

MINISTRY OF SCIENCE AND HIGHER EDUCATION OF THE RUSSIAN FEDERATION
Federal State Autonomous Educational Institution for Higher Education
«North-Caucasus Federal University»

APPROVED BY

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ASSESSMENT TOOLS FOR THE DISCIPLINE (MODULE)
«Methodology of Scientific Research»

Field of study	<u>13.04.02 Electric Power Engineering and Electrical Engineering</u>
Specialization (Profile)	<u>Training Program of Electrical Engineering</u>
Year of commencement of studies	<u>2026</u>
Mode of study	<u>full-time</u>
Implemented in semester(s)	<u>1</u>

Foreword

1. Purpose: This assessment tools (AT) document is intended to assess the level of competency formation during ongoing progress control and intermediate assessment of students in the discipline "Methodology of Scientific Research".

2. The AT is an appendix to the syllabus of the discipline "Methodology of Scientific Research".

3. Developer: Maksim S. Demin, Candidate of Physical and Mathematical Sciences, Associate Professor at the Department of Automated Electric Power Systems and Power Supply.

4. The AT has undergone expert review.

Members of the expert group:

Chairperson: Yu. G. Kononov, Doctor of Technical Sciences, Professor, Head of the Department of Automated Electric Power Systems and Power Supply.

Committee members:

D.A. Kostyukov, Candidate of Technical Sciences, Associate Professor, Department of Automated Electric Power Systems and Power Supply.

A.V. Petrov, Candidate of Technical Sciences, Associate Professor, Department of Automated Electric Power Systems and Power Supply.

Representative of the employer organization:

S.A. Filippov, Candidate of Technical Sciences, Head of the Leninsky District Department of the Stavropol Interdistrict Branch of the PJSC «Stavropolenergosbyt».

Expert opinion: The AT is recommended for assessing the level of competency formation during ongoing progress control and intermediate assessment of students in the discipline "Methodology of Scientific Research".

5. The validity period of the AT is determined by the period of implementation of the educational program.

1. Description of indicators and criteria for assessment at various stages of their formation, description of grading scales

Competency(ies), indicator(s)	Levels of competency formation			
	Minimum level not achieved (Unsatisfactory) – 2 points	Minimum level (Satisfactory) – 3 points	Medium level (Good) – 4 points	High level (Excellent) – 5 points
UC-1 Capable of conducting critical analysis of problem situations based on a systems approach and developing an action strategy				
Learning outcomes for the discipline (module): ID-1 UC-1 Searches for the required information, performs its critical analysis, and consolidates the analysis results to solve the assigned task	Does not sufficiently search for scientific and technical information. Uses random or unreliable sources, has difficulty identifying relevant data, and cannot consolidate the results to substantiate a research problem without substantial teacher assistance.	Finds the required scientific and technical information mainly from recommended sources; identifies relevant data and gives a basic assessment of source reliability with teacher support.	Independently searches several scientific and technical sources, critically evaluates their reliability and relevance, extracts key data and consolidates them to substantiate a research problem.	Performs a comprehensive and justified information search, critically compares sources, identifies gaps and contradictions, and synthesizes evidence into a coherent basis for research decisions.
Learning outcomes for the discipline (module): ID-2 UC-1 Analyses a problem situation and performs its decomposition into individual tasks	Does not sufficiently analyze a research problem and cannot decompose it into objectives, tasks, assumptions, limitations and expected results without substantial teacher assistance.	Describes a research problem and decomposes it into basic objectives and tasks according to a model; identifies assumptions and limitations only in general terms.	Independently analyzes a research problem and decomposes it into objectives, tasks, assumptions, limitations and expected results, showing logical links between them.	Fully analyzes a complex research situation using a systems approach, builds a justified decomposition, prioritizes tasks, and explains boundaries, dependencies and expected results.
Learning outcomes for the discipline (module): ID-3 UC-1 Develops a strategy for solving the assigned task	Does not sufficiently develop a strategy for solving a research task. The proposed actions are fragmentary, poorly connected with the goal, and require substantial teacher correction.	Proposes a general plan for solving a research task according to a model; identifies the main stages and expected result but gives limited justification.	Develops a justified strategy for a typical research task, including stages, methods, resources, possible risks and expected outcomes.	Develops a complete and flexible strategy for complex or non-standard research tasks, compares alternatives, justifies decisions and adjusts the plan based on evidence.
GPC-1 Capable of formulating research objectives and tasks, identifying task-solving priorities, and selecting evaluation criteria				
Learning outcomes for the discipline (module): Indicator: ID-1 GPC-1 Formulates research objectives and tasks	Does not sufficiently formulate research objectives and tasks. The goal and tasks are vague, inconsistent with the engineering problem or not feasible within available resources.	Formulates research objectives and tasks in general terms with partial connection to the selected engineering problem and available resources.	Clearly formulates research objectives and tasks consistent with the engineering problem, object, subject, available resources and expected results.	Formulates precise, measurable and logically consistent objectives and tasks, justifies their feasibility and explains their scientific and practical significance.
Learning outcomes for the discipline (module): Indicator: ID-2 GPC-1 Determines the sequence for solving tasks	Does not sufficiently determine the sequence for solving research tasks. Stages are missing, illogical or not connected with the research objective.	Describes the basic sequence of research stages according to a model, including problem statement, literature analysis, methods, data and presentation.	Builds a logical sequence of research stages, including literature analysis, methodology selection, data collection, processing, interpretation and presentation.	Optimizes and justifies the research sequence, links stages with resources, deadlines and risks, and adapts the plan to the research context.
Learning outcomes for the discipline (module): Indicator: ID-3 GPC-1 Formulates decision-making criteria	Does not sufficiently formulate decision-making criteria. The proposed criteria are absent, unclear or unrelated to the research results.	Proposes basic criteria for evaluating research results, such as accuracy, reliability and applicability, with teacher support.	Formulates relevant decision-making criteria for research results, including validity, reproducibility, accuracy and applicability.	Develops a comprehensive system of measurable criteria, justifies their choice and applies them to compare alternatives and evaluate research results.
GPC-2 Capable of applying modern research methods, evaluating and presenting the results of completed work				
Learning outcomes for the discipline (module): Indicator: ID-1 GPC-2	Does not sufficiently select research methods. The chosen methods are random, poorly justified or	Selects a research method from proposed options and gives a basic explanation of its	Independently selects appropriate theoretical, experimental, statistical and modelling methods	Justifies method selection for complex tasks, compares alternatives and

