



MINISTRY OF SCIENCE AND HIGHER EDUCATION OF THE RUSSIAN FEDERATION  
Federal State Autonomous Educational Institution of Higher Education  
**"Far Eastern Federal University"**  
(FEFU)  
INSTITUTE (SCHOOL) OF LIFE SCIENCES AND BIOMEDICINE (SCHOOL)

AGREED  
Head of OP

(signature)

December 21, 2021

Yu.S. Khotimchenko  
(FULL NAME)

APPROVE

Director of the Department of Pharmacy and Pharmacology

E.V. Khozhaenko  
(signature) (I.O. Surname)

December 21, 2021

**WORKING PROGRAM OF THE DISCIPLINE**

Systems analysis and management in healthcare

Direction of training 32.04.01 "Public Health"

Educational program "Leadership and governance in public health (program in English for foreign citizens)"

Full-time training form

course 1 semester 1

lectures - hour.

practical classes 36 hours.

seminars - hour,

including using MAO lek. 0 hours/practice 10 o'clock

total classroom hours 36 hours,

including using MAO 10 hours

independent work 36 hours.

abstracts are not included

control work is not provided

credit 1 semester

The work program of the discipline is compiled in accordance with the requirements of the Federal State Educational Standard of Higher Education in the field of study 32.04.01 Public health, approved by order of the Ministry of Education and Science of the Russian Federation dated May 31, 2017. No. 485.

The work program was discussed at the meeting Department of Pharmacy and Pharmacology, Protocol No. 4 dated December 21, 2021

Director of the Department Ph.D., E.V. Khozhaenko

Compiled by: Doctor of Medical Sciences, Professor G.N. Cooper

Reverse side of the title page of the RPD

1. The work program was revised at a meeting of the Department / department / department (implementing the discipline) and approved at a meeting of the Department / department / department (issuing structural unit), protocol dated “ \_\_\_\_ ” \_\_\_\_\_ 2021 No. \_\_\_\_\_
2. The work program was revised at a meeting of the Department / department / department (implementing the discipline) and approved at a meeting of the Department / department / department (issuing structural unit), protocol dated “ \_\_\_\_ ” \_\_\_\_\_ 2021 No. \_\_\_\_\_
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I. Goals and objectives of mastering the discipline:

Target:

- formation of a system of competencies among masters in the field of theoretical foundations and patterns of construction and functioning of systems in relation to public health and healthcare organization.

Tasks:

- Comprehension of the ideological and cultural significance of the theory of system analysis as a necessary result of the development of science, taking into account the needs of the study of increasingly complex objects of knowledge.

- Creation of a basic theoretical foundation and elementary skills necessary for the formation of a systemic worldview and mastering a systemic approach.

- Mastering the initial skills of applied system analysis in order to further develop them in the disciplines of the management cycle.

- Teaching the methodology and methods of assessing and managing public health;

- Training in a systematic approach to the analysis of public health;

- Formation of readiness to solve public health problems.

As a result of studying this discipline, students form the following universal, general professional and professional competencies (elements of competencies).

Professional competencies of graduates and indicators of their achievement:

Professional competencies of graduates and indicators of their achievement:

| Task type                     | Code and name of professional competence (result of development)   | Code and name of the indicator of achievement of competence   |
|-------------------------------|--|---|
| organizational and managerial | PC-5 The ability to evaluate the effectiveness of the activities of a medical organization, develop and select optimal management decisions, develop a business plan for the development of a medical organization, use a process approach in managing a medical organization, use technological maps of the processes of a medical organization | PC-5.1 Knows the methods of planning a medical organization<br>PC-5.2 Able to draw up a plan for a medical organization, develop business planning and investment projects<br>PC-5.3 Proficient in planning, developing business planning and investment projects |

| Task type                     | Code and name of professional competence (result of development)   | Code and name of the indicator of achievement of competence   |
|-------------------------------|--|---|
| organizational and managerial | PC-6 The ability to develop plans and programs, form a system of indicators for the activities of a medical organization, evaluate the effectiveness of a medical organization, develop options for management decisions and assess the risks associated with their implementation | PC-6.1 Knows the features of the formation of a system of indicators of a medical organization<br>PC-6.2 Is able to evaluate the effectiveness of the medical organization, taking into account the formed system of indicators<br>PC-6.3 Has the skills to form performance indicators, evaluate |

| Code and wording of competence  | Stages of competence formation  |
|---|---|
| PC-5.1 Knows the methods of planning a medical organization   | Knows the methods of planning a medical organization<br>Able to plan the work of a medical organization   |
| PC-5.2 Able to draw up a plan for a medical organization, develop business planning and investment projects | Knows the rules for drawing up a plan for a medical organization, develop a business plan, an investment project<br>Able to draw up a plan for a medical organization, develop business planning and investment projects<br>Has the skill of drawing up a plan for a medical organization, developing business and investment projects  |
| PC-5.3 Proficient in planning, developing business planning and investment projects                         | Knows the principles of goal-setting, types and methods of organizational planning and fundamental concepts of financial management, as well as the method of a process approach to managing a medical organization<br>Able to develop corporate, competitive and functional strategies for the development of the organization, develop investment projects and conduct their verification<br>He owns the methods of formulating and implementing strategies at the business unit level, developing and implementing marketing programs, as well as methods of investment analysis and analysis of financial markets, a process approach in managing a medical organization and the ability to use flow charts of the processes of a medical organization. |
| PC-6.1 Knows the features of the formation of a system of indicators of a medical organization              | Knows the features of the formation of a system of indicators of a medical organization<br>Able to form and fulfill the indicators of a medical organization<br>Possesses the skill of forming and fulfilling the indicators of a medical organization  |
| PC-6.2 Is able to evaluate the effectiveness of the medical   | Knows the main performance indicators of a medical organization   |

|   |   |
|---|---|
| organization, taking into account the formed system of indicators   | Knows how to evaluate the effectiveness of the activities of a medical organization, taking into account the formed system of indicators<br>Possesses the skill of evaluating the effectiveness of the activities of a medical organization, taking into account the formed system of indicators  |
| PC-6.3 Has the skills to form performance indicators, evaluate their effectiveness, as well as the ability to develop management decisions with an assessment of the risks associated with their implementation | Knows the main performance indicators of a medical organization<br>Knows how to form performance indicators, evaluate their effectiveness, assess the risks associated with their implementation<br>Possesses the skills of forming performance indicators, evaluating their effectiveness, as well as the ability to develop management decisions with an assessment of the risks associated with their implementation |

For the formation of the above competencies within the discipline "Systems analysis and management in healthcare" the following methods of active / interactive learning are used: practical exercises - debate, round table (preparation and discussion of abstracts).

