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

Institute of Environmental Engineering

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

COURSE SYLLABUS

Methodology of Scientific Creation

course title

Recommended by the Didactic Council for the Education Field of:

05.04.06.Ecology and environmental Management

field of studies / speciality code and title

The course instruction is implemented within the professional education programme of higher education:

Integrated Solid Waste Management

higher education programme profile/specialisation title

2025г.

1. OBJECTIVE OF THE DISCIPLINE

The objectives of mastering the discipline "Fundamentals of scientific research" in accordance with the general objectives of the main professional educational program are:

- assimilation by students of knowledge about the methods of conducting scientific research;
- the formation of students' scientific understanding of the methods of collecting, processing, analyzing and presenting scientific information in scientific research.

The tasks of the discipline are:

- Development of students' ability to analyze the structural components of the scientific problem they study, the ability to establish their place and role in the system of society;
- Formation for students' scientific worldview,
- familiarization of students with the main methodological traditions and innovations; improving the skills of organizing research activities.

2. REQUIREMENTS FOR THE RESULTS OF DISCIPLINE MASTERING :

Mastering the discipline "Fundamentals of scientific research" is aimed at developing the following competencies (parts of competencies):

Table 2. Mastering the discipline "Fundamentals of scientific research" is aimed at developing the following competencies (parts of competencies):

Code	Competencies	Competence achievement indicators (within this discipline)
YK 1	Able to carry out a critical analysis of problem situations based on a systematic approach, to develop a strategy of actions.	YK 1.1 Able to analyze a problem situation as a system, identifying its components and relationships between them
		YK 1.2 Owns argumentation and develops a meaningful strategy for solving a problem situation based on a systematic and interdisciplinary approach
		YK 1.3 Knows the basics of the strategy and identifies possible risks, suggesting ways to eliminate them
YK-6	Able to determine and implement priorities of one's own activities and their methods, arising on the basis of self-assessment.	YK 6.1 Capable of analyzing large amounts of information of professional content;
		YK 6.2 Capable of conducting analysis, synthesis and optimization of solutions to assigned tasks;
YK-7	Able to use basic knowledge in the field of information culture	YK 7.2 Formulates the task of processing real data in terms of a real problem;
ОПК 1	Able to use philosophical concepts and methodology of scientific knowledge in the study of various levels of organization of matter, space and time	ОПК 1.1 Knows the relationship between the intuitive, the unconscious and the conscious in scientific creativity, the social and psychological motives of scientific creativity; problems of moral evaluation of scientific creativity; bioethics; integrative trends of modern knowledge
		ОПК 1.2 Uses the positions and categories of philosophy to evaluate and analyze various social trends, facts and phenomena related to the modern development of natural science and technology
		ОПК 1.3 Owns the skills of historical and methodological analysis of scientific research and its results; all kinds of scientific communication; methods of conducting discussion and polemics, skills of public

Code	Competencies	Competence achievement indicators (within this discipline)
		speech and written argumentative presentation of one's own point of view
ОПК 3	Able to apply ecological research methods to solve research and applied problems of professional activity	ОПК 3.4 Uses modern databases, methods of obtaining and working with information at theoretical and empirical levels, GIS technologies;
ОПК 6	Able to design, present, protect and disseminate the results of his professional activities, including research	ОПК6. Capable of using information resources, scientific, experimental and instrumental bases on the subject of the research being conducted
		ОПК 6.2 Able to formulate the results obtained in the course of solving research problems;
		ОПК6.3 Capable of identifying scientific (scientific and technical) results that have practical significance;

3. THE PLACE OF DISCIPLINE IN THE STRUCTURE OF EP HE:

The course "Fundamentals of scientific research "refers to the part formed by the participants of the educational relations of the block B1.

As part of the EP HE, students also master other disciplines and / or practices that contribute to the achievement of the planned results of mastering the discipline "Fundamentals of scientific research ".