Selects the appropriate research method to solve the assigned task	do not correspond to the objective, object, data and limitations of the task.	relevance to the assigned task.	according to the objective, object, data and limitations of the research task.	accounts for limitations, accuracy, reproducibility and feasibility.
Learning outcomes for the discipline (module): Indicator: ID-2 GPC-2 Conducts analysis of the obtained results	Does not sufficiently analyze the obtained results. Processing is fragmentary, errors are not identified, and conclusions are not supported by data.	Processes and interprets obtained results using known algorithms with some teacher support; identifies the main patterns and basic sources of uncertainty.	Independently analyzes obtained results, applies statistical and graphical processing, evaluates uncertainty and reliability, and formulates substantiated conclusions.	Performs in-depth analysis of results, critically evaluates validity, limitations and robustness, compares interpretations and draws well-reasoned conclusions.
Learning outcomes for the discipline (module): Indicator: ID-3 GPC-2 Presents the results of the completed work	Does not sufficiently present the results of completed work. The structure is unclear, evidence is incomplete, and academic or ethical requirements are not met.	Presents results in a basic report or presentation using tables and figures, with minor structural or formatting inaccuracies.	Clearly presents results in reports, presentations and academic texts, follows academic standards and ethical requirements, and explains conclusions logically.	Produces polished, logically structured and well-argued research materials, adapts the presentation to the audience and uses correct academic style and publication standards.

ASSESSMENT TOOLS FOR CHECKING THE LEVEL OF COMPETENCY FORMATION

Task No.	Correct Answer	Question Content	Competency
1.	2	What is the main purpose of critical analysis in scientific research? 1) To collect as many sources as possible without evaluating them 2) To assess the reliability, relevance, and limitations of information 3) To replace experimental data with theoretical assumptions 4) To avoid comparing different viewpoints	UC-1
2.	3	Which action best reflects a systems approach to a research problem? 1) Studying only one variable in isolation 2) Ignoring external constraints 3) Identifying elements, relationships, boundaries, and feedback links 4) Selecting a method before defining the problem	UC-1
3.	1	Problem decomposition means: 1) Dividing a complex problem into logically connected subtasks 2) Removing all quantitative data from the study 3) Replacing the research objective with a literature review 4) Formulating conclusions before collecting data	UC-1
4.	4	A reliable scientific source is most likely to be: 1) An anonymous internet post 2) An advertising brochure 3) A social media comment 4) A peer-reviewed article or academic textbook	UC-1
5.	2	Which question should be asked first when analyzing a problem situation? 1) How can the final conclusion be written? 2) What exactly is the problem, and what are its boundaries? 3) Which diagram will look better in the report? 4) How can the number of references be increased?	UC-1
6.	1	A research gap is: 1) An insufficiently studied or unresolved aspect of a scientific problem 2) A formatting mistake in a bibliography 3) A complete list of all publications on a topic 4) A result that fully confirms a known theory	UC-1
7.	3	Two sources provide different conclusions on the same engineering problem. What is the best response? 1) Use only the source with the shorter text 2) Ignore both sources 3) Compare their methods, data, assumptions, and limitations 4) Select the source with the more attractive title	UC-1

