Federal State Autonomous Educational Institution of Higher Education

PEOPLES' FRIENDSHIP UNIVERSITY OF RUSSIA NAMED AFTER PATRICE LUMUMBA

Agrarian and Technological Institute

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

COURSE SYLLABUS

Data analysis and statistics

course title

Recommended by the Didactic Council for the Education Field of:

35.03.09 Landscape architecture
Management and design of urban green infrastructure

field of studies / speciality code and title

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

Landscape architecture

higher education programme profile/specialisation title

1. COURSE GOAL(s)

The goal of the discipline «Data analysis and statistics» is to obtain basic theoretical knowledge and practical skills in data collecting, processing, and analysis in the sphere of landscape architecture and ecology.

2. REQUIREMENTS FOR LEARNING OUTCOMES

Learning the discipline «Data analysis and statistics» is aimed at the formation of students of the following competencies:

Table 2.1. The list of competencies formed in the development of the discipline (the results of the discipline)

Competence code	Competence descriptor	Competence formation indicators (within this course)
UK-1	Student is able to search, critically analyze problem situations on the basis of a systematic approach, to develop a strategy of action.	UK-1.1 Student is able apply systematization to solve tasks; UK-1.2 Student is able search and analyze information.
UK-3	Student is able to organize and lead a team, developing a team strategy to achieve the goal.	UK-3.1 Student is able organize team work on the project; UK-3.2 Student is able interact with the executive authorities to coordinate all stages of the project.
UK-4	Student is able to use modern communication technologies in the state language of the Russian Federation and foreign language(s) for academic and professional interaction.	UK-4.1 Student is able prepare all necessary project documentation in Russian and foreign languages; UK-4.2 Student is able communicate on the project in Russian and foreign languages;
UK-5	Student is able to analyze and take into account the diversity of cultures in the process of intercultural interaction.	UK-5.1 Student is able understand the features of the social organization of society, the specifics of the mentality and worldview of the cultures of the West and East; UK-5.2 Student is able overcome the cultural barrier, perceiving intercultural differences.
UK-6	Student is able to identify and implement the priorities of his/her own activities and ways to improve them on the basis of self-assessment.	UK-6.1 Student is able plan their life activities for the period of study in an educational organization; UK-6.2 Student is able to determine the tasks of self-development and professional growth, distribute them into long-term and short-term ones with justification of their relevance and determination of the necessary resources.
GPC-1	Student is able to analyze modern problems of science and production, solve complex (non-standard) tasks in professional activities.	GPC-1.1 Student is able to solve complex (non-standard) tasks in professional activities; GPC-1.2 Student is able to analyze modern problems of science and production;

Competence code	Competence descriptor	Competence formation indicators (within this course)
GPC-2	Student is able to impart professional knowledge using modern pedagogical techniques.	GPC-2.1 Capable of transferring professional knowledge, GPC-2.2 Student is able to transfer professional knowledge using informationtechnology.
GPC-3	Student is able to develop and implement new effective technologies in professional activity.	GPC-3.1 Student is able to implement new effective technologies in professional activities; GPC-3.2 Student is able to develop new effective technologies in professional activities.
GPC-4	Student is able to conduct scientific research, analyze results, and prepare reporting documents.	GPC-4.1 Capable of conducting scientific research; GPC-4.2 Student is able to prepare reporting documentation;
GPC-5	Student is able to carry out a feasibility study of projects in professional activities.	GPC-5.1 Student is able to carry out economic feasibility study of projects; GPC-5.2 Student is able tocarry out feasibility study of projects.
GPC-6	Student is able to manage teams and organize production processes.	GPC-6.1 Ability to organize production processes; GPC-6.2 Ability to manage theteam.
GPC-7	Student is able to critically analyze and apply a systematic approach to the digital economy.	GPC-7.1 Ability to apply a systematic approach. GPC-7.2 Ability to perform critical analysis.
PC-17	Ability to develop work plans and programs for research in the field of landscape architecture, the ability to organize the collection, processing, analysis and systematization of scientific and technical information on the topic of research, the choice of methods and means of solving problems.	PC-17.1 Student is able to organize the collection, processing, analysis and systematization of scientific and technical information on the topic of research, the choice of methods andmeans of solving problems; PC-17.2 Student is able to develop working plans and programs for scientific research in the field of landscape architecture.
UK-7.1	Student is able to search for the required sources of information and data, perceive, analyze, memorize and transfer information using digital tools and algorithms when working with data obtained from various sources in order toeffectively use the information obtained to solve problems.	UK-7.1.1. Student is able to apply algorithms for effective evaluation of obtained data to solveassigned tasks; UK-7.1.2 Able to use open and closed sources of information for data collection and analysis.
UK-7.2	Student is able to assess information, its reliability, build logical conclusions onthe basis of incoming information and data.	UK-7.2.1 Student is able to check the reliability of the received information. UK-7.2.2 Student is able to logically evaluate the reliability of the received information.

