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

Methodological guidelines

for independent work in the discipline
« Artificial Intelligence (AI)»
for students of the field of study 13.04.02 Electric Power Engineering and Electrical Engineering

Stavropol 2026

INTRODUCTION

Independent work of students is a mandatory component of the educational process for each student and is determined by the curriculum. The types of independent work of students are determined by the content of the academic discipline when developing syllabi and educational and methodological packages. When determining the content of students' independent work, one should take into account their level of independence and the requirements for the level of independence of graduates so that the desired level is achieved during the period of study. Thus, the share of independent work in full-time study is up to 50% of the number of classroom hours allocated for studying the discipline; in distance learning, the number of hours allocated for mastering the discipline increases to 90%.

Independent work is defined as individual or collective learning activities carried out without the direct guidance of a teacher, but according to the teacher's assignments and under their supervision.

Independent work is a cognitive educational activity in which the sequence of the student's thinking, their mental and practical operations and actions depends on and is determined by the student themselves. Students' independent work contributes to the development of independence, responsibility, organization, and a creative approach to solving problems at the educational and professional level, which ultimately leads to the development of the skill of independent planning and implementation of activities.

The goal of students' independent work is to master the necessary competencies in their field of study, as well as the experience of creative and research activity.

Based on the competency-based approach to the implementation of professional educational programs, the types of assignments for independent work are:

- **For mastering knowledge:** reading text (textbook, primary source, additional literature), outlining the text, graphical representation of the text structure, making notes, extracting key points from the text, working with dictionaries and reference books, familiarization with regulatory documents, educational research work, using audio and video recordings, computer technology and the Internet information and telecommunications network, etc.
- **For consolidating and systematizing knowledge:** working with lecture notes, processing text (textbook, primary source, additional literature, audio and video recordings), reworking educational material, drawing up an outline, creating tables to systematize educational material, answering test questions, filling out a workbook, analytical text processing (annotation, reviewing, abstracting, summary analysis, etc.), completing classroom practical work and preparing reports on them, preparing multimedia messages/reports for presentations at seminars (conferences), presentation materials, preparing an abstract, compiling a bibliography, thematic crosswords, testing, etc.
- **For developing skills:** solving problems and exercises by example, solving variable problems, performing drawings, diagrams, performing calculations (graphical works), solving situational (professional) problems, preparing for business games, designing and modeling various types and components of professional activity, reflective analysis of professional skills using audio and video equipment, etc.

Independent work can be carried out individually or by groups of students, depending on the goal, volume, specific topic of independent work, level of complexity, and level of student skills.

Monitoring the results of students' independent work can be carried out within the time allocated for compulsory classes in the discipline and for extracurricular independent work in the discipline; it can be conducted in written, oral, or mixed form.

Independent work is carried out in the form of exercises when studying new material, exercises during consolidation and review, exercises for tests and examinations, as well as for self-monitoring.

The following conditions are necessary for organizing independent work:

1. Students' readiness for independent work;
2. The availability and accessibility of necessary educational, methodological, and reference materials;
3. Advisory assistance.

Independent work can take place in a lecture hall, computer lab, library, or at home. Independent work contributes to the formation of competencies, trains the will, fosters efficiency, attention, discipline, and responsibility.

1 General characteristics of independent work of a student when studying the discipline

Within the framework of the discipline course, students' independent work is actively applied and includes various types of activities:

- preparation for practical classes, including work with methodological guidelines and mass media;
- preparation for lectures, including independent in-depth study of the theoretical course using recommended literature;
- preparation for intermediate assessment.

The goal of a student's independent work when preparing for lectures is to acquire new knowledge gained through a deeper study of the discipline literature.

Objectives:

- finalizing and reviewing lecture notes;
- understanding the content of the lecture, its logical structure, and conclusions.

The goal of a student's independent work when preparing for practical classes is to deepen, expand, and detail the knowledge obtained in a generalized form during lectures.

Objectives:

- develop the ability to apply the acquired knowledge in practice when solving specific tasks;
- test the knowledge acquired by students during lectures and independent study of literature.

2 Content of the discipline (module)

№	Section (topic) of the discipline and brief content	Formed competencies and indicators	Full-time form				Forms of ongoing progress control
			Contact work of students with the teacher / of which in the form of practical training, hours			Independent work, hours	
			Lectures	Practical classes	Laboratory works		
1	Section 1. Introduction to Artificial Intelligence and its Foundations 1.1 Introduction to AI	ID-1 UC-1 ID-3 PC-3		2		4	Interview
2	1.2 Ethical and Social Aspects of AI	ID-1 UC-1 ID-3 PC-3		2		4	Interview
3	1.3 Modern Trends	ID-1 UC-1 ID-3 PC-3		2		4	Interview
4	Section 2. Classical AI: Problem Solving and Knowledge Representation 2.1 Knowledge Representation Problem	ID-1 UC-1 ID-3 PC-3		2		4	Interview
5	2.2 Search and Planning	ID-1 UC-1 ID-3 PC-3		2		4	Interview
6	Section 3. Fundamentals of Machine Learning 3.1Machine Learning Fundamentals	ID-1 UC-1 ID-3 PC-3		2		4	Interview
7	3.2 Linear Models	ID-1 UC-1 ID-3 PC-3		2		4	Interview
8	3.3 Decision Trees and Ensembles	ID-1 UC-1 ID-3 PC-3		2		6	Interview
9	3.4 Model Quality Metrics	ID-1 UC-1 ID-3 PC-3		2		4	Interview
10	3.5 Clustering	ID-1 UC-1 ID-3 PC-3		2		6	Interview
11	Section 4. Deep Learning and Processing Unstructured Data 4.1 Neural Networks	ID-1 UC-1 ID-3 PC-3		2		4	Interview

