

Документ подписан простой электронной подписью

Информация о владельце:

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Должность: и.о. декана медико-биологического факультета

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MINISTRY OF SCIENCE AND HIGHER EDUCATION

RUSSIAN FEDERATION

Federal State Autonomous Educational Institution of Higher Education

NORTH-CAUCASUS FEDERAL UNIVERSITY

APPROVED

Assoc. Prof. Kubanov S.I.

PhD in Medical Sciences

Dean

Faculty of Medicine and Biology

ASSESSMENT TOOLS FUND FOR THE DISCIPLINE

Information Technology in Biology and Medicine

Name of the discipline (module)

- Specialty: 31.05.01 General Medicine
- Mode of training: Full-time
- Year of commencement of studies: 2026
- Delivered in Semester 4, 5

Introduction

1. Intended for carrying out current control of academic performance progress and intermediate attestation in the discipline of Information Technology in Biology and Medicine for students of the specialty (majoring in) 31.05.01 General Medicine.
2. The ATF is an appendix to the program of the discipline (module) Introduction to Information Technologies
3. Developer(s): Babenko Mikhail Grigorievich, head of the department of Computational Mathematics and Cybernetics
4. Expert examination of the ATF has been completed.

Expert group:

Chairperson: S.I. Kubanov, Associate Professor of the Department of Surgery, Orthopedics and Traumatology

Committee members:

G.S. Ivchenko, Acting Head of the Department of Propaedeutics of Internal Diseases

S.M. Kotelevets, Professor of the Department of Propaedeutics of Internal Diseases

5. Employer organization representative: Vilensky I.L., Chief Physician of Independent CDL, LLC

Expert conclusion – the ATF allows evaluating the level of competency levels and is recommended to be employed in the educational process.

6. The validity period for the ATF shall be determined by the period of implementation of the educational program.

1. Description of Evaluation Criteria at Various Stages of Their Formation, Description of Evaluation Scales

Levels of formation of competence(s), indicator(s)	Descriptors			
	Minimum level not achieved (Unsatisfactory) 2 points	Minimum level (Satisfactory) 3 points	Intermediate level (Good) 4 points	High level (Excellent) 5 points
Competency UC-4				
Learning Outcome for the Discipline: Able to formulate queries (prompts) to generative neural networks, translate and summarize scientific literature, prepare presentations and reports in Russian and English using AI tools. Indicator: UC-4.1. Knows the norms and rules of business communication in oral and written forms in the state language of the Russian Federation and foreign language(s); is able to build business communication taking into account the specifics of intercultural interaction.	The student does not know the norms of academic and professional communication in Russian and English. Cannot formulate clear queries (prompts) to AI systems. Is unable to translate or summarize scientific texts. Makes gross grammatical and stylistic errors when preparing written medical documents. Cannot deliver an oral presentation in a foreign language on a biomedical topic.	The student knows the basic norms of business communication in Russian and English. Can formulate simple queries to neural networks to obtain general biomedical information. Is able to translate and summarize short scientific texts with the help of AI, but may make occasional inaccuracies. Prepares written documents with minor errors. Can deliver a basic presentation, but experiences difficulties with professional terminology and audience engagement.	The student confidently uses the norms of academic and professional communication in Russian and English. Effectively formulates structured prompts to obtain relevant biomedical information from neural networks. Independently translates, adapts, and summarizes scientific articles using AI tools. Prepares well-structured written documents and presentations, observing the norms of scientific style. Delivers clear and logical oral presentations, answering questions from the audience.	The student possesses an excellent command of the norms of business communication in Russian and English in a professional biomedical context. Independently develops complex multi-step prompts for solving professional tasks. Creates high-quality translations and summaries of scientific literature with minimal human intervention using AI. Impeccably prepares any type of medical documentation and scientific reports, adapting the style to the target audience. Fluently delivers oral presentations and participates in professional discussions in Russian and English, demonstrating a high level of communicative competence.