3. COURSE IN HIGHER EDUCATION PROGRAMME STRUCTURE

The course «Data analysis and statistics» refers to the core component of (B1) block B1 of the higher educational programme curriculum.

Table 3.1. List of components of the OP VO, contributing to the achievement of the planned results of acquiring skills in the discipline

Competence code	Competence descriptor	Previous courses/modules, Courses*	Subsequent courses/modules, Courses*
UK-1	Student is able to search, critically analyze problem situations on the basis of a systematic approach, to develop a strategy of action.	-	Landscape planning and sustainable development; Phytopathology and Plant Protection; Landscape engineering and nature-based solution; Principles of remote sensing and modelling; Advances in environmental monitoring.
UK-3	Student is able to organize and lead a team, developing a team strategy to achieve the goal.	-	Landscape planning and sustainable development; Phytopathology and Plant Protection; Landscape engineering and nature-based solution; Principles of remote sensing and modelling; Advances in environmental monitoring.
UK-4	Student is able to use modern communication technologies in the state language of theRussian Federation and foreign language(s) for academic and professional interaction.	-	Landscape planning and sustainable development; Foreign Language; Phytopathology and Plant Protection.
UK-5	Student is able to analyze and take into account the diversity of cultures in the process of intercultural interaction.	-	Landscape planning and sustainable development; Phytopathology and Plant Protection; Landscape engineering and nature-based solution; Principles of remote sensing and modelling; Advances in environmental monitoring.
UK-6	Student is able to identify and implement the priorities of his/her own activities andways to improve them on the basis ofself-assessment.	-	Landscape planning and sustainable development; Phytopathology and Plant Protection; Landscape engineering and nature-based solution; Principles of remote sensing and modelling;

Compet ence code	Competence descriptor	Previous courses/modules, Courses*	Subsequent courses/modules, Courses*
			Advances in environmental monitoring.
GPC-1	Student is able to analyze modern problems of science and production, solve complex (non-standard) tasks in professional activities.	-	Landscape planning and sustainable development; Phytopathology and Plant Protection; Principles of remote sensing and modelling.
GPC-2	Student is able to impart professional knowledge using modern pedagogical techniques.	-	Landscape planning and sustainable development; Phytopathology and Plant Protection; Principles of remote sensing and modelling.
GPC-3	Student is able to develop and implement new effective technologies in professional activity.	-	Landscape planning and sustainable development; Phytopathology and Plant Protection; Landscape engineering and nature-based solution.
GPC-4	Student is able to conduct scientific research, analyze results, and prepare reportingdocuments.	-	Landscape planning and sustainable development; Phytopathology and Plant Protection; Landscape engineering and nature-based solution.
GPC-5	Student is able to carry out a feasibility study of projects in professional activities.	-	Landscape planning and sustainable development; Phytopathology and Plant Protection; Landscape engineering and nature-based solution.
GPC-6	Student is able to manage teams and organize production processes.	-	Landscape planning and sustainable development.
GPC-7	Student is able to critically analyze and apply a systematic approach to the digital economy.	-	-
PC-17	Ability to develop work plans and programs for research in the field of landscape architecture, the ability to organize the collection, processing, analysis	-	-

Compet ence code	Competence descriptor	Previous courses/modules, Courses*	Subsequent courses/modules, Courses*
	and systematization of scientificand technical information on the topic of research, the choice of methods and means of solving problems.		
UK-7.1	Student is able to search for the required sources of information and data, perceive, analyze, memorize and transfer information using digital tools and algorithms when working with data obtained from various sources in order to effectively use the information obtained to solve problems.	-	Landscape planning and sustainable development.
UK-7.2	Student is able to assess information, its reliability, build logical conclusions onthe basis of incoming information and data.	-	Landscape planning and sustainable development.

4. COURSE WORKLOAD
The total workload of the course is 8 credits (288 academic hours).

5. COURSE CONTENTS
Table 5.1. Content of the discipline (module) by type of educational work

Modules	Contents (topics, types of practical activities)	Workload, academic hours
Data organization, description and visualization	1.1 Introduction to the DAS in ecology and landscape studies.	36
	1.1 Introduction to the R – program for data analysis. Types of data in R.	
	1.2 Types of variables and approaches to data visualization.	
	1.2 Approaches to visualization of numeric and character variables in R.	
	1.3 Descriptive statistics.	
	1.3 The practice of applying functions to calculate descriptive statistics: measures of central tendency and data variation.	
Statistical tests	2.1 Probability and statistical hypothesis. Hypothesis testing.	37
	2.1 The practical review of the basic probability distributions in R.	
	2.2 Data distributions, z-score.	
	2.2 Normal distribution. Data transformation. Tests for checking the normal distribution. Confidence intervals: calculation and visualization in R.	
	2.3 One-sample and two-sample T-test.	
	2.3 Approaches to the comparing means of two independent and dependent samples in R.	
	2.4 Comparing of several samples (ANOVA)	
	2.4 One-way ANOVA in R.	
	2.5 Correlation and regression analysis.	
	2.5 Correlation and regression.	
	Final work project (theory and practice)	
Independent work of students.		172
Control (exam/test with assessment).		42
	TOTAL:	288