12	4.2 Deep Learning	ID-1 UC-1 ID-3 PC-3		2		4	Interview
13	4.3 Natural Language Processing	ID-1 UC-1 ID-3 PC-3		2		6	Interview
14	4.4 Generative Models	ID-1 UC-1 ID-3 PC-3		4		4	Interview
15	Section 5. Advanced Topics and Interpretability 5.1 Reinforcement Learning	ID-1 UC-1 ID-3 PC-3		4		4	Interview
16	5.2 AI Interpretability and Explainability	ID-1 UC-1 ID-3 PC-3		4		6	Interview
				36		72	

3 Methodological recommendations for studying theoretical material

Independent work of a student during lecture classes includes studying theoretical questions assigned for independent study in accordance with the syllabus, working through lecture materials to prepare for knowledge control in lecture classes (questioning), and preparing questions for discussion during consultations with the teacher.

Work with lecture material does not end with the lecture. For every 2 hours of lecture, about one hour should be spent working with the notes. During this time, it is necessary to re-read the notes, supplement them with information that was remembered from the teacher's speech but could not be written down. While working with the notes, one should note unclear questions to be clarified with the teacher during consultation. Questions related to the lecture topic that the teacher assigned for independent study should be highlighted separately.

A lecture summary actively worked on during the semester will later serve as the basis for preparing for the exam.

Questions for independent study are presented in section 5.

Independent work during practical classes includes completing assignments for practical classes, in particular solving problems of varying difficulty levels. The problems are provided in the methodological guidelines for practical classes and in the assessment tools.

Knowing the topic of the practical class, one should prepare for it in advance. For effective preparation for a practical class, it is necessary to have a methodological guide for the practical class.

The criteria for assessing practical classes are presented in the assessment tools.

When checking a practical assignment, the following are assessed: the sequence and rationality of presenting the material; completeness and sufficiency of the answer; scientific rigor in handling basic concepts; use and study of additional literary sources.

The criteria for assessing the results of independent work: questions for interviews and exams are given in the assessment tools for the discipline.

4 Methodological recommendations for organizing independent work of students

Independent work is one of the types of learning activities of students; it contributes to the development of independence, responsibility, organization, and a creative approach to solving problems at the educational and professional level.

In-class independent work in the discipline is carried out in training sessions under the direct guidance of the teacher and according to the teacher's assignment.

Out-of-class independent work is performed according to the teacher's assignment without the teacher's direct participation.

The types of assignments for out-of-class independent work, their content, and nature can be variable and differentiated, taking into account the specifics of the discipline being studied and the individual characteristics of the student.

Monitoring of independent work and evaluation of its results is organized as a unity of two forms:

1. Self-monitoring and self-assessment by the student;
2. Monitoring and assessment by the teacher.

5 Methodological recommendations for taking notes during lectures

During lecture classes, take notes of the educational material. Pay attention to categories, formulations that reveal the content of certain phenomena and processes, scientific conclusions and practical recommendations, and positive examples in oratory. It is advisable to leave margins in your working notes to make notations from recommended literature that supplement the material of the lecture, as well as to highlight the particular importance of certain theoretical provisions. Ask the teacher clarifying questions in order to understand theoretical provisions and resolve controversial issues.

When preparing for seminars, study the main literature, familiarize yourself with additional literature, new publications in periodicals: journals, newspapers, etc. Take into account the teacher's

recommendations and the requirements of the curriculum. Refine your lecture notes by making appropriate entries from the literature recommended by the teacher and provided for in the curriculum. Prepare theses for presentations on all educational issues to be discussed at the seminar. When preparing for a report or abstract presentation, seek methodological help from the teacher. Draft an outline of your presentation. Think of examples to ensure a close connection between the theory being studied and real life. Timely and high-quality completion of independent work is based on compliance with these recommendations and the study of recommended literature. The student may supplement the list of references used with modern sources not presented in the list of recommended literature and subsequently use their own prepared educational materials when writing papers.

6 Methodological recommendations for preparing for practical classes

A practical class is one of the most effective types of training sessions in which students learn to work creatively, argue and defend their position, and correctly and clearly express their thoughts to an audience. The main thing in preparing and conducting practical classes is the student's independent work on studying the topic. The student must know exactly the plan of the lesson or the specific assignment for it. Key issues of the topic are discussed in class, but there may also be issues that were not covered in the lecture. There may also be special assignments for a particular topic.

One should prepare for a practical class in advance. It is necessary to carefully review the plan and other materials, understand the issues to be discussed. Then one needs to select literature and other necessary material, including recommended material (through the library, the department's educational and methodological office, etc.). But first of all, one should refer to one's lecture notes and the relevant section of the textbook. The study of all sources should be aimed at finding answers to the issues raised in the practice-oriented classes.

The final stage of preparation for classes consists of completing individual assignments.