Competency PC-11				
Learning Outcome: Able to work with medical information systems, electronic health records, medical databases, and statistical tools for processing patient data and preparing reports. Indicator: PC-11.1. Uses medical information systems (MIS) and databases for handling patient data and statistical reporting.	The student does not know the purpose of medical information systems. Has no understanding of electronic health records (EHR) or the principles of handling personal data. Cannot use search tools in medical databases (PubMed, eLibrary). Lacks skills in working with statistical packages (or Excel) for processing medical data. Makes gross errors when entering and coding diagnoses (ICD-10/11).	The student has a general understanding of medical information systems. Can find information in recommended medical databases using simple queries. Knows the structure of an electronic health record but has difficulties filling out some sections. Can create simple tables in Excel for collecting statistical data, but makes mistakes in formulas and report formatting. Is familiar with the main ICD codes but may be inaccurate.	The student confidently works with medical information systems and knows the procedure for maintaining an electronic record. Effectively uses search queries in scientific databases (PubMed, CyberLeninka) to solve professional tasks. Has skills in statistical analysis of medical data using MS Excel (pivot tables, charts). Correctly applies the International Classification of Diseases (ICD-10) when filling out documentation. Complies with information security and personal data protection requirements.	The student is fluent in various medical information systems and can adapt to new software. Uses advanced database features. Applies statistical processing methods using specialized packages. Independently creates complex reports and analytical extracts. Critically evaluates the reliability of information in digital sources. Understands the basics of telemedicine and digital ethics. Demonstrates readiness to work in the Unified State Health Information System (USHIS) of the Russian Federation.
Competency PC-12				
Competence: PC-12. Ability to apply information technologies and methods of evidence-based medicine in the diagnosis, treatment, and prevention of diseases, including the use of clinical decision support systems. Learning Outcome for the Discipline:	The student does not know the principles of building and functioning of clinical decision support systems (CDSS). Is unable to use AI tools to analyze clinical data. Cannot simulate clinical cases or evaluate recommendations from AI systems. Does not understand the role of CDSS in evidence-based medicine.	The student knows the basic types and functions of CDSS. Can use AI tools for analyzing simple clinical cases and formulating hypotheses. Is able to simulate basic clinical scenarios with the help of neural networks. Understands the importance of CDSS in clinical practice, but experiences difficulties in	The student confidently works with various types of clinical decision support systems (rule-based, machine learning models, knowledge bases). Effectively uses AI tools to analyze symptoms, interpret laboratory and instrumental data, and formulate differential	The student possesses an excellent command of modern clinical decision support systems and AI tools for professional activities. Independently selects and configures CDSS for solving specific clinical tasks. Develops complex clinical scenarios for educational and research purposes using generative

Able to use clinical decision support systems and AI tools for analyzing symptoms, formulating differential diagnoses, evaluating clinical evidence, and creating educational materials. Indicator: PC-12.1. Uses clinical decision support systems and medical information systems in professional activities.		critically evaluating AI-generated recommendations.	diagnoses. Simulates complex clinical cases and critically evaluates recommendations from CDSS from the standpoint of clinical guidelines. Correctly integrates AI recommendations into the decision-making process.	neural networks. Expertly evaluates the quality and relevance of CDSS recommendations, identifies potential errors and limitations, and makes informed clinical decisions. Demonstrates readiness for the practical implementation of AI technologies in healthcare.
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The evaluation of the competency formation level in the discipline is carried out on the basis of the Regulations on conducting current control of academic progress and intermediate attestation of students in higher education educational programs – Bachelor’s programs, Specialist’s programs, Master’s programs – at the Federal State Autonomous Educational Institution of Higher Education NORTH-CAUCASUS FEDERAL UNIVERSITY in its current edition.

ASSESSMENT TOOLS FOR CHECKING THE LEVEL OF COMPETENCY DEVELOPMENT

Task Number	Correct Answer	Content of the Question	Competency
1	B) A text query to a neural network containing instructions, context, and the expected response format	What is a "prompt" in the context of working with generative neural networks? A) A programming language for neural networks B) A text query to a neural network containing instructions, context, and the expected	UC-4

		response format C) A type of neural network architecture D) A data storage format for training datasets	
2	B) PubMed	Which of the following is the largest and most authoritative biomedical literature database? A) Instagram B) PubMed C) Wikipedia D) YouTube	PC-11
3	B) To formulate clinical questions for searching evidence in databases	What is the purpose of the PICO(S) format in evidence-based medicine? A) To design clinical trials B) To formulate clinical questions for searching evidence in databases C) To code diagnoses using ICD-10 D) To create patient treatment plans	PC-12
4	B) SPSS	Which of the following is a specialized software package for statistical analysis of biomedical data? A) Microsoft Word B) SPSS C) Adobe Photoshop D) AutoCAD	PC-11
5	B) ICD-10	Which international classification is used for coding diseases in Russia and many other countries? A) SNOMED CT B) ICD-10 C) LOINC D) DSM-5	PC-12

