's thesis.

The main objectives of the practice are:

-to study scientific and technical information, domestic and foreign experience on the topic of research work.

-learn to set scientific and technical problems, choose methodological methods and means of solving them, process data for writing a master's thesis.

-master the primary skills and basic techniques of setting up and conducting experiments, collecting and analyzing results, identifying theory and experiment.

2. Place of practice in the structure of OP VO

"Independent research work (obtaining basic research skills) / Research work (obtaining primary research skills)" refers to the mandatory part.

Within the framework of the OP HE, students also master disciplines and / or other practices that contribute to the achievement of the planned learning outcomes based on the results of the internship "Independent Research Work (obtaining basic research skills) / Research work (obtaining primary research skills)".

Таблица 2.1. Перечень компетенций, формируемых у обучающихся при прохождении практики (результатов обучения по итогам практики)

№	Code and name of competence	Preceding disciplines	Subsequent disciplines (groups of disciplines)
	UC-1	Able to carry out critical analysis of problem situations based on a systematic approach, to develop an action strategy	UC-1.1 Analyzes the task, highlighting its basic components
			UC-1.2 Determines and ranks the information required to solve the task
			UC-1.3 Searches for information to solve the task on various types of requests
			UC-1.4 Offers options for solving the problem, analyzes the possible consequences of their use
			UC-1.5 Analyzes ways to solve problems of ideological, moral and personal nature on the basis of the use of the main philosophical ideas and categories in their historical development and socio-cultural context
	UC-2	Able to manage the project at all stages of its life cycle	UC-2.1 Formulates a problem, the solution of which is directly related to the achievement of the project goal
			UC-2.2 Determines the relationship between the tasks set and the expected results of their solution

№	Code and name of competence	Preceding disciplines	Subsequent disciplines (groups of disciplines)
			UC-2.3 Within the framework of the tasks set, determines the available resources and restrictions, the current legal norms
			UC-2.4 Analyzes the schedule for the implementation of the project as a whole and chooses the best way to solve the tasks, based on the current legal norms and available resources and limitations
			UC-2.5 Monitors the progress of the project, adjusts the schedule in accordance with the results of the control
	UC-3	Able to organize and manage the work of the team, developing a team strategy to achieve the goal	UC-3.1 Defines its role in the team, based on the strategy of cooperation to achieve the goal
			UC-3.2 Formulates and takes into account in its activities the peculiarities of the behavior of groups of people identified depending on the goal
			UC-3.3 Analyzes the possible consequences of personal actions and plans his actions to achieve a given result
			UC-3.4 Exchanges information, knowledge and experience with team members
			UC-3.5 Argues his point of view regarding the use of ideas of other team members to achieve the goal
			UC-3.6 Participates in teamwork on the execution of assignments
	UC-6	Able to determine and implement the priorities of their own activities and ways to improve them based on self-esteem	UC-6.1 Controls the amount of time spent on specific activities
			UC-6.2 Develops tools and methods of time management in the implementation of specific tasks, projects, goals
			UC-6.3 Analyzes its resources and their limits (personal, situational, temporary, etc.) for the successful implementation of the task
			UC-6.4 Distributes tasks into long-, medium- and short-term with justification of relevance and analysis of resources for their implementation
	UC-7	Able to: search for the necessary sources of information and data, perceive, analyze, remember and transmit information using digital means, as well as using algorithms when working with data received from	UC-7.1 Searches for the necessary sources of information and data, perceives, analyzes, remembers and transmits information using digital means, as well as with the help of algorithms when working with data received from various sources in order to effectively use the information received to solve problems.
			UC-7.2 Evaluates information, its reliability, builds logical conclusions on the basis of incoming information and data

