

Name and code of discipline	D.1.3.3. Modern methods of data analysis - geostatistics		2022-23 academic year 1 semester
Labor intensity of the course	5 credits Total -150 h.	Class structure	Lectures - 15 hours. Practical classes - 30 hours. Independent work - 105 hours.
Information about the teacher	Kasymov Meymanbek Arekeevich, Candidate of Geological and Mineralogical Sciences, Associate Professor, Department of Water, Oil and Gas Resources and Georisks, office No. 28, room No. 20, 32. tel. 500-826685, k_mei@mail.ru		
The purpose and objectives of the discipline	To give students information about the purpose of the experiment, the types of experiments and methods of processing experimental data. Objectives of the discipline: To form students' skills in planning and organizing experiments. To form stable skills for conducting experiments and processing experimental data using popular identification methods. Mastering modern computer tools for the analysis and processing of experimental data.		
Course description	The discipline deals with the basic concepts of experiment planning, methods for calculating and checking the adequacy of mathematical models of the research object, methods for finding optimal conditions and the extremum of the response function.		
Prerequisites	"Mathematical analysis", "Statistics", "Informatics", "General geology", Geology of oil and gas, "Mathematical methods,		
Brief content of the discipline	The discipline sections encompass various methodologies and analyses crucial in the geological field. They begin with discussions on covariance, correlation, and autocorrelation, examining their applications in quantitative traits and geological problem-solving. The subsequent sections delve into statistical techniques like the least squares method and regression analysis, both linear and nonlinear, highlighting their significance in understanding geological data variability and hypothesis testing. Spectral analysis and trend analysis are introduced, emphasizing smoothing techniques and trend surface analysis for geological interpretations. Discriminant analysis and cluster analysis follow, exploring classification algorithms and distance measures essential for data categorization. Principal component analysis is detailed for spatial feature reduction and factor analysis. Traditional methods for deposit reserve calculation and geostatistical assessment, including interpolation techniques like Kriging, are elucidated. Geostatistical modeling, variogram selection, and validation methods contribute to resource reliability assessment. The introduction of neural networks delineates their historical evolution and practical applications, from rock classification to hazard assessment, alongside software utilization for modeling and analysis. These sections collectively provide a comprehensive framework for understanding and applying statistical and computational techniques in geological studies.		
Required literature:	<ol style="list-style-type: none"> 1. Matheron J. Fundamentals of applied geostatistics: [trans. from French] / M. Izhevsk: Scientific Research Center "Regular and Chaotic Dynamics": Institute of Computers. Research, 2009. 2. Armstrong M. (1998) Fundamentals of linear geostatistics, (translated from English) 3. Krige, Danie G. (1951). "A statistical approach to some basic mine valuation problems on the Witwatersrand." J. of the Chem., Metal. and Mining Soc. of South Africa 52 (6): 119–139 4. Davis J. S. (1990) Statistical analysis of data in geology, "Subsoil", in 2 vols. (translation from English) https://www.geokniga.org/books/350 5 Guskov O.I., Kushnarev P.I. Mathematical methods in geology: Collection of problems: Textbook for students of geological special universities: Nedra, 1991. 6. Kazhdan A. B. Mathematical methods in geology: Textbook for students of geological special universities. M.: Nedra, 1990. 7. Kaputin Yu.E., Ezhov A.I. Henley S. Geostatistics in mining and geological practice; Russian Academy of Sciences Number of research centers Mining Institute, Apatity, 1995. 8. Armstrong M. Geostatistics: Proc.of the Third Intern.geostatistics Congr., Sept.5-9, 1988, Avignon, France: Vol.1. Dordrecht etc.: Kluwer acad. publ., Cop. 1989. 9. Armstrong M. Geostatistics: Proc.of the Third Intern.geostatistics Congr., Sept.5-9, 1988, Avignon, France: Vol.2. Dordrecht etc.: Kluwer acad. publ., Cop. 1989. B) 		
Additional literature:	<ol style="list-style-type: none"> 1. Kobzar, A. I. Applied mathematical statistics. For engineers and scientists: textbook / A. I. Kobzar. — 2nd ed. - Moscow: FIZMATLIT, 2012. - 816 p. — ISBN 978-5-9221-1375-5. — Text: electronic // Lan: electronic library system. — URL: https://e.lanbook.com/book/59747 (access date: 00.00.0000). — Access mode: for authorization. users. 2. Gorelova G.V. Probability theory and mathematical statistics in examples and problems using Excel. – M.: Phoenix, 2005. – 476 p. 		