6	B) To summarize scientific articles and extract key information	What is the main application of generative neural networks in working with scientific literature? A) To create video animations B) To summarize scientific articles and extract key information C) To design laboratory equipment D) To replace peer review	UC-4
7	A, C, D	Which of the following are components of a well-structured prompt for a generative neural network? (Select all that apply) A) Clear instructions on what to do B) A random set of words without context C) Context or background information D) Specification of the expected response format (e.g., table, list, text)	UC-4
8	A, B, D	Which of the following are considered key principles of evidence-based medicine? (Select all that apply) A) Integration of the best available clinical evidence with clinical expertise B) Consideration of patient preferences and values	PC-12

		C) Reliance solely on the doctor's intuition D) Systematic search and critical evaluation of research	
9	A, B, C	Which of the following tools can be used for statistical processing of biomedical data? (Select all that apply) A) Microsoft Excel (with Analysis ToolPak) B) SPSS C) Statistica D) Microsoft Paint	PC-11
10	A, B, D	What are the main functions of clinical decision support systems (CDSS)? (Select all that apply) A) Alerting doctors to potential drug interactions B) Providing diagnostic recommendations based on symptoms C) Replacing the doctor's clinical judgment entirely D) Suggesting treatment options based on clinical guidelines	PC-12
11	A, B, C	Which of the following are reliable sources for searching biomedical scientific literature? (Select all that apply) A) PubMed B) Scopus C) Cochrane Library D) A personal blog of an anonymous author	PC-11
12	A, B, D	What are the key features of a well-formulated prompt	UC-4

		for obtaining high-quality medical information from a neural network? (Select all that apply) A) Specificity and clarity of the request B) Providing context (patient data, clinical setting) C) Using vague and ambiguous language D) Requesting a structured output (e.g., differential diagnosis table)	
13	PICO(S) (or PICO)	The format for formulating clinical questions in evidence-based medicine is abbreviated as _____.	PC-12
14	hallucination(s)	False or fabricated information that a generative neural network presents as facts is called a(n) _____.	UC-4
15	summarization	The process of creating a concise and coherent summary of a longer scientific article using AI tools is called _____.	UC-4
16	SPSS (or Statistica, R)	The name of the software package widely used for advanced statistical analysis of biomedical data is _____.	PC-11
17	systematic review	A type of scientific publication that uses explicit and reproducible methods to search for and critically appraise all relevant studies on a specific topic is called a _____.	PC-12

18	MeSH (or Medical Subject Headings)	The controlled vocabulary thesaurus used by PubMed for indexing articles is called _____.	PC-11
19	1 → 2 → 3 → 4	Arrange the steps for formulating a clinical question using the PICO(S) format in the correct order: 1) Identify the Problem/Population (P) 2) Define the Intervention (I) 3) Specify the Comparison (C) 4) Determine the Outcome (O) and Setting (S)	PC-12
20	1 → 2 → 3 → 4 → 5	Arrange the steps for creating a prompt for a generative neural network to solve a biomedical task in the correct order: 1) Define the goal of the query (what information is needed) 2) Provide context and background information 3) Formulate specific instructions for the neural network 4) Specify the desired output format 5) Add verification instructions (e.g., indicate sources or ask for critical evaluation)	UC-4
21	1 → 2 → 3 → 4	Arrange the steps for conducting a systematic literature search in PubMed in the correct order: 1) Define the research question and	PC-11

		keywords 2) Select MeSH terms and build a search strategy 3) Apply filters (publication date, article type, language) 4) Save, export, and analyze the selected articles	
22	1 → 2 → 3 → 4 → 5	Arrange the steps for evaluating the quality of clinical evidence according to evidence-based medicine principles in the correct order: 1) Formulate a clinical question using PICO(S) 2) Search for the best available evidence in databases 3) Critically appraise the quality and relevance of the studies 4) Integrate the evidence with clinical expertise and patient preferences 5) Apply the evidence in clinical practice and evaluate the outcome	PC-12
23	1 → 2 → 3 → 4	Arrange the steps for performing a basic statistical analysis of biomedical data in MS Excel in the correct order: 1) Enter the raw data into a spreadsheet 2) Calculate descriptive statistics (mean, median, standard deviation) using formulas or the Analysis ToolPak 3) Perform inferential	PC-11

		statistical tests (e.g., t-test, ANOVA) 4) Interpret the results and create charts for visualization	
24	1 → 2 → 3 → 4 → 5	Arrange the steps for generating an educational medical case using a generative neural network in the correct order: 1) Define the clinical topic and learning objectives 2) Formulate a detailed prompt for the neural network (context, instructions, format) 3) Generate the initial clinical case draft using AI 4) Verify the accuracy of the generated content using authoritative sources (PubMed, clinical guidelines) 5) Edit, format, and prepare the final educational material for presentation	UC-4
25	A-3, B-1, C-4, D-2	Match the type of clinical evidence with its level according to evidence-based medicine (from highest to lowest): Left: A) Systematic reviews and meta-analyses B) Randomized controlled trials (RCTs) C) Cohort studies D) Case reports and expert opinions	PC-12