№	Code and name of competence	Preceding disciplines	Subsequent disciplines (groups of disciplines)
		various sources in order to effectively use the information received to solve problems; evaluate information, its reliability, build logical conclusions on the basis of incoming information and data	
	OPC-1	Able to solve the problems of professional activity on the basis of the use of theoretical and practical foundations, the mathematical apparatus of fundamental sciences	OPC-1.1 Selects a mathematical model suitable for the professional task being solved, sets the required parameters, boundary conditions
			OPC-1.2 Solves problems of mathematical moderation, using suitable analytical, numerical, or numerical-analytical methods
			OPC-1.3 Solves professional problems using modern software systems for mathematical, digital modeling of structures
	OPC-2	Able to analyze, critically comprehend and present information, search for scientific and technical information, acquire new knowledge, including with the help of information technologies	OPC-2.1 Is able to search for scientific and technical information, including with the help of information technologies
			OPC-2.2 Is able to analyze, critically comprehend information, acquire new knowledge
			OPC-2.3 Is able to present found and meaningful information, including with the help of information technology
	OPC-3	Able to set and solve scientific and technical problems in the field of construction, construction industry and housing and communal services based on knowledge of the problems of the industry and experience in solving them	OPC-3.1 Is able to set and solve scientific and technical problems in the field of design of building structures
			OPC-3.2 Is able to set and solve scientific and technical problems in the field of technology, organization, construction management and operation of capital construction facilities
			OPC-3.3 Is able to set and solve scientific and technical problems in the field of designing engineering systems
	OPC-6	Able to carry out research of objects and processes in the field of construction and housing and communal services	OPC-6.1 Is able to formulate goals, set research objectives, draw up a research program
			OPC-6.2 Is able to choose the appropriate methods of research and carry out the study according to the chosen methodology
			OPC-6.3 Is able to carry out processing, analysis and design of research results

№	Code and name of competence	Preceding disciplines	Subsequent disciplines (groups of disciplines)
			OPC-6.4 Is able to present and defend the results of the study
	OPC-7	Able to manage an organization operating in the construction industry and housing and communal services, organize and optimize its production activities	OPC-7.5 Is able to develop measures to improve the efficiency of work in the field of design, construction, operation of capital construction facilities
	PC-1	Conducting applied research in the field of engineering and technical design for urban planning activities	PC-1.1 Able to carry out planning, preparation for applied research in the field of engineering and technical design for urban planning activities
			PC-1.2 Able to carry out, control, obtain the results of applied research in the field of engineering and technical design for urban planning activities
			PC-1.3 Able to analyze and process the results of applied research in the field of engineering and technical design for urban planning activities
			PC-1.4 Able to design, coordinate, present the results of applied research in the field of engineering and technical design for urban planning activities

3.. Requirements for the results of training based on the results of the internship

Conducting the practice "Independent Research Work (obtaining basic skills of research work)" is aimed at forming the following competencies (part of the competencies) among students:

Таблица 3.1. Перечень компонентов ОП ВО, способствующих достижению запланированных результатов обучения по итогам прохождения практики

Шифр	**Наименование компетенции**	**Предшествующие дисциплины/модули, практики***	**Последующие дисциплины/модули, практики***
UC-1	Able to carry out critical analysis of problem situations on the basis of a systematic approach, to develop an action strategy	Problem solving tecniques in Civil Engineering / Methods of solving scientific and technical problems in construction; Mathematical methods of experimental data processing; Mathematical Modelling;	Pre-Graduation Practice; Pedagogical Practice; Introductory Practice; Desin Practice; Independent Research Work; Technological Practice; State Final Certification
UC2	Able to manage the project at all stages of its life cycle		

Шифр	Наименование компетенции	Предшествующие дисциплины/модули, практики*	Последующие дисциплины/модули, практики*
UC-3	Able to organize and manage the work of the team, developing a team strategy to achieve the goal	Digital technologies in construction; Applications of Geoinformation Systems / Workshop on the Application of Geographic Information Systems; Project management;	
UC-6	Able to determine and implement the priorities of their own activities and ways to improve them on the basis of self-esteem		
UC-7	Able to: search for the necessary sources of information and data, perceive, analyze, remember and transmit information using digital means, as well as using algorithms for работе с derived from various data sources in order to effectively use the information obtained to solve problems; evaluate information, its reliability, build logical conclusions on the basis of incoming information and data		
OPC-1	Able to solve the problems of professional activity on the basis of the use of theoretical and practical foundations, the mathematical apparatus of fundamental sciences		
OPC-2	Able to analyze, critically comprehend and present information, search for scientific and technical information, acquire new knowledge, including with the help of information technologies		
OPC-3	Able to set and solve scientific and technical		