Task No.	Correct Answer	Question Content	Competency
8.	4	Which sequence is the most logically correct for research planning? 1) Conclusion - experiment - objective - problem 2) Data analysis - bibliography - hypothesis - object 3) Presentation - literature review - problem - method 4) Problem - objective - tasks - methods - results	UC-1
9.	2	Which element is essential when developing a strategy for solving a research task? 1) Excluding possible risks 2) Defining stages, methods, resources, and expected results 3) Avoiding justification of selected methods 4) Using only one source of information	UC-1
10.	1	The boundary of a research system defines: 1) What is included in and excluded from the object of analysis 2) The font size of the report 3) The number of pages in the final text 4) The language of publication only	UC-1
11.	3	Which situation is an example of sampling bias? 1) All measurements are repeated three times 2) Data are collected according to a written protocol 3) Only easily accessible objects are included in the sample 4) The results are presented in a table	UC-1
12.	2	Synthesis of information means: 1) Copying fragments from several sources 2) Combining and comparing information to form a reasoned conclusion 3) Listing sources without interpretation 4) Translating a text without understanding it	UC-1
13.	4	Traceability of scientific information means that: 1) The author does not need to cite sources 2) Data may be changed after the experiment 3) Only final conclusions should be documented 4) Claims, data, and conclusions can be linked to their sources or evidence	UC-1
14.	1	Which set of elements is most appropriate for multifactor analysis of a research problem? 1) Variables, constraints, assumptions, stakeholders, and external conditions 2) Title page, margins, and font type only 3) Only the final numerical result 4) Only personal opinion of the researcher	UC-1
15.	2	When prioritizing research tasks, the researcher should primarily consider: 1) The alphabetical order of task names 2) Relevance, feasibility, expected impact, and available resources 3) The number of words in each task 4) Personal preference without justification	UC-1
16.	3	Operationalization in research is: 1) Removing variables from the study 2) Preparing only the title of the article 3) Transforming abstract concepts into measurable indicators 4) Replacing measurements with assumptions	UC-1
17.	1	A research assumption is: 1) A condition accepted as true for the purpose of analysis 2) A final proven conclusion 3) A random statement unrelated to the study 4) A citation from any source	UC-1
18.	4	A risk in a research strategy is best understood as: 1) A required section of the title page 2) A synonym for the research objective 3) A result that has already been obtained 4) An uncertainty that may affect the achievement of research objectives	UC-1

Task No.	Correct Answer	Question Content	Competency
19.	2	Critical reading of a scientific article includes: 1) Accepting all statements without question 2) Evaluating the aim, method, evidence, limitations, and conclusions 3) Reading only the abstract 4) Counting the number of pages	UC-1
20.	3	If essential data are missing at the beginning of a study, the researcher should: 1) Invent approximate values 2) Ignore the missing information 3) Identify data gaps and plan how to obtain or justify the missing data 4) Write conclusions without analysis	UC-1
21.	1	A research objective should be: 1) Clear, specific, and connected with the research problem 2) Unrelated to the research topic 3) Broader than the entire field of science 4) Written only after the conclusion	GPC-1
22.	4	Which formulation is the best example of a research task? 1) 'To write something about science' 2) 'To make the work interesting' 3) 'To study everything related to engineering' 4) 'To analyze existing methods for processing experimental data'	GPC-1
23.	2	Decision-making criteria in research are used to: 1) Replace the research hypothesis 2) Evaluate and compare alternatives or results 3) Avoid data analysis 4) Eliminate the need for conclusions	GPC-1
24.	3	A scientific hypothesis is: 1) A random guess that cannot be tested 2) A bibliography entry 3) A testable assumption about relationships or effects 4) A final confirmed result	GPC-1
25.	1	The object of research is: 1) The process, phenomenon, or system being studied 2) The page numbering style 3) The name of the supervisor 4) The final list of references	GPC-1
26.	4	The subject of research is: 1) Any unrelated scientific term 2) The entire scientific discipline 3) Only the title of the work 4) A specific aspect, property, or relationship within the object of research	GPC-1
27.	2	Which objective is formulated most correctly? 1) 'To consider some issues' 2) 'To develop and justify a methodology for analyzing experimental data reliability' 3) 'To make a good report' 4) 'To read several sources'	GPC-1
28.	3	A correct sequence of research tasks should: 1) Start with conclusions 2) Ignore the selected methods 3) Reflect the logical stages of achieving the objective 4) Be independent of the research problem	GPC-1
29.	1	Which criterion is measurable? 1) Relative error of measurement does not exceed 5% 2) The method is 'good' 3) The report looks 'serious' 4) The topic seems 'important'	GPC-1