		Right: 1) Level I 2) Level V 3) Highest level of evidence (Level A) 4) Lower level of evidence	
26	A-2, B-3, C-1, D-4	Match the AI tool with its primary application in medicine: Left: A) Generative neural network (GPT, Claude) B) Biomedical databases (PubMed, GeneCards) C) Statistical packages (SPSS, R) D) Clinical decision support systems (CDSS) Right: 1) Data analysis and hypothesis testing 2) Text generation, summarization, prompt formulation 3) Literature search and fact verification 4) Diagnostic and treatment recommendations	UC-4 / PC-11 / PC-12
27	A-2, B-3, C-4, D-1	Match the step of a systematic literature search with its description: Left: A) Formulating the research question B) Building a search strategy C) Applying filters D) Critical appraisal Right: 1) Evaluating the quality and validity of studies	PC-11

		2) Defining the PICO(S) elements 3) Using MeSH terms and Boolean operators 4) Limiting results by date, language, or study type	
28	A-3, B-1, C-4, D-2	Match the type of statistical analysis with its purpose in biomedical research: Left: A) Descriptive statistics B) T-test C) ANOVA D) Correlation analysis Right: 1) Comparing the means of two groups 2) Measuring the strength of association between two variables 3) Summarizing and describing the main features of data (mean, median, SD) 4) Comparing the means of three or more groups	PC-11
29	A-2, B-4, C-1, D-3	Match the component of the PICO(S) format with its description: Left: A) Population/Patient (P) B) Intervention (I) C) Comparison (C) D) Outcome (O) Right: 1) Alternative intervention or control group 2) The patient group or condition of	PC-12

		interest 3) The measured result or effect 4) The treatment, exposure, or diagnostic test being studied	
30	A-2, B-1, C-4, D-3	Match the type of neural network application with its description in biomedical education: Left: A) Summarization of scientific articles B) Simulation of clinical cases C) Generation of educational tests D) Preparation of differential diagnosis Right: 1) Creating realistic patient scenarios for training 2) Condensing long research papers into concise abstracts 3) Listing possible diagnoses with evidence and reasoning 4) Creating multiple-choice questions on a given topic	UC-4 / PC-12

2. Description of the Evaluation Scale

Within the framework of the rating system, students' academic progress in each discipline is evaluated during current control and intermediate attestation. The rating system for assessing students' knowledge is based on the use of a combination of control activities to check the covered material (checkpoints), optimally located throughout the entire time interval of studying the discipline. The principles of the rating system for assessing students' knowledge are based on the requirements described in the Regulations on the organization of the educational process based on the rating system for assessing students' knowledge at NCFU.

3. Criteria for Evaluating Competencies

The grade **Excellent** shall be awarded to a student if the theoretical content of the course has been mastered completely, without gaps; the material is presented exhaustively, consistently, clearly, and logically; the student freely copes with tasks, questions, and other types of knowledge application; uses additional material in the answer; all tasks provided for by the

program are completed, and the quality of their execution is evaluated by a number of points close to the maximum; analyzes the obtained results; demonstrates independence when performing tasks.

The grade **Good** is to be awarded to a student if the theoretical content of the course is mastered completely, the necessary practical competencies are mainly formed, all educational tasks provided for by the training program are completed, and the quality of their execution is sufficiently high. The student firmly knows the material, presents it competently and strictly on the merits of the matter, without allowing significant inaccuracies in answering the question.

The grade **Satisfactory** is awarded to a student in case the theoretical content of the course has been mastered in part only, but the gaps are not of a significant nature, most of the tasks provided for by the program are completed, but contain errors, the student allows inaccuracies and insufficiently correct wording when answering the question, and violations of logical sequence are observed in the presentation of the program material.

The grade **Unsatisfactory** is awarded to a student if they do not know a significant part of the program material, allow significant errors, perform practical works with great difficulty and uncertainty, the necessary practical competencies are not formed, most of the educational tasks provided for by the training program are not completed, and the quality of their execution is evaluated by a number of points close to the minimum.