Table 3.1. The list of the components of the educational program that contribute to the achievement of the planned results of mastering the discipline

Code	Name of competence	Previous disciplines/modules, practices	Subsequent disciplines/modules, practices
YK-7	Able to use basic knowledge in the field of information culture		Work Experience Internship; Research Work;Pre-graduation Practical Training;
YK 1	Able to carry out a critical analysis of problem situations based on a systematic approach, to develop a strategy of actions.		Modern technologies for nature protection; Environmental control and MSW monitoring programs**; Physicochemical methods of waste testing**; Environmental noms for sustainability;Work Experience Internship; Research Work;Pre-graduation Practical Training;
YK-6	Able to determine and implement priorities of one's own activities and their methods, arising on the basis of self-assessment.		Management of environmental-economic risks; Environmental control and MSW monitoring programs; Physicochemical methods of waste testing; Work Experience Internship; Research Work; Pre-graduation Practical Training;
ОПК 6	Able to design, present, protect and disseminate the results of his professional activities, including research		Management of environmental-economic risks; Work Experience Internship; Research Work;Pre-graduation Practical Training;
ОПК 1	Able to use philosophical concepts and methodology of scientific		MSW Recycling and Utilization Technics;Work Experience Internship;

	knowledge in the study of various levels of organization of matter, space and time		Research Work;Pre-graduation Practical Training;
OIK 3	Able to apply ecological research methods to solve research and applied problems of professional activity		Environmental nms for sustainability;Modern remediation technologies;Work Experience Internship; Research Work;Pre-graduation Practical Training;

4. SCOPE OF DISCIPLINE AND TYPES OF EDUCATIONAL WORK

The total labor intensity of the discipline "*Fundamentals of scientific research*" is 2 credit.

Table 4.1. Types of educational work by periods of mastering the EP HE for FULL-time education

Type of educational work		TOTAL, ac.h.	Semester(s)			
			1	2	3	4
Contact work, ac.h.		51	51			
including:						
Lectures (L)		17	17			
Laboratory work (LW)						
Practical/seminar classes (SC)		34	34			
Independent work of students, ac.h.		36	36			
Control (exam / test with assessment), ac.h.		21	21			
Total labor intensity of the discipline	ac.h.	108	108			
	credit	3	3			

5. CONTENT OF THE DISCIPLINE

Table 5.1. Content of the discipline (module) by type of academic work

Name of the discipline section	Content of the section (topics)	Type of educational work*
Topic 1. Fundamentals of the methodology of scientific creativity	<i>Introduction to the methodology of scientific creativity, basic terms and definitions, structure of research activities, relevance and scientific novelty, classification of scientific research methods, tools for identifying problems, methods aimed at enhancing the use of experience and intuition of specialists, logical laws.</i>	L, PC
Topic 2. Introduction to Information Retrieval Theory	<i>Information, types of information, ascending/descending information flows, the birth of information, the law of information scattering. Search for information, search for information on the Internet, use of libraries and databases.</i>	L, PC
Topic 3. Empirical methods of knowledge	<i>Methods of empirical knowledge, observation, measurement, measurement scales, measurement errors, the concept of an experiment, experiment planning, processing of experimental results, surveys, interviews, expert surveys, etc.</i>	L, PC
Topic 4. General requirements for the thesis	<i>General requirements for research work, the basics of scientific citation, the effectiveness of scientific research, the concept of plagiarism in scientific activity, discoveries, their mechanism and typology.</i>	L, PC
Topic 5. Other activities	<i>Methodology of practical activity, methodology of artistic and educational activity, organization of collective activity.</i>	L, PC

5.2. Practical classes (seminars)

№ п/п	№ of the discipline section	Topics of practical classes (seminars)	Labor intensity (hour)
1.	1	Relevance, scientific novelty, goals and objectives of the Final Qualifying Work (FQW) Problem identification tools Methods aimed at activating the use of experience and intuition of specialists	3
2.	2	Search for information using various the database	2
3	3	Expert surveys (preparation of a scientific article)	5
4	4	Rules for writing FQW, information efficiency of FQW, Methods for calculating the percentage of personal participation Types of discoveries.	5
5	5	Organization of collective activity	3