	<p>3. Probability theory and mathematical statistics. Basic course with examples and tasks. – M.: Fizmatlit, 2002. – 223 p.</p> <p>4. Kramer G. Mathematical methods of statistics, trans. from English, 2nd ed. – M: RKhD, 1975. – 648 p.</p> <p>5. Microsoft Office, Excel, Datamine RM.</p>			
Information at the rate	Rating (points)	Grading by letter system	Evaluation digital equivalent	Evaluation according to the traditional system (4-point)
	87 - 100	A	4,0	Excellent
	80 - 86	B	3,33	Fine
	74 - 79	C	3,0	
	68 - 73	Д	2,33	Satisfactorily
	61 - 67	E	2,0	Unsatisfactory
	41 - 60	FX	0	
0 - 40	F	0		
Scoring Policy	<p>To assess the knowledge of students, a point-rating system for assessing the educational achievements of students is used. The grading policy is based on the principles of objectivity, transparency, flexibility and high differentiation. The assessment is carried out through the AVN system (electronic testing) in three stages: 2 boundary (1st and 2nd modules) and final. The score is set automatically upon completion of the test. In total, you can get 100 points in the discipline, of which the current work (modules 1 and 2) is estimated at 30 points, the final form of control - 40 points. The minimum number for admission to the offset is 28 points.</p> <p>The student has the right to appeal the grade. There is a system of penalties: in case of late assignment; not attending classes; reward system for: timely delivery of assignments, no absences from classes; completing additional tasks. The teacher has the right to additionally add or reduce the final scores as an encouragement or penalty.</p>			
Course policy	<p>Students must follow the following requirements, the rules of conduct in the classroom, relationships with the teacher, with other students. The implementation of which ensures high efficiency of the educational process and is mandatory for students. Below is a list of minimum requirements and rules.</p> <p>a) Compulsory attendance; b) Activity during practical (seminar) classes; c) Preparation for classes, for homework and SRS.</p> <p>Not allowed: a) Being late and leaving class; b) Use of cell phones during class; c) Fraud and plagiarism; d) Late submission of assignments.</p>			
Student Rights	<p>In case of disagreement with the actions, assessment of the teacher, the student has the right and opportunity to apply to academic advisers, the head of the department, to the appeal commission.</p>			

The structure and content of the classroom work on the discipline / module

No .	Chapter Disciplines/ module	Lectures	Practical classes	Current Forms control
1	Section 1. Covariance and correlation autocorrelation, cross-correlation . Nonparametric methods.	1	1	7
2	Section 2. Least squares method and regression analysis in the analysis of geological data.	1	2	6
3	Section 3. Nonlinear regression of geological data.	1	2	8
4	Section 4. Basics of spectral analysis. Trend analysis.	1	2	6
5	Section 5. Discriminant analysis	1	2	6
6	Section 6. Cluster analysis	1	2	6

7	Section 7. Principal Component Method	1	2	6
8	Section 8. Traditional methods for calculating deposit reserves, conditions	1	2	6
9	Section 9. Mining and geological foundations of geostatistical assessment. Basic methods of geostatistical assessment.	1	1	6
10	Section 10. Geostatistical Modeling	1	2	6
ele ve n	Section 11. Selection of variogram models	1	2	6
12	Section 12. Kriging	1	2	6
13	Section 13. Interpolation check	1	2	6
14	Section 14. Degree of reliability of resources.	1	2	6
15	Section 15 Basics of Neural Networks	1	4	18
	Total	15	30	105

The syllabus was discussed and recommended at the meeting of the department

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Head department