Federal State Autonomous Educational Institution of Higher Education

"Peoples' Friendship University of Russia"

Faculty of Ecology

Recommended by the Methodological council
on specialties and study directions

WORKING PROGRAM OF THE DISCIPLINE

Name of the discipline

IT IN ECOLOGY AND NATURAL RESOURCES MANAGEMENT

Recommended for the specialty/ direction

05.04.06 Ecology and nature management

Masters' program:

Economics of natural resources management

1. Goals and objectives of the discipline:

To develop students' understanding of the role, significance and limitations of the use of statistical methods in scientific and practical socio-economic and environmental research; to teach how to use methods for assessing the representativeness of the material, the volume of samples when conducting quantitative studies, statistical methods for comparing the data obtained and determining patterns; to form the skill of using modern computer tools for processing statistical data and in solving problems of future professional and scientific activities.

2. Place of discipline in the structure of the educational program:

The discipline Environmental Management Standards refers to an optional part of block 2 of the curriculum.

Table No. 1 shows the previous and subsequent disciplines aimed at the formation of the discipline's competencies in accordance with the competence matrix of EP HE.

Table **1**

Previous and subsequent disciplines aimed at building competencies

№ п/п	Code and name of competence	Preceding disciplines	Subsequent disciplines (groups of disciplines)
General professional competencies			
1	GPC-2 Ability to apply modern computer technologies in collecting, storing, processing, analyzing and transmitting information and for solving research and production-technological problems of professional activity		Research practice work per semester, including coursework. Research work on the topic of the dissertation. Industrial (including undergraduate) practice
2	GPC -6 The ability to use in-depth knowledge of legal and ethical norms in assessing the consequences of their professional activities, the development and implementation of socially significant projects and to use in practice skills and abilities in the organization of research and scientific-production work, in the management of the scientific team		Research practice work per semester, including coursework. Research work on the topic of the dissertation. Industrial (including undergraduate) practice
Professional competencies (type of professional activity - research, control and expert, organizational and management)			
3	PC-3 Possession of the basics of design, expert and analytical activities and research performance using modern approaches and		

	methods, equipment and computing systems		
4	PC-4 Ability to use modern methods of processing and interpreting environmental information in scientific and industrial research		Research practice work per semester, including coursework. Research work on the topic of the dissertation. Industrial (including undergraduate) practice

3. Requirements for the results of mastering the discipline:

The process of studying the discipline is aimed at the formation of the following competencies:

OPK-2, OPK-4, PC-3, PC-4

As a result of studying the discipline, the student must:

Know: the role and limitations of the use of statistical methods in scientific and practical research; methods of processing statistical data, including small samples; computer tools for processing statistical data and solving statistical problems .

Be able to: formulate the problem of processing real data in terms of mathematical statistics, choose methods for processing statistical data to solve real problems, use computer tools for processing statistical data, formulate conclusions in terms of a real problem

Own: methods of processing statistical information, including small samples, computer tools for processing statistical data

4. The scope of the discipline and types of educational work

The total labor intensity of the discipline			3 credits							
Type of educational work	Total hours			Semesters						
		1	2	3	4	5	6	7	8
Classroom Lessons (total)									
Including:									
Lectures	9			9					
Practical lessons	18			18					
Seminars	-								
Laboratory work	-								
Independent work	79								
Control	2					2	2		
The total labor intensity, hours. The total labor intensity, credits	108								

5. Discipline content
5.1 Contents of discipline sections

Discipline section name	Section content (topics)
Introduction. Application of computer technologies	Computational methods for assessing environmental impact, risk assessment, etc. Application of computer tools (Excel) for economic and

in the work of an ecologist	environmental calculations. Specialized programs for complex calculations for environmental impact assessment, risk analysis. Graphics processing software
Primary processing of statistical data in Excel	Distribution characteristics, their interpretation and methods of finding them in a given sample. Compilation of interval series and determination of characteristics for a series. Visualization of statistical data
Assessment of the characteristics of the general population. Observation errors	Observation errors and confidence intervals for characteristics of large and small samples. Determination of the required sample size
Testing statistical hypotheses	Statistical hypotheses and their application to solving real problems. Parametric criteria and conditions for their application. Testing the hypothesis about the distribution law. Comparison of two samples by mean value and comparison of variances of two samples using parametric tests. Nonparametric tests. Computing consistent ranks. Comparison of two samples by the mean and comparison of variances of two samples using nonparametric tests. Data consistency assessment.
ANOVA	Comparison of averages in more than two objects. Analysis of variance. Nonparametric ANOVA
Correlation-regression analysis	Statistical connection and methods of its study. Correlation coefficient: graphical assessment, Pearson, Spearman, Kendall coefficients. Linear regression analysis. Pairwise linear regression. Multiple Linear Regression. Non-linear regression models. Correlation ratio
Time series analysis	Dynamic (time) series, their classification, structure, tasks and conditions of study. Indicators of the analysis of the series of dynamics. Time series trend analysis. Making forecasts. Revealing seasonal irregularities in time series