II. The complexity of the discipline and types of training sessions in the discipline

The total labor intensity of the discipline is 2 credit units (72 academic hours).

|                   |  |
|-------------------|--|
| Designation       | Types of training sessions and work of the student   |
| Etc               | Practical lessons  |
| Right electr.     |  |
| SR:               | Independent work of the student during the period of theoretical training  |
| including control | Independent work of the student and contact work of the student with the teacher during the period of intermediate certification |
|                   | And other types of work  |

### I. Discipline structure:

#### Full-time form of education

| No. | Section name disciplines   | Semester | The number of hours by type of training sessions and work of the student |     |     |    |    |         | Forms of intermediate certification |
|-----|--|----------|--|-----|-----|----|----|---------|-------------------------------------|
|     |  |          | Lek  | Lab | Etc | OK | SR | Control |                                     |
| 1   | Lesson 1. Subject and methods of systems theory. Types and properties of systems | 1        |  |     | 2   |    | 2  |         |                                     |

|                |   |  |  |   |  |   |  |  |
|----------------|---|--|--|---|--|---|--|--|
| 2              | Lesson 2. The concept of structure in systems theory  |  |  | 2 |  | 2 |  |  |
| 3              | Lesson 3. Basic methods of systems theory   |  |  | 2 |  | 2 |  |  |
| 4              | Lesson 4. Cybernetic systems. The concept of structure in theory  |  |  | 2 |  | 2 |  |  |
| 5              | Lesson 5. Freedom and expediency of systems.  |  |  | 2 |  | 2 |  |  |
| 6              | Lesson 6. Synthetic method in systems theory. Tasks of system analysis  |  |  | 2 |  | 2 |  |  |
| 7              | Lesson 7. Systems Research Methods  |  |  | 2 |  | 2 |  |  |
| 8              | Lesson 8. Methods of system analysis in relation to solving problems of organizing medical care for the population. |  |  | 2 |  | 2 |  |  |
| 9              | Lesson 9. Stages of systems research. Characteristics and classification of scientific research                     |  |  | 2 |  | 2 |  |  |
| 10             | Lesson 10. System regularities as a basis for designing control mechanisms for complex social and medical systems   |  |  | 2 |  | 2 |  |  |
| el<br>ev<br>en | Lesson 11. Particular methods of system analysis in relation to solving problems in the field of medical service    |  |  | 2 |  | 2 |  |  |
| 12             | Lesson 12. Quantitative methods for describing systems in healthcare.   |  |  | 2 |  | 2 |  |  |

|    |  |   |   |   |    |   |    |  |        |
|----|--|---|---|---|----|---|----|--|--------|
| 13 | Lesson 13. Qualitative methods of systems analysis   |   |   |   | 2  |   | 2  |  |        |
| 14 | Lesson 14. Methods of formalized representation of systems   |   |   |   | 2  |   | 2  |  |        |
| 15 | Lesson 15. System Modeling   |   |   |   | 2  |   | 2  |  |        |
| 16 | Lesson 16. Biotechnical systems  |   |   |   | 2  |   | 2  |  |        |
| 17 | Lesson 17. Simulation  |   |   |   | 2  |   | 2  |  |        |
| 18 | Lesson 18. Models of decision making in the management of complex systems. ACS for medical and biological purposes |   |   |   | 2  |   | 2  |  |        |
|    | Total:   | 1 | - | - | 36 | - | 36 |  | offset |

### III. STRUCTURE AND CONTENT OF THE THEORETICAL PART OF THE COURSE

Lectures are not included in the curriculum

### IV. STRUCTURE AND CONTENT OF THE PRACTICAL PART OF THE COURSE AND INDEPENDENT WORK

**Practical classes (36 hours, including using MAO - 10 hours)**

**Lesson 1. Subject and methods of systems theory. Types and properties of systems (2 hours)**

The subject of systems theory.

Methods of systems theory.

Types of systems.

System properties: integrity, complexity, coherence, structure, organization, diversity. Nonlinear dynamical systems.

**Lesson 2. The concept of structure in systems theory (2 hours)**

Identical structures in nature. The concept of a field. Field structure according to B. Russell, its application to systems theory. The concepts of "isomorphism" and "homomorphism". Structure identity as a classification feature.

**Lesson 3. Basic methods of systems theory (2 hours)**

Sequence of system analysis. Methods of system analysis: black box method, decomposition method, analogy method, modeling principle, evolutionary method, expert method, methods of statistical analysis of relationships. Methods of system description and analysis.

**Lesson 4. cybernetic systems. The concept of structure in systems theory (2 hours)**

The concept of cybernetic systems.

Structure in systems theory.

**Lesson 5. Freedom and expediency of systems. (2 hours)**

Measuring the freedom of systems.

Purpose as an objective system category.

**Lesson 6. Synthetic method in systems theory. Tasks of system analysis (2 hours)**

Synthetic method in systems theory.

Characteristics of the problems of system analysis.

Features of problems of system analysis.

**Class 7. Systems Research Methods (2 hours)**

Analysis and synthesis - methods for studying systems.

System analysis procedures.

**Lesson 8. Methods of system analysis in relation to solving problems of organizing medical care for the population. (2 hours)**

Methods, technologies, procedures and criteria for the formation of the structure of the health care system for various levels of complexity of the organization of society: at the level of individuals; at the level of various social groups; at the level of social strata; at the level of social institutions and the state as a whole.

**Class 9. Stages of systems research. Characterization and classification of scientific research (2 hours)**

Stages of research systems.

Characteristics and classification of scientific research from the standpoint of the methodology of system analysis.

**Lesson 10. System laws as a basis for designing control mechanisms for complex social and medical systems (2 hours)**



System laws.

Patterns of the systemic organization of health care.

**Lesson 11. Particular methods of system analysis in relation to solving problems in the field of medical service (2 hours)**

Homeostasis in social structures as a central concept and law for determining the level, volume, nature of the needs for medical services in different layers of a social organization.

**Lesson 12. Quantitative methods for describing systems in healthcare. (2 hours)**

1. Levels of system description.
2. Higher levels of systems description.
3. Lower levels of systems description.
4. Cybernetic approach to the description of systems.

**Session 13. Qualitative methods of systems analysis (2 hours)**

1. Morphological methods.
2. Method of expert assessments.
3. Development of scenarios.
4. Evaluation of systems using the Delphi method.
5. A "tree of goals" type method.

**Lesson 14. Methods of formalized representation of systems (2 hours)**

Descriptive

Graphic

model

Using 3-D technologies.

**Lesson 15. Modeling systems. (4 hours)**

1. Model types.
2. Model properties.
3. Model development.
4. Models of scientific research in health care.
5. Performance evaluation models.

**Lesson 16. Biotechnical systems (2 hours)**

Analysis and synthesis of biotechnical systems.

The study of a biological object from the standpoint of systems theory

**Lesson 17. Simulation modeling (2 hours)**

The essence of simulation modeling.

Composition of discrete systems.

An example of building a simulation model for analyzing the reliability of a complex system.

**Lesson 18. Models of decision making in the management of complex systems. ACS for medical and biological purposes (2 hours)**

Control systems (ACS, ACS). Stages of management.

The main types of models in the management of the system "health - public health".