Task No.	Correct Answer	Question Content	Competency
30.	4	When planning an experimental study, the researcher should first define: 1) The color of diagrams 2) The number of slides 3) The final grade 4) Factors, response variables, measurement conditions, and evaluation criteria	GPC-1
31.	2	Research task priorities should be determined according to: 1) Random choice 2) Their importance for achieving the objective and their logical order 3) The length of their wording 4) The personal preference of the author only	GPC-1
32.	3	Which set best describes the structure of a research plan? 1) Title, font, margins, appendix 2) Abstract, keywords, page numbers 3) Problem, objective, tasks, methods, data, expected results, criteria 4) Only literature review and conclusion	GPC-1
33.	1	A dependent variable is: 1) The measured result or response affected by factors 2) A variable that is always ignored 3) A source in the bibliography 4) A section of the introduction	GPC-1
34.	4	An independent variable is: 1) The final conclusion 2) The research supervisor 3) The formatting standard 4) A factor that is changed or controlled in the study	GPC-1
35.	2	Feasibility of a research plan means that: 1) The plan has no limitations 2) The tasks can be completed with available time, data, methods, and resources 3) The research does not require justification 4) The results are known in advance	GPC-1
36.	3	Expected research results should be: 1) Completely unrelated to the objective 2) Hidden from the assessment procedure 3) Connected with the objective, tasks, and selected methods 4) Replaced by personal impressions	GPC-1
37.	1	Which criterion is appropriate for comparing two research methods? 1) Accuracy, reproducibility, complexity, required data, and applicability 2) The length of the method name 3) The number of words in the description 4) The popularity of the author's surname	GPC-1
38.	4	The scope of a research project defines: 1) The author's personal biography 2) The final mark only 3) The number of pages in the appendix only 4) The limits of the problem, data, methods, and expected results	GPC-1
39.	2	Which task is most directly connected with the objective 'to evaluate the reliability of experimental results'? 1) To select a title page template 2) To calculate measurement uncertainty and analyze reproducibility 3) To increase font size 4) To remove all diagrams	GPC-1
40.	3	Success criteria for a research project are needed to: 1) Avoid planning 2) Replace the research method 3) Determine whether the objective and tasks have been achieved 4) Exclude comparison of results	GPC-1

Task No.	Correct Answer	Question Content	Competency
41.	1	The choice of a research method should primarily depend on: 1) The research objective, data type, problem structure, and constraints 2) The number of pages in the report 3) The personal preference of the researcher only 4) The alphabetical order of methods	GPC-2
42.	3	Which method is most suitable for identifying relationships between numerical variables? 1) Random retelling of literature 2) Translation of the title 3) Correlation or regression analysis 4) Changing the document formatting	GPC-2
43.	2	Statistical processing of experimental data may include: 1) Removing all numerical values 2) Calculation of mean values, variance, confidence intervals, and errors 3) Writing only a conclusion 4) Replacing measurements with opinions	GPC-2
44.	4	Validity of research results means that: 1) The text has a large number of pages 2) The results are always positive 3) The bibliography is placed before the introduction 4) The method measures or evaluates what it is intended to measure	GPC-2
45.	1	Reliability of measurement results is associated with: 1) Stability and consistency of results under repeated conditions 2) The color of the diagram 3) The number of headings 4) The absence of any calculations	GPC-2
46.	3	A factor experiment is mainly used to: 1) Avoid studying the influence of variables 2) Replace the research objective 3) Study the influence of several factors and their interactions 4) Prepare only a bibliography	GPC-2
47.	2	Which graph is most appropriate for showing a relationship between two quantitative variables? 1) Table of contents 2) Scatter plot 3) Title page 4) List of abbreviations	GPC-2
48.	4	A confidence interval is used to: 1) Prove that no uncertainty exists 2) Replace raw data 3) Remove the need for measurements 4) Estimate the range in which a parameter is likely to lie	GPC-2
49.	1	An outlier is: 1) A value that differs markedly from the general pattern of data 2) A required section of the conclusion 3) A synonym for a research objective 4) A type of bibliography entry	GPC-2
50.	3	Before excluding an outlier, the researcher should: 1) Delete it automatically 2) Ignore it completely 3) Check possible measurement error, data entry error, and methodological justification 4) Replace it with any convenient value	GPC-2
51.	2	Reproducibility of research means that: 1) The author can change data after publication 2) Other researchers can obtain the same results using the same data and methods 3) The results are always identical in any conditions 4) The study does not require a method description	GPC-2