5.2* Sections of disciplines and types of classes

№ п/п	Discipline section name	Lectures	Practical lessons	Independent work	Total hours
1.	Introduction. Application of computer technologies in the work of an ecologist	1	2	9	12
2.	Primary processing of statistical data in Excel	1	2	10	13
3.	Assessment of the characteristics of the	1	2	12	15

	general population. Observation errors				
4.	Testing statistical hypotheses	1	2	12	15
5.	ANOVA	1	2	12	15
6.	Correlation-regression analysis	2	4	12	18
7.	Time series analysis	2	4	12	18

6. Laboratory workshop (if available) - NO

7. Practical lessons; seminars

Nr	Discipline section	Subjects of practical classes (seminars)	Total hours
1.	Introduction. Application of computer technologies in the work of an ecologist	The use of computer tools (Excel) for economic and environmental calculations	2
2.	Primary processing of statistical data in Excel	Acquaintance with specialized software for performing complex calculations, processing graphic images, etc	4
3	Assessment of the characteristics of the general population. Observation errors	Distribution characteristics, their interpretation and methods of finding them in a given sample. Compilation of interval series and determination of characteristics for a series. Distribution series visualization.	4
4	Testing statistical hypotheses	Statistical hypotheses and their application to solving real problems. Parametric criteria and conditions for their application. Testing the hypothesis about the distribution law. Comparison of two samples by mean value and comparison of variances of two samples using parametric tests. Nonparametric tests. Computing consistent ranks. Data consistency assessment. Comparison of two samples by the mean and comparison of variances of two samples using nonparametric tests	4
5	ANOVA	Statistical connection and methods of its study. Correlation coefficient: graphical assessment, Pearson, Spearman, Kendall coefficients. Linear regression analysis. Pairwise linear regression. Multiple Linear Regression. Non-linear regression models. Correlation ratio.	4
6	Correlation-regression analysis	Statistical connection and methods of its study. Correlation coefficient: graphical assessment, Pearson, Spearman, Kendall	

		coefficients. Linear regression analysis. Pairwise linear regression. Multiple Linear Regression. Non-linear regression models. Correlation ratio.	
7	Time series analysis	Dynamic (time) series, their classification, structure, tasks and conditions of study. Indicators of the analysis of the series of dynamics. Time series trend analysis. Making forecasts. Revealing the seasonal unevenness of the time series. Solving real problems	

8. Material and technical base of the discipline:

An auditorium equipped with multimedia equipment and a personal computer with a standard package of office programs.

9. Information support of the discipline

When studying the discipline, traditional information technologies are used to present the theoretical part of the material by the teacher (PowerPoint presentation).

a) Software
MSWindows; MSOffice
b) databases, reference and search systems
www.mnr.gov.ru - site of the Ministry of Natural Resources of the Russian Federation;
http://rpn.gov.ru/ - Federal Service for Supervision in the Sphere of Natural Resources (Rosprirodnadzor);
www.ecoindustry.ru - site of the journal "Production Ecology";
www.unep.org - site of the United Nations Environment Program;
www.wwf.ru - site of the World Wildlife Fund.
http://burondt.ru/ - website of the BAT Bureau - information on the introduction of standardization based on the best available technologies
http://www.mnr.gov.ru/activity/directions/zelenye_standarty/zelenye_standarty/?sphrase_id=1 24597 - information on the development, application and implementation of "green standards"
http://www.mnr.gov.ru/activity/directions/natsionalnyy_proekt_ekologiya/ - information on the progress of the National Project "Ecology"