Principles of building management decision-making systems in health care, examples of automated control systems for medical and biological purposes. Examples of telemetry, diagnostics and health management systems

**Schedule for the implementation of independent work on the discipline**

| No. p/p | Date/Due dates | Type of independent work | Approximate lead times | form of control |
|---------|----------------|--------------------------|------------------------|-----------------|
| 1       | 1-6th week     | Preparation of abstracts | 12 hours               | Protection      |
| 2       | 7-12th week    | Presentation preparation | 12 hours               | Protection      |
| 3       | 13th-18th week | Preparation for the test | 12 hours               | offset          |

Independent work of students consists of preparing for practical classes, working on recommended literature, writing reports on the topic of the seminar, preparing presentations, abstracts.

The teacher offers each student individual and differentiated tasks. Some of them can be carried out in a group (for example, preparing a report and presentations on the same topic can be done by several students with a division of their duties - one prepares a scientific and theoretical part, and the second analyzes practice).

**Recommendations for independent work of students**

The purpose of the student's independent work is to work meaningfully and independently first with educational material, then with scientific information, lay the foundations for self-organization and self-education in order to instill the ability to continuously improve their professional qualifications in the future.

The process of organizing independent work of students includes the following stages:

- preparatory (defining goals, drawing up a program, preparing methodological support);

- the main one (implementation of the program, use of methods of information search, assimilation, processing, application, transfer of knowledge, fixing the results, self-organization of the work process);

- final (assessment of the significance and analysis of the results, their systematization, evaluation of the effectiveness of the program and methods of work, conclusions about the directions of labor optimization).

In the process of independent work, the student acquires the skills of self-organization, self-control, self-government, self-reflection and becomes an active independent subject of educational activity. Independent work of students should have an important impact on the formation of the personality of a future specialist; it is planned by the student independently. Each student independently determines the mode of his work and the measure of labor expended on mastering the educational content in each discipline. He performs extracurricular work according to a personal individual plan, depending on his preparation, time and other conditions.

### **Methodological recommendations for independent work of students**

As the material is mastered on the subject of the discipline, it is envisaged to carry out independent work of students in collecting and processing literary material to expand the field of knowledge in the discipline being studied. To study and fully master the program material in the discipline, educational, reference and other literature recommended by this program, as well as specialized periodicals, are used. In self-preparation, students take notes on the material, independently study questions on the topics covered, using educational literature from the proposed list, periodicals, scientific and methodological information, databases of information networks (Internet, etc.).

Independent work consists of such types of work as studying material from textbooks, reference books, videos and presentations, as well as other reliable sources of information; preparation for the test.

### **List of types of independent work of the student**

Preparation for a practical lesson, preparation of a report on a selected aspect of the topic or selection of practical material for participation in the discussion constitute the content of the student's independent work. The material for training can be professional literature, educational and methodological support of the discipline. Forms of current control: survey, group discussion, control tasks, report presentation.

Assessment of knowledge and skills is carried out at an intermediate control point after passing the appropriate section of the discipline. For methodological

support of mastering the discipline, the department develops teaching aids (recommendations and instructions for students and teachers, etc.), which detail the goals and methods of conducting classes.

Independent work of students includes the study of teaching aids, materials, work on the Internet, which makes it possible to form the appropriate skills and abilities, is the foundation for making rational management decisions in the economic field of healthcare. Active use of computer teaching and control technologies in the educational process contributes to the formation of students' skills to use modern innovative educational programs.

### **Guidelines for writing and designing an abstract**

An abstract is a creative activity of a master, which reproduces in its structure research activities to solve theoretical and applied problems in a certain branch of scientific knowledge. Because of this, term paper is the most important component of the educational process in higher education.

The abstract, being a model of scientific research, is an independent work in which the master solves a problem of a theoretical or practical nature, applying the scientific principles and methods of this branch of scientific knowledge. The result of this scientific search may have not only subjective, but also objective scientific novelty, and therefore can be presented for discussion by the scientific community in the form of a scientific report or message at a scientific and practical conference, as well as in the form of a scientific article.

The abstract involves the acquisition of skills in building business cooperation based on ethical standards for the implementation of scientific activities. Purposefulness, initiative, disinterested cognitive interest, responsibility for the results of one's actions, conscientiousness, competence are personality traits that characterize the subject of research activities that correspond to the ideals and norms of modern science.

The abstract is an independent educational and research activity of the master. The teacher provides advisory assistance and evaluates the process and results of the activity. He provides an approximate topic for abstracts, clarifies the problem and the topic of research together with the intern, helps to plan and organize research activities, appoints the time and minimum number of consultations.

The teacher accepts the text of the abstract for verification at least ten days before the defense.

Traditionally, a certain structure of the abstract has developed, the main elements of which, in the order of their location, are the following:

1. Title page.

2. Task.
3. Table of contents.
4. List of symbols, symbols and terms (if necessary).
5. Introduction.
6. The main part.
7. Conclusion.
8. Bibliographic list.
9. Applications.

The title page indicates: educational institution, graduating department, author, teacher, research topic, place and year of the abstract.

The title of the abstract should be as short as possible and fully correspond to its content.

The table of contents (content) reflects the names of the structural parts of the abstract and the pages on which they are located. It is advisable to place the table of contents at the beginning of work on one page.

The presence of a detailed introduction is a mandatory requirement for the abstract. Despite the small volume of this structural part, its writing causes considerable difficulties. However, it is a well-executed introduction that is the key to understanding the entire work and testifies to the professionalism of the author.

Thus, the introduction is a very important part of the abstract. The introduction should begin with a rationale for the relevance of the chosen topic. When applied to the abstract, the concept of "relevance" has one feature. From how the author of the abstract knows how to choose a topic and how correctly he understands and evaluates this topic from the point of view of modernity and social significance, characterizes his scientific maturity and professional readiness.

In addition, in the introduction it is necessary to isolate the methodological basis of the abstract, to name the authors whose works formed the theoretical basis of the study. A review of the literature on the topic should show the author's thorough acquaintance with specialized literature, his ability to systematize sources, critically examine them, highlight the essential, determine the main thing in the current state of study of the topic.

The introduction reflects the significance and relevance of the chosen topic, defines the object and subject, purpose and objectives, and the chronological framework of the study.

The introduction ends with a statement of general conclusions about the scientific and practical significance of the topic, the degree of its study and availability of sources, and the formulation of a hypothesis.

In the main part, the essence of the problem is stated, the topic is revealed, the author's position is determined, factual material is given as an argument and for illustrations of the put forward provisions. The author needs to show the ability to consistently present the material while simultaneously analyzing it. Preference is given to the main facts, rather than small details.

The abstract ends with the final part, which is called the “conclusion”. Like any conclusion, this part of the abstract plays the role of a conclusion determined by the logic of the study, which is in the form of a synthesis of the scientific information accumulated in the main part. This synthesis is a consistent, logically coherent presentation of the results obtained and their relationship with the general goal and specific tasks set and formulated in the introduction. It is here that the so-called "inferential" knowledge is contained, which is new in relation to the original knowledge. The conclusion may include suggestions of a practical nature, thereby increasing the value of theoretical materials.

