Federal State Autonomous Educational Institution of Higher Education
"Peoples' Friendship University of Russia"

Institute of Environmental Engineering
(наименование основного учебного подразделения (ОУП)-разработчика ОП ВО)

COURSE SYLLABUS

IT IN ECOLOGY AND NATURAL RESOURCES MANAGEMENT
(наименование дисциплины/модуля)

Recommended by the Methodological Council for the Education Field:

05.04.06 Ecology and nature management
(код и наименование направления подготовки/специальности)

The discipline is mastered within the framework of the main professional higher education program:

Economics of natural resources management
(наименование (профиль/специализация) ОП ВО)

2022

1. COURSE GOALS

The course goal is 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. LEARNING OUTCOMES

The mastering of the discipline " IT IN ECOLOGY AND NATURAL RESOURCES MANAGEMENT " is aimed at the formation of the following competencies (parts of competencies) in students:

Table 2.1. List of competencies formed by students during the development of the discipline (LEARNING OUTCOMES)

Code	Competence	Indicators of competence achievement (within the framework of this discipline)
GC-7.	able to use digital technologies and methods of search, processing, analysis, storage and presentation of information (in the field of ecology and nature management) in the digital economy and modern corporate information culture.	**GC--7.1** has skills in using digital technologies and search methods
		GC--7.2 is able to process, analyze, store and correctly present information
		GC--7.3 knows the principles and techniques of modern corporate information culture and the basics of the digital economy
GC-1.	able to carry out a critical analysis of problem situations based on a systematic approach, to develop a strategy of actions.	**GC-1.1** able to analyze a problem situation as a system, identifying its components and the connections between them
		GC-1.2 possesses argumentation and develops a meaningful strategy for solving a problem situation based on systemic and interdisciplinary approaches
		GC -1.3 knows the basics of the strategy and identifies possible risks, suggesting ways to eliminate them
GPC -5	Able to solve the problems of professional activity in the field of ecology, nature management and nature protection using information and communication, including geoinformation technologies.	**GPC -5.2** Able to use information technology tools to search, store, process, analyze and present information
		GPC -5.3 Knows how to process Earth remote sensing data and use cartographic materials, owns modern GIS technologies

3. COURSE IN HIGHER EDUCATION PROGRAMME STRUCTURE

The discipline "IT in ecology and natural resources management" refers to Compulsory Disciplines of the Higher Education Program.

Within the framework of the higher education program, students also master other disciplines and/or practices that contribute to expected learning outcomes of the discipline " IT in ecology and natural resources management".

Table 3.1. List of Higher Education Program components that contribute to expected learning outcomes

Code	**Competence**	Previous Disciplines (Modules)	Subsequent Disciplines (Modules)
GC-1.	able to carry out a critical analysis of problem situations based on a systematic approach, to develop a strategy of actions.		Management of natural resources / Менеджмент природных ресурсов Environmental noms for sustainability / Экологические нормы для устойчивого развития Environmental statistics / Экологическая статистика Учебная практика / Educational practice Производственная практика / Production practice Научно-исследовательская работа (учебная) / Research work (educational) Научно-исследовательская работа / Research work НИР / Research work Преддипломная практика / Pre-graduate practice
GC-7.	able to use digital technologies and methods of search, processing, analysis, storage and presentation of information (in the field of ecology and nature management) in the digital economy and modern corporate information culture.		Environmental noms for sustainability / Экологические нормы для устойчивого развития Учебная практика / Educational practice Производственная практика / Production practice Научно-исследовательская работа (учебная) / Research work (educational) Научно-исследовательская работа / Research work Преддипломная практика / Pre-graduate practice
GPC -5	Able to solve the problems of professional activity in the field of ecology, nature management and nature protection using information and communication, including		Учебная практика / Educational practice Производственная практика / Production practice Научно-исследовательская работа (учебная) / Research work (educational)

Code	Competence	Previous Disciplines (Modules)	Subsequent Disciplines (Modules)
	geoinformation technologies.		Научно-исследовательская работа / Research work НИР / Research work Преддипломная практика / Pre-graduate practice

4. COURSE WORKLOAD AND ACADEMIC ACTIVITIES

Workload of the course «IT in ecology and natural resources management» is 3 ECTS.