- to be filled in only for full-time education: LC - lectures; LW - laboratory work; SR - seminars.

6. COURSE EQUIPMENT AND TECHNOLOGY SUPPORT REQUIREMENTS

The infrastructure and technical support necessary for the course implementation include: certified soil-ecological laboratory, individual consultations, routine monitoring and interim certification, equipped with a set of specialized furniture and equipment. (rooms 203, 418). Specialized educational/laboratory equipment includes Draper Diplomat 213x213 83" tripod screen, a workstation based on a complete system unit and a monitor for working with graphical applications. Model AG_PC Axiom Group/Intel Core I3 Processor 8 Cooperative memory Crucial by Micron DDR4 8SV*2;Motherboard PRIME B360-PLUS; MoHHTop Samsung 23.5, Software ArchiCAD 15, AutoCAD12, SketchUp, QGIS 2.10 (Quantum GIS).

7. RESOURCES RECOMMENDED FOR COURSE
The main literature:
1. D. M. Diez, C.D. Barr, M. Cetinkaya-Rundel . OpenIntro Statistics. 2014. openintro.org
2. D. Borcard, F. Gillet, P. Legendre. Numerical Ecology with R. 2011.
3. Kabacoff R.I. R In Action. Data analysis and graphics with R. Second edition. 2015.
4. Logan M. Biostatistical design and analysis using R. A practical guide. 2010.

5. Quick J.M., Statistical Analysis in R: Beginners Guide. 2010. …

Additional literature:

1. Mastitsky S.E., Shitikov V.K. Statistical analysis and visualization of data with R. 2014. E-book,access address: http://r-analytics.blogspot.com (in Russian)

E-materials:
Resources of information and telecommunication network "Internet":
1. RUDN e-library:
RUDN electronic library system - RUDN EBS
http://lib.rudn.ru/MegaPro/WebUniversity Library Online
Libraries http://www.biblioclub.ru
Yurite electronic library system http://www.biblio-online.ru Student's Consultant electronic library system www.studentlibrary.ru
Lan LBS http://e.lanbook.com/ 2.

2. Databases and search engines:
NCBI: https://p.360pubmed.com/pubmed/
RUDN Bulletin: access mode from the RUDN territory and remotely http://journals.rudn.ru/
Elibrary.ru scientific library: access via RUDN IP-addresses at: http://www.elibrary.ru/defaultx.asp
ScienceDirect (ESD), FreedomCollection, Cell Press of Elsevier Publishing House. There is remote access to the database, access via RUDN IP-addresses (or remotely via individual login and password).
Google Scholar is a free search engine for full-text scientific publications of all formats and disciplines. Indexes the full texts of scientific publications. Access mode:https://scholar.google.ru/
Scopus is a scientometric database of Elsevier Publishing House. Access to the platform is via IP-addresses of PFUR or remotely. http://www.scopus.com/

Educational and methodological materials for students' individual work foracquiring skills discipline/module*:
1. Theoretical and practical information in the presentations «Data analysis andstatistics»
2. Practical tasks
* - all educational and methodical materials for students' individual work are placed in TUIS

8. ASSESSMENT TOOLKIT AND GRADING SYSTEM* FOR EVALUATION OF Students' COMPETENCES LEVEL AS COURSE RESULTS

The assessment toolkit and the 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.

* The assessment toolkit and the grading system are formed based on the requirements of the relevant local normative act of RUDN University (regulations / order).

DEVELOPERS:

Associate Professor, department of landscape planning and sustainable ecosystems		V. I. Vasenev
position, educational department	signature	name and surname.

Associate Professor, department of landscape planning and sustainable ecosystems		K. V. Ivashchenko
position, educational department	signature	name and surname.

HEAD OF EDUCATIONAL DEPARTMENT:

Director, department of landscape planning and sustainable ecosystems		E. A. Dovletyarova
educational department	signature	name and surname.

HEAD OF
HIGHER EDUCATION PROGRAMME:

Associate Professor, department of landscape planning and sustainable ecosystems		V. I. Vasenev
position, educational department	signature	name and surname