So, in the conclusion of the abstract should be: a) the conclusions on the results of the study are presented; b) theoretical and practical significance, novelty of the abstract; c) the possibility of applying the results of the study is indicated.

After the conclusion, it is customary to place a bibliographic list of used literature. This list is one of the essential parts of the abstract and reflects the independent creative work of the author of the abstract.

The list of sources used is placed at the end of the work. It is issued either in alphabetical order (by the author's last name or the title of the book), or in the order in which references appear in the text of the written work. In all cases, the full title of the work, the names of the authors or the editor of the publication, if a team of authors participated in writing the book, data on the number of volumes, the name of the city and publishing house in which the work was published, the year of publication, the number of pages are indicated.

### **Guidelines for preparing presentations**

To prepare a presentation, it is recommended to use: PowerPoint, MS Word, Acrobat Reader, LaTeX beamer package. The simplest presentation program is Microsoft PowerPoint. To prepare the presentation, it is necessary to process the information collected when writing the abstract.

The sequence of preparation of the presentation:

1. Clearly state the purpose of the presentation.
2. Determine what will be the format of the presentation: live performance (then how long will it be) or email (what will be the context of the presentation).

3. Select all the content for the presentation and build a logical chain of presentation.

4. Identify key points in the content of the text and highlight them.

5. Determine the types of visualization (pictures) to display them on slides in accordance with the logic, purpose and specifics of the material.

6. Choose the design and format the slides (the number of pictures and text, their location, color and size).

7. Check the visual perception of the presentation.

Visualization types include illustrations, images, diagrams, tables. An illustration is a representation of a real-life visual range. Images, unlike illustrations, are metaphors. Their purpose is to evoke emotion and create an attitude towards it, to influence the audience. With the help of well-thought-out and presented images, information can remain in a person's memory for a long time. Diagram - visualization of quantitative and qualitative relationships. They are used to convincingly demonstrate data, for spatial reasoning in addition to logical reasoning. A table is a concrete, visual and accurate display of data. Its main purpose is to structure information, which sometimes makes it easier for the audience to perceive the data.

#### *Practical Tips for Preparing a Presentation*

- printed text + slides + handouts are prepared separately;
- slides - a visual presentation of information, which should contain a minimum of text, a maximum of images that carry a semantic load, look clear and simple;
  - the textual content of the presentation - oral speech or reading, which should include arguments, facts, evidence and emotions;
  - recommended number of slides 17-22;
  - mandatory information for the presentation: topic, surname and initials of the speaker; message plan; brief conclusions from what has been said; list of sources used;
- handouts – should provide the same depth and scope as a live performance: people trust what they can carry with them more than disappearing images, words and slides are forgotten, and handouts remain a constant tangible reminder; it is important to hand out handouts at the end of the presentation; handouts should be different from slides, should be more informative.

#### **Abstract Evaluation Criteria**

The stated understanding of the abstract as a holistic author's text determines the criteria for its evaluation: the novelty of the text; the validity of the choice of

source; the degree of disclosure of the essence of the issue; compliance with formatting requirements.

**Text novelty:**a) the relevance of the research topic; b) novelty and independence in posing the problem, formulating a new aspect of a well-known problem in establishing new connections (interdisciplinary, intradisciplinary, integration); c) the ability to work with research, critical literature, systematize and structure the material; d) the manifestation of the author's position, the independence of assessments and judgments; e) stylistic unity of the text, unity of genre features.

**The degree of disclosure of the essence of the issue:**a) compliance of the plan with the topic of the essay; b) compliance of the content with the topic and plan of the abstract; c) completeness and depth of knowledge on the topic; d) the validity of the methods and methods of working with the material; f) the ability to generalize, draw conclusions, compare different points of view on one issue (problem).

**The validity of the choice of sources:**a) assessment of the literature used: whether the most famous works on the research topic were involved (including journal publications of recent years, the latest statistics, summaries, references, etc.).

**Compliance with formatting requirements:**a) how correctly the references to the literature used, the list of references are drawn up; b) assessment of literacy and culture of presentation (including spelling, punctuation, stylistic culture), knowledge of terminology; c) compliance with the requirements for the volume of the abstract.

**The reviewer should clearly articulate** remarks and questions, preferably with links to the work (possible to specific pages of the work), to research and factual data that the author did not take into account.

**The reviewer may also indicate:**whether the master has addressed the topic before (abstracts, written works, creative works, olympiad works, etc.) and whether there are any preliminary results; how the graduate did the work (plan, intermediate stages, consultation, revision and revision of the written or lack of a clear plan, rejection of the leader's recommendations).

The master submits an abstract for review no later than a week before the defense. The teacher is the reviewer. Experience shows that it is advisable to familiarize the master with the review a few days before the defense. Opponents are appointed by a teacher from among the masters. For an oral presentation, 10-20 minutes are enough (approximately so much time answers the tickets for the exam).

**Grade 5**it is set if all the requirements for writing and defending the abstract are met: the problem is identified and its relevance is justified, a brief analysis of various points of view on the problem under consideration is made and one's own



position is logically stated, conclusions are formulated, the topic is fully disclosed, the volume is maintained, the requirements for external design are met, correct answers were given to additional questions.

**Grade 4**– the basic requirements for the abstract and its defense are met, but there are some shortcomings. In particular, there are inaccuracies in the presentation of the material; there is no logical sequence in judgments; the volume of the abstract is not maintained; there are omissions in the design; incomplete answers were given to additional questions during the defense.

**Grade 3**– there are significant deviations from the requirements for referencing. In particular: the topic is covered only partially; Factual errors were made in the content of the abstract or when answering additional questions; no output during protection.

**Grade 2**- the topic of the abstract is not disclosed, a significant misunderstanding of the problem is revealed.

**Grade 1**- abstract not submitted

### **Topics for essays and presentations**

1. Structure of a cybernetic system.
2. The law of necessary diversity in the formulation of W. Ashby. Applied value of the law of necessary diversity.
3. Control functions in a cybernetic system.
4. The concept of homeostasis, its significance for the practice of healthcare management.
5. Control characteristics: controllability, reachability, stability.
6. B. Russell's contribution to the development of the conceptual apparatus of systems theory.
7. The concept of field structure and its application in systems theory.
8. Isomorphism: definition, examples, application. Homomorphism: definition, examples.
9. The essence of classification from the standpoint of systems theory. Concepts of relation and field in systems theory.
10. Identical and different structures in nature, in economics, in public health.
11. Theoretical analysis of the content of the category "freedom of the system". Correlation between the concepts of freedom and entropy of systems.
12. Scientific definitions of the category of system freedom, features of their application. Absolute indicators of system freedom: calculation algorithm, application features. Relative indicators of system freedom: calculation algorithm, features of application in medicine.