Шифр	Наименование компетенции	Предшествующие дисциплины/модули, практики*	Последующие дисциплины/модули, практики*
	problems in the field of construction, construction industry and housing and communal services based on knowledge of the problems of the industry and experience in solving them		
ОРС-6	Able to carry out research of objects and processes in the field of construction and housing and communal services		
ОРС7	Able to manage an organization operating in the construction industry and housing and communal services, organize and optimize its production activities		
РС-1	Conducting applied research in the field of engineering and technical design for urban planning activities		

* - заполняется в соответствии с матрицей компетенций и СУП ОП ВО

Know:
- in the field of methods of mathematical analysis.
- know the state standards and be able to use them.
- basic methods of calculation and design of building structures.
- know the main theoretical provisions of the discipline:
- requirements for products and quality of information and theoretical support of the calculation base.
- knowledge of specialized software and computing systems.

Be able to:
- use modern information technologies.
- be able to use the appropriate computer developments.
- use modern software and computing systems for the calculation of building structures.
- use information technology to solve specific tasks.
- use information technology to solve specific tasks;
- use information technology in professional activities

.**Own:**
- application of theoretical knowledge in practice.

- search for the necessary information.
- use of the latest automated projecting systems.
- use of information support in the calculation of structures and structures.
- organization of high-quality calculation of structures and structures.
- search for new software and computing systems to solve the tasks.

4. Scope of discipline and types of educational work

The total workload of the discipline is 4 credit units.

The total labor intensity of the practice "Independent Research Work (obtaining basic skills of research work) is 21 credits (756 academic hours).

Table 4.1. Types of educational work by periods of mastering the postgraduate program

Type of educational work		Total hours	Course			
			1	2	3	4
Classroom lessons (total)		*36*	*36*			
including:						
Lectures **(LC)**		24	24			
Laboratory work **(LW)**		-	-			
Practical lessons **(PL)**		12	12			
Independent work (total)		*36*	*36*			
Control (test with assessment), total		-	-			
Total labor intensity	hour	**72**	**72**			
	credits	**2**	**2**			

5. CONTENT OF THE DISCIPLINE / СОДЕРЖАНИЕ ДИСЦИПЛИНЫ

Table 5.1. The content of the discipline (module) by type of educational work

The name of the discipline section	Section content (topics)	Type of study work
Theoretical research	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. Research objectives. Topic 1.2. Fundamentals of scientific research methodology. Theoretical research. Applied research. Technical and technological development. The purpose of the development. Topic 1.3. Scientific and technical information. Scientific direction. Scientific problem. Problem formulation and hypothesis. Scientific theme.	LC, PL
Planning experiments and observations	Topic 2.1. Fundamentals of experimental research methodology. Goals and objectives of experimental research. Experiment planning. Planning matrix. Topic 2.2. Random balance method. Random balance method. Construction of interpolation models. Process optimization (planning	LC, PL

The name of the discipline section	Section content (topics)	Type of study work
	extreme experiments). Regression analysis. Factorial experiment.	
Experimental research	Topic 3.1. Natural experiments. Artificial experiments. Computational experiments. Laboratory experiment. Natural experiment. Research (search) experiment. Confirmatory experiment. Topic 3.2. Method design and equipment selection. Preparation of samples and elements. Developing a plan for controlling variables. Topic 3.3. Carrying out an experiment. Processing and interpretation of results. Preparation of a scientific report.	LC, PL
Processing and analysis of research results	Topic 4.1. Comparison of the results of theoretical and experimental studies. Matching criteria. Criteria for the adequacy of theoretical relationships to experimental ones. Topic 4.2. Mathematical processing of experimental data. Analysis of the results of experimental studies. Topic 4.3. Preparation of research results for publication and scientific periodicals. Scientific and technical report. Abstract.	LC, PL

5.2. Sections of disciplines and types of classes

No.	Discipline section No.	Lectures.	Practice	Lab. works	Seminars	Independent work of students	Total hour.
1.	**Theoretical research**	4	8	0	0	14	26
2.	**Planning experiments and observations**	4	10	0	0	14	28
3.	**Experimental research**	4	8	0	0	14	28
4.	**Processing and analysis of research results**	4	8	0	0	14	28