Table 4.1. Types of academic activities during the period of the HE program mastering ***ОЧНОЙ*** *формы обучения*

Вид учебной работы		TOTAL	Semesters			
			1	2	3	4
Contact academic hours		*27*		*27*		
Incl.:						
Lectures		17				
Lab work						
Seminars		17				
Self-study		*22*				
Evaluation and assessment		*16*				
Total workload	Ac.hours	**72**				
	ECTS	**2**				

5. COURSE CONTENTS

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

Name of the discipline section	Content of the section (topics)	Type of academic activity*
Introduction. Application of computer technologies in the work of an ecologist	Computational methods for assessing environmental impact, risk assessment, etc. Application of computer tools (Excel) for economic and environmental calculations. Specialized programs for complex calculations for environmental impact assessment, risk analysis. Graphics processing software	Seminars
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	Seminars
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	Seminars

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.	Seminars
ANOVA	Comparison of averages in more than two objects. Analysis of variance. Nonparametric ANOVA	Seminars
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	Seminars
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	Seminars

6. CLASSROOM EQUIPMENT AND TECHNOLOGY SUPPORT REQUIREMENTS

Table 6.1. Classroom equipment and technology support requirements

Classroom for Academic Activity Type	**CLASSROOM EQUIPMENT**	**Specialized learning, laboratory equipment, software and materials for the mastering the course**
Lecture	-	-
Seminars	Classroom, equipped with a set of specialized furniture; whiteboard; a set of devices includes portable multimedia projector, laptop, projection screen, Stable wireless Internet connection. Software: Microsoft Windows, MS Office / Office 365, MS Teams, Chrome (latest stable release), Skype	-
Self-studies	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 an electronic information and	-

Classroom for Academic Activity Type	CLASSROOM EQUIPMENT	Specialized learning, laboratory equipment, software and materials for the mastering the course
	educational environment.	

7. RECOMMENDED SOURCES FOR COURSE STUDIES

- *Main reading:*

1. Ott W. R. Environmental statistics and data analysis. – Routledge, 2018.

Additional sources:

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
4. Gmurman V.E. Probability theory and mathematical statistics: Textbook for universities – M. : High School, 2003
5. Gorbatsevich V.V. Time series analysis and forecasting. Methodological instructions for lecturing and conducting practical exercises. M., 2000.

Internet-sources:

1. Electronic library system of the RUDN and third-party electronic library systems, to which university students have access on the basis of concluded contracts:

- electronic library system of the RUDN University http://lib.rudn.ru/MegaPro/Web
- electronic library system «Университетская библиотека онлайн» http://www.biblioclub.ru
- electronic library system Юрайт http://www.biblio-online.ru
- electronic library system «Консультант студента» www.studentlibrary.ru
- electronic library system «Лань» http://e.lanbook.com/
- electronic library system «Троицкий мост»

2. Databases and search engines:

- electronic fund of legal and regulatory and technical documentation http://docs.cntd.ru/
- Yandex search engine https://www.yandex.ru/
- Google search engine https://www.google.ru/
- abstract database SCOPUS http://www.elsevierscience.ru/products/scopus/
- ……..

*Educational and methodological materials for independent work of students during the development of the discipline/ module *:*

1. A course of lectures on the discipline "IT in ecology and natural resources management".

* - all educational and methodological materials for independent work of students are placed in accordance with the current procedure on the discipline page in the Telecommunication educational and Information System!

8. MID-TERM ASSESSMENT AND EVALUATION TOOLKIT

Evaluation materials and a point-rating system* for assessing the level of competence formation (part of competencies) based on the results of mastering the discipline "IT in ecology and natural resources management" are presented in the Appendix to this Work Program of the discipline.

* - evaluation toolkit and ranking system are formed on the basis of the requirements of the relevant local regulatory act of the RUDN (regulations / order).

DEVELOPER:

Professor of the Department of Environmental Safety and Product Quality Management		**Redina M.M.**
Position, Department	Signature	Name

HEAD of the DEPARTMENT:

Head of the Department of Environmental Safety and Product Quality Management		**Savenkova E.V.**
Department	Signature	Name

HAED od the HIGHER EDUCATION PROGRAM:

Professor of the Department of Environmental Safety and Product Quality Management		**Redina M.M.**
Position, Department	Signature	Name