13. The concept of an adaptive system. The value of freedom for adaptive systems. Theoretical and applied significance of the scientific category "freedom of the system" for public health purposes.

14. Application of systems analysis methods in program development in healthcare.

### **Criteria for evaluating the performance of independent work**

*Evaluation of independent work* is carried out according to the following criteria:

- the completeness and quality of the tasks performed;
- possession of methods and techniques of computer modeling in the issues under study, the use of software tools;
- the quality of the report design, the use of rules and standards for the design of text and electronic documents;
- use of data from domestic and foreign literature, Internet sources, regulatory information and best practices;
- absence of factual errors related to understanding the problem.

When evaluating the knowledge of masters, not only the amount of knowledge is taken into account, but, first of all, the quality of assimilation of the material, understanding the logic of the academic discipline, the ability to freely, competently, logically present what has been learned is evaluated, the ability to reasonably defend one's own point of view.

"Excellent" marks the answer to independent tasks, in which the material is systematically, logically and consistently presented.

The "good" rating implies knowledge of the material and the ability to draw independent conclusions, comment on the material presented; answer with minor flaws.

Assimilation of the material is assessed as "satisfactory" when the student has not studied some sections deeply enough, allows fuzzy formulations, and gives incomplete answers.

"Unsatisfactory" is put in the case when the student does not know a significant part of the educational material, makes significant mistakes; knowledge is unsystematic.

### **Abstract Evaluation Criteria**

- 100-86 points are given to the student if the student expressed his opinion on the formulated problem, argued it, accurately defining its content and components. The data of domestic and foreign literature, statistical information, information of a regulatory nature are given. The student knows and owns the skill

of independent research work on the research topic; methods and techniques for analyzing the theoretical and / or practical aspects of the area under study.

- 85-76 - points - the work is characterized by semantic integrity, coherence and consistency of presentation; no more than 1 mistake was made when explaining the meaning or content of the problem. For argumentation, data of domestic and foreign authors are given. Demonstrated research skills and abilities. There are no actual errors related to understanding the problem.

- 75-61 points - the student conducts a fairly independent analysis of the main stages and semantic components of the problem; understands the basic foundations and theoretical justification of the chosen topic. The main sources on the topic under consideration are attracted. No more than 2 errors were made in the sense or content of the problem.

- 60-50 points - if the work is a retold or completely rewritten source text without any comments or analysis. The structure and theoretical component of the topic is not disclosed. Three or more than three errors were made in the semantic content of the problem being disclosed.

## **V. EDUCATIONAL AND METHODOLOGICAL PROVISION OF STUDENTS' INDEPENDENT WORK**

Independent work is defined as an individual or collective learning activity carried out without the direct guidance of a teacher, but according to his instructions and under his control. Independent work is a cognitive learning activity, when the sequence of a student's thinking, his mental and practical operations and actions depends and is determined by the student himself.

Independent work of students contributes to the development of independence, responsibility and organization, a creative approach to solving problems at the educational and professional levels, which ultimately leads to the development of the skill of independent planning and implementation of activities.

The purpose of independent work of students is to master the necessary competencies in their field of study, experience in creative and research activities.

Forms of independent work of students:

- work with basic and additional literature, Internet resources;
- self-acquaintance with the lecture material presented on electronic media in the library of an educational institution;
- preparation of abstract reviews of sources of periodicals, reference notes, predetermined by the teacher;
- search for information on the topic with its subsequent presentation to the

audience in the form of a report, presentations;

- preparation for the implementation of classroom control work;
- performance of home control works;
- performance of test tasks, problem solving;
- drawing up crossword puzzles, schemes;
- preparation of reports for presentation at a seminar, conference;
- filling out a workbook;
- essay writing, term paper;
- preparation for business and role-playing games;
- compiling a resume;
- preparation for tests and exams;
- other kinds activities, organized And carried out

educational institution and student self-government bodies.

## VI. CONTROL OF ACHIEVEMENTS OF THE GOALS OF THE COURSE

| No . p / p | Controlled modules / sections / topics of the discipline    | Codes and stages of formation of competencies                 | Appraisal tools - name |  |                           |
|------------|---|---|------------------------|--|---------------------------|
|            |   |   | current control        | intermediate certification                                   |                           |
| 1          | Subject and methods of systems theory. Types and properties | PC-5.1;<br>PC-5.2;<br>PC-5.3;<br>PC-6.1;<br>PC-6.2;<br>PC-6.3 | Knows                  | Interview<br>UO-1, abstract PR-4                             | offset<br>Questions 1-3   |
|            |   |   | Can                    | Tests PR-1, essay PR-3,<br>case-tasks PR-11,<br>presentation |                           |
|            |   |   | owns                   | Work in small groups, UO-3                                   |                           |
| 2          | .The concept of structure in systems theory                 | PC-5.1;<br>PC-5.2;<br>PC-5.3;<br>PC-6.1;<br>PC-6.2;<br>PC-6.3 | Knows                  | Interview<br>UO-1, abstract PR-4                             | offset<br>Questions 4-6   |
|            |   |   | Can                    | Tests PR-1, essay PR-3,<br>case-tasks PR-11,<br>presentation |                           |
|            |   |   | owns                   | Work in small groups, UO-3                                   |                           |
| 3          | Basic Methods of Systems Theory                             | PC-5.1;<br>PC-5.2;<br>PC-5.3;<br>PC-6.1;<br>PC-6.2;<br>PC-6.3 | Knows                  | Interview<br>UO-1, abstract PR-4                             | offset<br>Questions 7-9   |
|            |   |   | Can                    | Tests PR-1, essay PR-3,<br>case-tasks PR-11,<br>presentation |                           |
|            |   |   | owns                   | Work in small groups, UO-3                                   |                           |
| 4          | cybernetic systems. The concept of                          | PC-5.1;<br>PC-5.2;  | Knows                  | Interview<br>UO-1, abstract PR-4                             | offset<br>Questions 10-12 |