6. Material and technical support of the discipline / материально-техническое обеспечение дисциплины

Table 6.1. Logistics of discipline

Type of auditorium	Auditorium equipment	Specialized educational / laboratory equipment, software and materials for mastering the discipline (if necessary)
Lecture room	An auditorium for lecture-type classes, equipped with a set of specialized furniture; board (screen) and technical means of	

Type of auditorium	Auditorium equipment	Specialized educational / laboratory equipment, software and materials for mastering the discipline (if necessary)
	multimedia presentations.	
Classroom for practical training	An auditorium for conducting seminar-type classes, group and individual consultations, current control and intermediate certification, equipped with a set of specialized furniture and technical means for multimedia presentations.	A set of slides, control tests, scripts for conducting classes using interactive forms of organizing the educational process, selection of tasks for current control
Computer class	Computer class for conducting classes, group and individual consultations, current control and intermediate certification, equipped with personal computers (in the amount of 12 pcs), a board (screen) and technical means of multimedia presentations.	RUDN University software: Plaxis 2D Suit (Network license). Plaxis Professional (version 8) + Plaxis Dinamics Modul + PlaxFlow (version 1) - Education Registration number 90-07-019-00261-3 MS-office corporate, Registration code: 86626883 Parent program: 86493330 Status: Active
Educational-methodical room for independent, research work of students	An auditorium for independent work of students (can be used for seminars and consultations), equipped with a set of specialized furniture and computers with access to the EIOS.	418

* - аудитория для самостоятельной работы обучающихся указывается обязательно!

7. Educational and methodological support of the discipline / учебно-методическое и информационное обеспечение дисциплины

Main literature:

1. Svintsov A.P. Methods for solving scientific and technical problems in construction: Educational and methodological complex. M. Publishing house of RUDN. 2018. - 101 p.

2. Kashirin V.P. Theory of scientific research / V.P. Kashirin. –Krasnoyarsk: Krasnoyarsk state. agrarian un-t, 2007. - 184 p.

3. Sidnyaev N.I. Theory of experiment planning and analysis of statistical data / N.I. Sidnyaev. - M .: Yurayt, 2011. - 399 p.

Additional literature:

1. Planning an experiment in examples and calculations. / NI Bogdanovich and others; - Arkhangelsk: Northern (Arctic) Federal University, 2010. - 126 p.

2. Rykov VV Mathematical statistics and planning of experiment-M .: MAKS Press, 2010. - 303 p.

3. Kim EN Planning and organization of the experiment. / E. N. Kim, E. P. Lapteva-Vladivostok: Dalrybvtuz, 2009. - 188 p.

4. Rozhkov NF - Planning and organization of the measuring experiment. / N.F. Rozhkov. -Omsk: Publishing house of OmSTU, 2009. - 106 p.

Databases, reference and search systems:

- 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/
- SCOPUS abstract database http://www.elsevierscience.ru/products/scopus/
- Site of the Ministry of Construction and Housing and Communal Services of the Russian Federation http://www.minstroyrf.ru/
- Electronic library system RUDN - EBS RUDN http://lib.rudn.ru/MegaPro/Web
- EBS "University Library Online" http://www.biblioclub.ru
- EBS Yurayt http://www.biblio-online.ru
- EBS "Student Consultant" www.studentlibrary.ru
- EBS "Doe" http://e.lanbook.com/

Methodical instructions for students on mastering the discipline (module):*

Methodological instructions for mastering the discipline are contained in the book: A.P. Svintsov. Methods for solving scientific and technical problems in construction: Educational and methodological complex. M. Publishing house of RUDN. 2018 .- 101 p.

* - все учебно-методические материалы для самостоятельной работы обучающихся размещаются в соответствии с действующим порядком на странице дисциплины в ТУИС!

8. Fund of assessment tools for intermediate certification of students in the discipline (module) / оценочные материалы и балльно-рейтинговая система оценивания уровня сформированности компетенций по дисциплине

Evaluation materials and a point-rating system for assessing the development of the discipline are presented in the Appendix to this Work Program of the discipline.

* - ОМ и БРС формируются на основании требований соответствующего локального нормативного акта РУДН.

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