Task No.	Correct Answer	Question Content	Competency
52.	4	Replication of research means that: 1) The title is repeated in the conclusion 2) The same author writes the same text again 3) Figures are copied without explanation 4) Independent research confirms findings under comparable conditions	GPC-2
53.	1	Which element is necessary for a reproducible research report? 1) Clear description of data, methods, parameters, and analysis procedure 2) Absence of methodological details 3) Only final results without explanation 4) Personal opinions instead of data	GPC-2
54.	3	Which practice violates academic ethics? 1) Correct citation of sources 2) Transparent description of methods 3) Presenting someone else's text or results as one's own 4) Indicating limitations of the study	GPC-2
55.	2	A limitation of a study is: 1) A decorative element of the report 2) A factor that restricts the interpretation or generalization of results 3) A final proof of the hypothesis 4) A synonym for the title	GPC-2
56.	4	When presenting research results, tables are especially useful for: 1) Replacing all explanations 2) Hiding numerical values 3) Avoiding comparison 4) Organizing exact numerical data and indicators	GPC-2
57.	1	When presenting research results, figures are especially useful for: 1) Showing trends, relationships, structures, and comparisons visually 2) Removing the need for data analysis 3) Replacing the research problem 4) Increasing the number of pages only	GPC-2
58.	3	Which conclusion is scientifically correct? 1) 'The method is good because I like it.' 2) 'The hypothesis is confirmed because this was expected.' 3) 'The results indicate a statistically and practically significant effect under the stated conditions.' 4) 'The data were not analyzed, but the conclusion is obvious.'	GPC-2
59.	2	A p-value is best interpreted as: 1) The probability that the hypothesis is absolutely true 2) A measure used to assess whether observed results are compatible with the null hypothesis 3) The percentage of copied text 4) The exact size of the experimental effect in all cases	GPC-2
60.	4	The final presentation of completed research should include: 1) Only the title and references 2) Only raw data without interpretation 3) Only personal impressions 4) Problem statement, objective, methods, results, interpretation, limitations, and conclusions	GPC-2

2. Description of the grading scale

Within the framework of the rating system, student performance in each discipline is assessed during ongoing progress control and intermediate assessment. The rating system for assessing student knowledge is based on the use of a set of control measures (checkpoints) for testing the material covered, optimally located throughout the entire time interval of studying the discipline. The principles of the rating system for assessing student knowledge are based on the provisions described in the "Regulations on the organization of the educational process based on the rating system for assessing student knowledge" at North Caucasus Federal University.

The rating assessment system is not provided for students studying in master's degree programs, or for students studying in bachelor's degree programs by correspondence or part-time (evening) forms of study.

3. Criteria for assessing competencies

The grade "Excellent" is awarded to a student who has deeply and firmly mastered the program material, presents it exhaustively, consistently, clearly, and logically coherently, is able to closely link theory with practice, handles tasks, questions, and other types of knowledge application with ease, and does not struggle to answer when assignments are modified.

The grade "Good" is awarded to a student who has a solid command of the material, presents it competently and substantively without making significant inaccuracies in answering questions, correctly applies theoretical principles to practical questions and tasks, and possesses the necessary skills and techniques for their execution.

The grade "Satisfactory" is awarded to a student who has knowledge of only the basic material but has not mastered its details, makes inaccuracies, insufficiently correct formulations, and violates logical sequence in presenting the program material.

The grade "Unsatisfactory" is awarded to a student who does not know a significant part of the program material and makes substantial errors.