|    |  |   |             |  |                        |
|----|--|---|-------------|--|------------------------|
|    | structure in systems theory  | PC-5.3;<br>PC-6.1;<br>PC-6.2;<br>PC-6.3                       | Can<br>owns | Tests PR-1, essay PR-3, case-tasks PR-11, presentation<br>Work in small groups, UO-3 |                        |
| 5  | Freedom and expediency of systems  | PC-5.1;<br>PC-5.2;<br>PC-5.3;<br>PC-6.1;<br>PC-6.2;<br>PC-6.3 | Knows       | Interview UO-1, abstract PR-4  | offset Questions 13-15 |
|    |  |   | Can         | Tests PR-1, essay PR-3, case-tasks PR-11, presentation                               |                        |
|    |  |   | owns        | Work in small groups, UO-3   |                        |
| 6  | Synthetic method in systems theory. Tasks of system analysis   | PC-5.1;<br>PC-5.2;<br>PC-5.3;<br>PC-6.1;<br>PC-6.2;<br>PC-6.3 | Knows       | Interview UO-1, abstract PR-4  | offset Questions 16-18 |
|    |  |   | Can         | Tests PR-1, essay PR-3, case-tasks PR-11, presentation                               |                        |
|    |  |   | owns        | Work in small groups, UO-3   |                        |
| 7  | Systems Research Methods   | PC-5.1;<br>PC-5.2;<br>PC-5.3;<br>PC-6.1;<br>PC-6.2;<br>PC-6.3 | Knows       | Interview UO-1, abstract PR-4  | offset Questions 19-21 |
|    |  |   | Can         | Tests PR-1, essay PR-3, case-tasks PR-11, presentation                               |                        |
|    |  |   | owns        | Work in small groups, UO-3   |                        |
| 8  | Methods of system analysis in relation to solving the problems of organizing medical care for the population | PC-5.1;<br>PC-5.2;<br>PC-5.3;<br>PC-6.1;<br>PC-6.2;<br>PC-6.3 | Knows       | Interview UO-1, abstract PR-4  | offset Questions 22-24 |
|    |  |   | Can         | Tests PR-1, essay PR-3, case-tasks PR-11, presentation                               |                        |
|    |  |   | owns        | Work in small groups, UO-3   |                        |
| 9  | Stages of research systems. Characteristics and classification of scientific research                        | PC-5.1;<br>PC-5.2;<br>PC-5.3;<br>PC-6.1;<br>PC-6.2;<br>PC-6.3 | Knows       | Interview UO-1, abstract PR-4  | offset Questions 25-27 |
|    |  |   | Can         | Tests PR-1, essay PR-3, case-tasks PR-11, presentation                               |                        |
|    |  |   | owns        | Work in small groups, UO-3   |                        |
| 10 | System regularities as a basis for designing control mechanisms for complex social and medical systems       | PC-5.1;<br>PC-5.2;<br>PC-5.3;<br>PC-6.1;<br>PC-6.2;<br>PC-6.3 | Knows       | Interview UO-1, abstract PR-4  | offset Questions 28-30 |
|    |  |   | Can         | Tests PR-1, essay PR-3, case-tasks PR-11, presentation                               |                        |
|    |  |   | owns        | Work in small groups, UO-3   |                        |
|    |  |   | Knows       | Interview  | offset                 |

|        |   |   |       |  |                           |
|--------|---|---|-------|--|---------------------------|
| eleven | Particular methods of system analysis in relation to solving problems in the field of medical service | PC-5.1;<br>PC-5.2;<br>PC-5.3;<br>PC-6.1;<br>PC-6.2;<br>PC-6.3 |       | UO-1, abstract PR-4                                    | Questions 31-33           |
|        |   |   | Can   | Tests PR-1, essay PR-3, case-tasks PR-11, presentation |                           |
|        |   |   | owns  | Work in small groups, UO-3                             |                           |
| 12     | Quantitative methods for describing systems in health care  | PC-5.1;<br>PC-5.2;<br>PC-5.3;<br>PC-6.1;<br>PC-6.2;<br>PC-6.3 | Knows | Interview<br>UO-1, abstract PR-4                       | offset<br>Questions 34-36 |
|        |   |   | Can   | Tests PR-1, essay PR-3, case-tasks PR-11, presentation |                           |
|        |   |   | owns  | Work in small groups, UO-3                             |                           |
| 13     | Qualitative Methods of System Analysis  | PC-5.1;<br>PC-5.2;<br>PC-5.3;<br>PC-6.1;<br>PC-6.2;<br>PC-6.3 | Knows | Interview<br>UO-1, abstract PR-4                       | offset<br>Questions 37-39 |
|        |   |   | Can   | Tests PR-1, essay PR-3, case-tasks PR-11, presentation |                           |
|        |   |   | owns  | Work in small groups, UO-3                             |                           |
| 14     | Methods of formalized representation of systems   | PC-5.1;<br>PC-5.2;<br>PC-5.3;<br>PC-6.1;<br>PC-6.2;<br>PC-6.3 | Knows | Interview<br>UO-1, abstract PR-4                       | offset<br>Questions 40-42 |
|        |   |   | Can   | Tests PR-1, essay PR-3, case-tasks PR-11, presentation |                           |
|        |   |   | owns  | Work in small groups, UO-3                             |                           |
| 15     | Systems Modeling  | PC-5.1;<br>PC-5.2;<br>PC-5.3;<br>PC-6.1;<br>PC-6.2;<br>PC-6.3 | Knows | Interview<br>UO-1, abstract PR-4                       | offset<br>Questions 43-45 |
|        |   |   | Can   | Tests PR-1, essay PR-3, case-tasks PR-11, presentation |                           |
|        |   |   | owns  | Work in small groups, UO-3                             |                           |
| 16     | Biotechnical systems  | PC-5.1;<br>PC-5.2;<br>PC-5.3;<br>PC-6.1;<br>PC-6.2;<br>PC-6.3 | Knows | Interview<br>UO-1, abstract PR-4                       | offset<br>Questions 46-48 |
|        |   |   | Can   | Tests PR-1, essay PR-3, case-tasks PR-11, presentation |                           |
|        |   |   | owns  | Work in small groups, UO-3                             |                           |
| 17     | Simulation  | PC-5.1;<br>PC-5.2;<br>PC-5.3;<br>PC-6.1;<br>PC-6.2;<br>PC-6.3 | Knows | Interview<br>UO-1, abstract PR-4                       | offset<br>Questions 49-50 |
|        |   |   | Can   | Tests PR-1, essay PR-3, case-tasks PR-11, presentation |                           |
|        |   |   | owns  | Work in small groups, UO-3                             |                           |

|    |   |   |       |  |                           |
|----|---|---|-------|--|---------------------------|
| 18 | Models of decision making in the management of complex systems. ACS for medical and biological purposes | PC-5.1;<br>PC-5.2;<br>PC-5.3;<br>PC-6.1;<br>PC-6.2;<br>PC-6.3 | Knows | Interview<br>UO-1, abstract PR-4                             | offset<br>Questions 51-52 |
|    |   |   | Can   | Tests PR-1, essay PR-3,<br>case-tasks PR-11,<br>presentation |                           |
|    |   |   | owns  | Work in small groups, UO-3                                   |                           |

## VII. EDUCATIONAL AND METHODOLOGICAL SUPPORT OF DISCIPLINE

### Main literature

1. Theory of systems and system analysis: textbook. allowance / A.M. Korikov, S.N. Pavlov. - M. : INFRA-M, 2019. - 288 p. Access mode:<http://znanium.com/catalog/product/994445>

2. System analysis: textbook / A.V. Antonov. - 4th ed., revised. and additional - M. : INFRA-M, 2018. - 366 p. + Add. materials [Electronic resource; Access mode:<http://www.znanium.com>]. Access mode:<http://znanium.com/catalog/product/973927>