10. Literature

Basic list

1. Ledashcheva T.N., Bragina L.V., Chemodanova V.I. Lecture notes for the course "Statistical analysis of ecosystems" Moscow, 2011 - available at the department and in electronic form
2. Ledashcheva T.N., Chemodanova V.I. Analysis of statistical data: workshop. Moscow, 2016 - available at the department and in electronic form
3. Statistical collection "Regions of Russia 2007" - available in electronic form

b) additional literature

1. Gmurman V.E. Probability theory and mathematical statistics: Textbook for universities –M. : High School, 2003
2. Gorbatsevich V.V. Time series analysis and forecasting. Methodological instructions for lecturing and conducting practical exercises. M., 2000.
3. Order of the Ministry of Emergency Situations of the Russian Federation of 10.07.2009 N 404 (as amended on 14.12.2010) "On the approval of the methodology for determining the calculated values of fire risk at industrial facilities" [Electronic resource] - Access mode: http: // consultant.ru

11. Methodical instructions for students on mastering the discipline (module)

Independent work of students includes:
• individual study of theoretical material on the subject of the course (links to information sources are presented in the previous sections);
• study of additional material;
• preparation of abstracts on the topics specified in the program.

11.1. Independent study of additional theoretical material is carried out by students on an individual basis; the list of recommended information sources is given above.
11.2. Requirements for writing abstracts
Academic ethics, respect for copyright. In the first lesson, students are informed about the need to comply with the norms of academic ethics and copyright during their studies. In particular, information is provided:
- general information about copyright;
- citation rules;
- link formatting rules
All footnotes in the text are carefully checked and provided with "addresses". It is not permissible to include in your work excerpts from the works of other authors without indicating this, to retell someone else's work close to the text without referring to it, to use other people's ideas without indicating the primary sources. This also applies to sources found on the Internet. You must specify the full site address. All cases of plagiarism must be excluded. If unjustified and incorrect borrowings are identified, the abstract is not accepted.
When preparing written works, the following must be submitted without fail: work plan; a list of used literature, drawn up in accordance with the current rules for the bibliographic description of used sources.
For the preparation of the abstract, only special relevant sources should be used. In addition to abstracts, the subject of which is related to the dynamics of any phenomena over many years, or the historical development of scientific views on any problem, sources should be used for a period of no more than 10 years.
The prepared essay should be presented at one of the classes in agreement with the teacher. Use of PowerPoint presentations (or those prepared using similar licensed or free software) is encouraged, but not required. The approximate time of the presentation is up to 15 minutes. The structure of the report and additional requirements for the quality of materials are determined by the chosen topic and are additionally discussed with the teacher.

12. Fund of appraisal funds for intermediate certification of students in the discipline (module)
(developed in accordance with the requirements of the "Regulations for the formation of funds of appraisal funds", approved by order of the rector dated 05.05.2016 No. 420).

VALUATION FUND

ON THE EDUCATIONAL DISCIPLINE

IT IN ECOLOGY AND NATURAL RESOURCES MANAGEMENT

direction 05.04.05 "Ecology and nature management"

Program:

Economics of natural resources management

Qualification (degree) of the graduate –

Master of Ecology and Nature Management

Passport of the fund of assessment tools by discipline

Direction 05.04.6 «Экология и природопользование»:

Discipline: IT IN ECOLOGY AND NATURAL RESOURCES MANAGEMENT

Code Б1.В.05

12.1. Балльно-рейтинговая система оценки и характеристика шкалы оценивания

Rating assessment system and characteristics of the assessment scale

Балльно-рейтинговая система оценки и характеристика шкалы оценивания

Controlled competence code or part thereof Код контролируемой компетенции или ее части	Controlled discipline topic Контролируемая тема дисциплины	Forms of control ФОСы (формы контроля уровня освоения ООП)				Topic points Баллы темы
		Classroom work Аудиторная работа		Самостоятельная работа	Экзамен	
		Test / Тест	Test work Контрольная работа	Class work Работа на занятии	Доклад seminar report	
GPC- 2,6 PC - 3, 4	Introduction. Application of computer technologies in the work of an ecologist	X		6		4
GPC- 2,6 PC - 3, 4	Primary processing of statistical data in Excel	X		6		4
GPC- 2,6 PC - 3, 4	Assessment of the characteristics of the general population. Observation errors	X		6		6
GPC- 2,6 PC - 3, 4	Testing statistical hypotheses	X		10		8
GPC- 2,6 PC - 3, 4	ANOVA	X		10		10
GPC- 2,6 PC - 3, 4	Correlation-regression analysis			10		
GPC- 2,6 PC - 3, 4	Time series analysis			10		
	Exam Экзамен		20	56	-	14