6. MATERIAL AND TECHNICAL SUPPORT OF THE DISCIPLINE:

Table 6.1. Material and technical support of discipline

Classroom type	Classroom equipment	Specialized educational/laboratory equipment and materials for the discipline/module realization
Lecture hall	To organize the educational process, a classroom is used for conducting lecture-type classes, seminar-type classes, group and individual consultations, current control and intermediate certification, equipped with a set of specialized furniture; chalk board; technical means: HP PRO system unit, HP-V2072A monitor, LUMIEN retractable projection screen, with Internet access. Software: Microsoft products (OS, office suite, including MS Office/Office 365, Teams, Skype)	access to databases (Scopus, Pubmed, Sciecedirect)
For independent work of students	Computer class for conducting practical classes, course design, independent work. A set of specialized furniture; marker board; technical means: personal computers (18.), projection screen, multimedia projector, NEC NP-V302XG, Internet access. Software: Microsoft products (OS, office suite, including MS Office/Office 365, Teams, Skype)	access to databases (Scopus, Pubmed, Sciecedirect)

* - the audience for independent work of students must be specified

7. EDUCATIONAL, METHODOLOGICAL AND INFORMATIONAL SUPPORT OF THE DISCIPLINE

Mandatory literature:

1. Shai O, Reich Y, Hatchuel A, Subrahmanian E (2013) Creativity and scientific discovery with infused design and its analysis with C-K theory. Research in Engineering Design 24 (2):201-214. (the materials are posted on Researchgate)
2. Ross, S. M., & Morrison, G. R. (2004). Experimental research methods. In Handbook of research on educational communications and technology (Vol. 2, pp., 1021–1043). Routledge. Taylor & Francis: https://www.researchgate.net/publication/201382131_Experimental_Research_Methods
3. Rules of preparation and registration of the final qualifying work of a student of the RUDN. (materials are posted on the RUDN educational portal).

Additional literature:

4. Noah, S.M., 2002. Research Methodology: Philosophy, Theory and Practice. University Putra Malaysia, Serdang, ISBN: 983-2373-38-7, pp: 85-96 (the materials are posted on Researchgate)

a) software: Word, Excell., Powerpoint


б) databases (DB), information and reference and search systems: Yahoo, Infoseek, Lycos, Excite, LookSmart, Euroseek, AltaVista, АУ, Созвездие Интернет, Rambler, Апорт, WebRing10.

8. EVALUATION MATERIALS AND SCORE-RATING SYSTEM FOR ASSESSING THE LEVEL OF FORMATION OF COMPETENCES IN THE DISCIPLINE


Evaluation materials and a score-rating system* for assessing the level of competence formation (part of competencies) based on the results of mastering the discipline "Fundamentals of scientific research" are presented in the Appendix to this Work Program of the discipline.

* 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:

Associate Professor		Y.N. Rebouh
_____ position, educational department	_____ signature	_____ name and surname.

HEAD OF EDUCATIONAL DEPARTMENT:

Director of the Department of Environmental Management		Kucher D.E.
_____ educational department	_____ signature	_____ name and surname.

HEAD OF HIGHER EDUCATION PROGRAMME:

Director of the Department of Environmental Management		Kucher D.E.
_____ position, educational department	_____ signature	_____ name and surname

ASSESSMENT TOOLKIT

for the course

Methodology of scientific research

course title

05.04.06. Ecology and environmental Management

field of studies / speciality code and title

Integrated solid waste management

higher education programme profile/specialisation title

master's

graduate's qualification (degree)

Passport to Assessment Toolkit for Course Methodology of scientific research

Field of Studies / 05.04.06. Ecology and environmental Management

Course: Fundamentals of scientific research

Competences (competences in part) under assessment	Course module under assessment	Course topic under assessment	Tools to assess higher education programme mastering level						Points for topic	Points for module
			Current control				certification intermediate	Final certification exam		
			Work in class	Practical class	Homework	Control work				
YK 1; YK-7, YK-6 ОПК 1; ОПК 3; ОПК 6	Module 1: Fundamentals of the methodology of scientific creativity	Topic1:Introduction to the scientific research methodology, basic terms and definitions, structure of research activities, relevance and scientific novelty.	1	1	5	2		5	9	18
		Topic 2: classification of scientific research methods, tools for identifying problems, methods aimed at enhancing the use of experience and intuition of specialists, logical laws.	1	1	5	2			9	
YK 1; YK-7, YK-6 ОПК 1; ОПК 3; ОПК 6	Module 2: Introduction to Information Retrieval Theory	Topic1:Information, types of information, ascending/descending information flows, the birth of information, the law of information dispersion. Search for information	0,5	0,5		1		5	2	8