3. System analysis in management: textbook. allowance / O.V. Bulygin, A.A. Emelyanov, N.Z. Emelyanova, A.A. Kukushkin; ed. Dr. Econ. sciences, prof. A.A. Emelyanov. - 2nd ed., revised. and additional - M. : FORUM : INFRA-M, 2018. - 450 p. Access mode:<http://znanium.com/catalog/product/939889>

4. Systems theory and systems analysis: studies. allowance / A.M. Korikov, S.N. Pavlov. - M. : INFRA-M, 2018. - 288 p.

Access mode:<http://znanium.com/catalog/product/935445>

5. System analysis: Textbook / Kornev G.N., Yakovlev V.B. - M.: ITs RIOR, NITs INFRA-M, 2016. - 308 p. Access mode:<http://znanium.com/catalog/product/538715>

6. System analysis in management: textbook / V.S. Kasyanov, V.N. Popov, I.P. Savchenko. - Moscow: KnoRus, 2016. - 298 p. — ISBN 978-5-406-05085-9.<https://www.book.ru/book/921600>

### additional literature

1. Introduction to the theory of dynamic systems: textbook for universities / M. G. Yumagulov. St. Petersburg, Lan. - 2016. - 272 p.<http://lib.dvfu.ru:8080/lib/item?id=chamo:777259&theme=FEFU>

2. System analysis of biomedical research: textbook for universities / E. P. Popechitelev. Stary Oskol, TNT. - 2014. - 418 p.  
<http://lib.dvfu.ru:8080/lib/item?id=chamo:777135&theme=FEFU>

3. Qualimetry and system analysis: Textbook / V.I. Kirillov. - 2nd ed., erased. - M.: NITs Infra-M; Mn.: Nov. knowledge, 2013. - 440 p.  
<http://lib.dvfu.ru:8080/lib/item?id=Znanium:Znanium-390550&theme=FEFU>

4. Starodubov V. I. Public health and health care. National leadership. GEOTAR-MED. - 2013. - 624 p. Access mode:  
<http://www.studentlibrary.ru/book/ISBN9785970426784.html>

### **The list of resources of the information and telecommunication network "Internet", necessary for the development of the discipline**

1. Patent database and searchpatents<http://www.freepatent.ru/>
2. Internet portal for healthcare<http://bio-x.ru/go.mail.ru/search?rf=e.mail.ru&fm=1&us=15&usln=3&usstr=health&usqid=7d41348ea69338f3&hasnavig=1&sbmt=1509229987234&q=health>
3. Research site<https://infopedia.su/4x3e87.html>;  
<https://dic.academic.ru/dic.nsf/ruwiki/663252>
4. SSAU Electronic Library -<http://library.sgau.ru>
5. NEB -<http://elibrary.ru>
6. Student library<http://www.studmedlib.ru>
- 7.<http://www.medliter.ru/?page=list&id=09>
- 8.<http://www.rmj.ru/medjurnrus.htm>
9. Spravochno-legal system Consultant plus.
10. <http://vladmedicina.ru> Medical portal of Primorsky Krai
- eleven. <http://www.rosminzdrav.ru> Official website of the Ministry of Health of the Russian Federation
12. <http://meduniver.com> Medical site about various fields of medicine

### **List of information technologies and software**

- Microsoft Office Professional Plus 2010;
- an office suite that includes software for working with various types of documents (texts, spreadsheets, databases, etc.);
- 7Zip 9.20 - free file archiver with a high degree of data compression;
- ABBYY FineReader 11 - software for optical character recognition;



- Adobe Acrobat XI Pro - a software package for creating and viewing electronic publications in PDF format;
- ESET Endpoint Security - comprehensive protection of workstations based on Windows OS. Virtualization support + new technologies;
- WinDjView 2.0.2 is a program for recognizing and viewing files with the same name format DJV and DjVu.

## **VIII. METHODOLOGICAL INSTRUCTIONS FOR MASTERING THE DISCIPLINE**

The practical part of the discipline "Systems analysis and management in healthcare" is revealed in practical classes, where the teacher gives the basic concepts of the discipline and the implementation of independent work on the discipline.

Practical classes of the course are held in all sections of the curriculum. Practical work is aimed at developing students' skills of independent research work. During practical classes, the master performs a set of tasks that allows you to consolidate the material on the topic under study.

The active consolidation of theoretical knowledge, carried out as a result of independent study of the material, is facilitated by the discussion of the problematic aspects of the discipline in the form of a seminar and classes using active learning methods. At the same time, the development of skills of independent research activity in the process of working with scientific literature, periodicals, the formation of the ability to reasonably defend one's point of view, listen to others, answer questions, and lead a discussion take place.

**Practical lessons** focused on the most fundamental and problematic issues and are designed to stimulate the development of their own position on these topics.

In working with students, a variety of means, forms and methods of teaching (information-developing, problem-search) are used: the method of scientific discussion, a conference or a round table, an analysis of specific educational situations (case study).

### **Conference or round table**

When using this method, you can invite various specialists involved in the study of the problem under consideration or working on a topic studied by students. These can be scientists, economists, artists, representatives of public organizations, government agencies, etc.

Before such a meeting, the teacher invites students to put forward a problem of interest to them on this topic and formulate questions for their discussion. If students find it difficult, the teacher can suggest a number of problems and, together with the students, choose a more interesting one for them. Selected questions are transferred to the invited expert of the round table to prepare for the presentation and answers. At the same time, several specialists involved in the study of this problem can be invited to the "round table". In order for the round table meeting to be active and interested, it is necessary to encourage listeners to exchange views and maintain an atmosphere of free discussion.

When applying all these forms of classes, students get a real practice of formulating their point of view, comprehending the system of argumentation, that is, turning information into knowledge, and knowledge into beliefs and views.

The collective form of interaction and communication teaches students to formulate thoughts in a professional language, to speak orally, to listen, hear and understand others, to argue correctly and reasonably. Joint work requires not only individual responsibility and independence, but also self-organization of the work of the team, exactingness, mutual responsibility and discipline. At such seminars, the subject and social qualities of a professional are formed, the goals of training and educating the personality of a future specialist are achieved.

The features of collective mental activity are that there is a rigid dependence of the activity of a particular student on a fellow student; it helps to solve the psychological problems of the team; there is a "transfer" of action from one participant to another; self-management skills develop.

There are various forms of organizing and conducting this type of training, such as a press conference.

At the previous lesson, the teacher gives the task to students to individually answer the questions of the practical lesson and collectively discuss options for solving the same situation, which significantly deepens the experience of the trainees. Faced with a specific situation, the student must determine whether there is a problem in it, what it consists of, determine their attitude to the situation. At the same time, each student must, by getting used to the role of specific historical figures, analyze the causes, course and results of the events. The practical lesson begins with an introductory speech by the teacher, in which the problems for discussion are voiced. As the discussion proceeds, each of the students has the opportunity to get acquainted with the solutions, listen and weigh their many assessments, additions, changes, enter into a dialogue and discussion.