12.2 The maximum number of credits in the course is 3. At the same time, the following ratio is established between the number of points and the number of credits:

Points to credits ratio

Total points	Final assessment	Amount of credits
91	5	3
91-100	5	3
86 - 91	5 (B)	3
71-85	4 (C)	2
61-70	3+ (D)	1
51 - 60	3 (E)	1
21 - 51	2 (FX)	0
<21	2 (F)	0

8. Deciphering of grades is also accepted according to the specified document:
9. - A: "Excellent" - the theoretical content of the course has been fully mastered, without gaps, the necessary practical skills for working with the material learned have been formed, all the educational tasks provided for by the training program have been completed, the quality of their implementation was assessed by the number of points close to the maximum.
10. - B: "Very good" - the theoretical content of the course is mastered completely, without gaps, the necessary practical skills of working with the acquired material are basically formed, all the educational tasks provided for by the training program are completed, the quality of most of them is assessed by the number of points close to the maximum ...
11. - C: "Good" - the theoretical content of the course has been mastered completely, without gaps, some practical skills of working with the mastered material are not sufficiently formed, all the educational tasks provided for by the training program have been completed, the quality of performance of none of them has not been assessed with a minimum number of points, some types of tasks have been completed with mistakes.
12. - D: "Satisfactory" - the theoretical content of the course is partially mastered. but the gaps are not significant, the necessary practical skills to work with the acquired material are basically formed, most of the educational tasks provided for in the training program have been completed, some of the completed tasks may contain errors.
13. - E: "Mediocre" - the theoretical content of the course is partially mastered, some practical skills have not been formed, many of the educational tasks provided for by the training program have not been completed, or the quality of some of them is assessed by the number of points close to the minimum.

- FX: "Conditionally unsatisfactory" - the theoretical content of the course has been partially mastered, the necessary practical skills have not been formed, most of the educational tasks provided for by the training program have not been completed, or the quality of their implementation was assessed by the number of points close to the minimum; with additional independent work on the course material, it is possible to improve the quality of completing educational tasks.

- F: "Certainly unsatisfactory" - the theoretical content of the course has not been mastered, the necessary practical skills are not formed, all the completed study tasks contain gross errors, additional independent work on the course material will not lead to any significant improvement in the quality of the study tasks.

12.3 List of competencies and stages of their formation

№ п/п	Code and name of competence	Preceding disciplines	Subsequent disciplines (groups of disciplines)
General professional competencies			
1	GPC-2 Ability to apply modern computer technologies in collecting, storing, processing, analyzing and transmitting information and for solving research and production-technological problems of professional activity		Research practice work per semester, including coursework. Research work on the topic of the dissertation. Industrial (including undergraduate) practice
2	GPC -6 The ability to use in-depth knowledge of legal and ethical norms in assessing the consequences of their professional activities, the development and implementation of socially significant projects and to use in practice skills and abilities in the organization of research and scientific-production work, in the management of the scientific team		Research practice work per semester, including coursework. Research work on the topic of the dissertation. Industrial (including undergraduate) practice
Professional competencies (type of professional activity - research, control and expert, organizational and management)			
3	PC-3 Possession of the basics of design, expert and analytical activities and research performance using modern approaches and methods, equipment and computing systems		
4	PC-4 Ability to use modern methods of processing and interpreting environmental information in scientific and industrial research		Research practice work per semester, including coursework. Research work on the topic of the dissertation. Industrial (including undergraduate) practice

12.4. Typical control tasks or other materials necessary to assess knowledge, skills, skills and (or) experience of activities, characterizing the stages of the formation of competencies in the process of mastering the educational program

Sample tasks to prepare for certification

Presented in the attachment.

12.4. Methodological materials defining the procedures for assessing knowledge, skills, and activity skills, characterizing the stages of the formation of competencies).

The assessment of knowledge, skills and abilities is carried out using the components of the WCF presented in paragraphs. 12.1-12.34, in accordance with the sequence of acquisition of competencies indicated in table. p. 12.2.

The program is compiled in accordance with the requirements of the ES HE RUDN / FGOS HE.

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