		Topic 2: Search for information on the Internet, basics of Internet search, classification of IRS, pertinence and relevancy.	0,5	0,5	5	1			6	
УК 1; УК-7, УК-6 ОПК 1; ОПК 3; ОПК 6	Module 3:Empirical methods of knowledge.	Topic 1: Methods of empirical knowledge	0,5	0,5		1		5	2	21
		Topic 2:observation	1	1		1			3	
		Topic 3:measurement, measurement scales, measurement errors	1	1		1			3	
		Topic 4:the concept of an experiment, planning an experiment, processing the results of an experiment	1	1		2			4	
		Topic 5:surveys, interviews	0,5	0,5		1			2	
		Topic 6:expert surveys	0,5	0,5	5	1			7	
УК 1; УК-7, УК-6 ОПК 1; ОПК 3; ОПК 6	Module 4: General requirements for the thesis	Topic1:General requirements for research work	0,25	0,25	5	1		5	6,5	18
		Topic 2: science citation basics	0,25	0,25		0,5			1	
		Topic 3: effectiveness of scientific research	0,25	0,25	5	1			6,5	
		Topic 3:the concept of plagiarism in scientific activity	0,25	0,25		1			1,5	
		Topic 3: discoveries, their mechanism and typology.	0,5	0,5		1,5			2,5	
УК 1; УК-7, УК-6 ОПК 1; ОПК 3; ОПК 6	Module 5: Other activities	Topic1:Practice Methodology	0,25	0,25		0,5			1	
		Topic 2: Methodology of artistic and educational activities	0,25	0,25		0,5			1	
		Topic 3: organization of collective activities	0,5	0,5	5	1		5	7	9
ИТОГО:			10	10	35	20	32	25		100

Course: Methodology of scientific research
course title

QUESTION CARD No

QUESTION 1 Give a definition of scientific research
QUESTION 2 What does the IMRaD system mean?
QUESTION 3 What should the introduction section of a scientific paper contain?
QUESTION 4 What should the abstract section of a scientific paper contain?
QUESTION 5 What does topic novelty mean? And how can we define it ?
QUESTION 6 What types of scientific papers exist and what is the difference between them?

Developer _____ (name and surname)
signature

Head of Educational Department _____ (name and surname)
signature

day, month, year

Note * Practice case/task inclusion is subject to the teacher's discretion.

The set of exam question cards is complemented by the assessment criteria developed by the teacher and approved at the department meeting.

Assessment criteria:
(in compliance with the legal regulations in force)

Department _____
educational department to be specified

Set of assignments for control work

for the course _____
course title

Theme: writing scientific articles

Variant 1: overview

Task 1: find relevant sources.

Theme 2: keywords use .

Variant 1: bibliographical research.

Task1: check multiple databases by using keywords.

Theme 3: novelty of the topic

Variant 1: what does topic novelty mean and how do you define it?

Task 1: definition of the novelty of the topic

Theme 4: introduction section writing

Variant 1: what is the introduction content of a scientific paper?

Task 1: introduction writing

Theme 5: Discussion section writing

Variant 1: What is the discussion content of a scientific paper?

Task 1: Discussion of results

Assessment criteria:

(in compliance with the legal regulations in force)

Developer _____ (name and surname)
signature

day, month, year

Department _____
educational department to be specified

Themes for essays (research essay/library research papers*, reports, briefs)

for the course _____
course title

1. Scientific research methodology
2. Citation methodology
3. IMRaD System (Introduction, Methods, Results, and Discussion)
4. literature review methodology
5. Find relevant sources.
6. Collect the necessary data from sources.
7. Use keywords.
8. Check multiple databases.

Assessment criteria:
(in compliance with the legal regulations in force)

Developer _____ (name and surname)
signature

day, month, year

*Requirements for library research papers can be found at
<https://custom-writing.org/blog/library-research-paper>
<https://www.cambridge.org/core/books/abs/psychologists-companion/steps-in-writing-the-library-research-paper/D4AFF7400D158C124F58EC71E2E7B004>