As the questions of the practical lesson are discussed, the analytical abilities of the trainees develop, contribute to the correct use of the information at their disposal, develop independence and initiative in decisions.

At the final stage of the lesson, the teacher, correcting the conclusions on the performances of students, draws general conclusions for each practical task and the overall result for the entire lesson.

### **Method of scientific discussion**

The academic group is divided into two subgroups - generators and critics of ideas. Three more people stand out - expert analysts.

The practical lesson is implemented in four stages:

The first is preparatory (carried out 1-2 weeks before the practical session). The teacher instructs about the purpose, content, nature, rules of participation in the game. Student preparation includes:

- determination of the purpose of the lesson, specification of the educational task;
- planning the general course of the lesson, determining the time of each stage of the lesson;
- development of criteria for evaluating the proposals and ideas received, which will make it possible to purposefully and meaningfully analyze and summarize the results of the lesson.

Mutual criticisms and evaluations are strictly prohibited; they hinder the emergence of new ideas. You should refrain from actions, gestures that may be misinterpreted by other participants in the session. No matter how fantastic or incredible the idea put forward by any of the participants in the session, it should be met with approval. The more proposals put forward, the greater the likelihood of a new and valuable idea.

The second - the lesson begins with the fact that the generators of ideas quickly and clearly characterize the ruler, the situation in the country and express all proposals for solving the named problem;

Third - critics of ideas "attack" - select the most valuable, progressive of them, analyze, evaluate, criticize and include in the list of relevant assumptions that provide a solution to the problem;

Fourth - experts analyze and evaluate the activities of both subgroups, the significance of the ideas put forward.

The goal of the teacher is to organize collective mental activity to find non-traditional ways to solve problems, when discussing controversial issues, hypotheses, problematic or conflict situations.

When writing essays, it is recommended to independently find literature for it. The abstract reveals the content of the problem under study. Working on an essay helps to deepen the understanding of individual issues of the course, form and defend one's point of view, acquire and improve the skills of independent creative work, and conduct active cognitive work.

An interview and a survey are conducted to conduct ongoing monitoring and intermediate certification. To prepare for the test, a list of questions is provided in Appendix 2.

## IX. LOGISTICS AND TECHNICAL SUPPORT OF THE DISCIPLINE

The educational process in the discipline is carried out in the lecture, computer classes of the building of the School of Biomedicine of the FEFU campus, equipped with computers and multimedia systems, with a connection to the FEFU corporate network and the Internet, the simulation Center of the FEFU School of Biomedicine.

The material and technical support for the implementation of the discipline includes classrooms for lectures and practical classes, equipped with multimedia support and corresponding to sanitary and contrary rules and regulations.

In order to provide special conditions for the education of people with disabilities and people with disabilities in FEFU, all buildings are equipped with ramps, elevators, lifts, specialized places equipped with toilets, information and navigation support signs.

| Name of equipped premises and premises for independent work   | List of main equipment  |
|---|---|
| 690922, Primorsky Territory, Vladivostok, Russian Island, Saperny Peninsula, Ayaks village, 10, School of Biomedicine, room M 419, area 74.9 m <sup>2</sup> | Multimedia Audience:<br>Motorized Screen 236*147cm Trim Screen Line; Projector DLP, 3000 ANSI Lm, WXGA 1280x800, 2000:1 EW330U Mitsubishi; document camera CP355AF Avergence, video camera MP-HD718 Multipix; Subsystem of specialized equipment fastenings CORSA-2007 Tuarex; Video switching subsystem: Audio switching and sound amplification subsystem: power amplifier, wireless LAN based on 802.11 a/b/g/n 2x2 MIMO(2SS) access points. |
| 690922, Primorsky Territory, Vladivostok, Russian Island, Saperny Peninsula, Ayaks settlement, 10, room M612, area 47.2 m <sup>2</sup>                      | Computer class for 22 workplaces:<br>HP ProOpe 400 All-in-One 19.5 (1600x900), Core i3-4150T, 4GB DDR3-1600 (1x4GB), 1TB HDD 7200 SATA, DVD+/-RW, GigEth, Wi-Fi, W, usb kbd/ mse, Win7Pro(64-bit)+Win8.1Pro(64-bit), 1-1-1 Wty (25 pcs.)  |
| Reading rooms of the FEFU Scientific Library with open access to the fund (building A - level 10)   | HP ProOpe 400 All-in-One 19.5 (1600x900), Core i3-4150T, 4GB DDR3-1600 (1x4GB), 1TB HDD 7200 SATA, DVD+/-RW, GigEth, Wi-Fi, BT, usb kbd/ mse, Win7Pro (64-bit)+Win8.1Pro(64-bit), 1-1-1 Wty Internet access speed 500   |

|  |  |
|--|--|
|  | Mbps. Workplaces for people with disabilities are equipped with Braille displays and printers; equipped with: portable devices for reading flat-print texts, scanning and reading machines, a video enlarger with the ability to regulate color spectra; magnifying electronic loupes and ultrasonic markers |
|--|--|

## X. VALUATION FUND

### FOS passport

| Task type                     | Code and name of professional competence (result of development)   | Code and name of the indicator of achievement of competence   |
|-------------------------------|--|---|
| organizational and managerial | PC-5 The ability to evaluate the effectiveness of the activities of a medical organization, develop and select optimal management decisions, develop a business plan for the development of a medical organization, use a process approach in managing a medical organization, use technological maps of the processes of a medical organization | PC-5.1 Knows the methods of planning a medical organization<br>PC-5.2 Able to draw up a plan for a medical organization, develop business planning and investment projects<br>PC-5.3 Proficient in planning, developing business planning and investment projects                                 |
| organizational and managerial | PC-6 The ability to develop plans and programs, form a system of indicators for the activities of a medical organization, evaluate the effectiveness of a medical organization, develop options for management decisions and assess the risks associated with their implementation   | PC-6.1 Knows the features of the formation of a system of indicators of a medical organization<br>PC-6.2 Is able to evaluate the effectiveness of the medical organization, taking into account the formed system of indicators<br>PC-6.3 Has the skills to form performance indicators, evaluate |

| Code and wording of competence                                    | Stages of competence formation   |
|---|--|
| PC-5.1 Knows the methods of planning a medical organization       | Knows the methods of planning a medical organization<br>Able to plan the work of a medical organization          |
| PC-5.2 Able to draw up a plan for a medical organization, develop | Knows the rules for drawing up a plan for a medical organization, develop a business plan, an investment project |

|   |   |
|---|---|
| business planning and investment projects   | Able to draw up a plan for a medical organization, develop business planning and investment projects<br>Has the skill of drawing up a plan for a medical organization, developing business and investment projects  |
| PC-5.3 Proficient in planning, developing business planning and investment projects   | Knows the principles of goal-setting, types and methods of organizational planning and fundamental concepts of financial management, as well as the method of a process approach to managing a medical organization<br>Able to develop corporate, competitive and functional strategies for the development of the organization, develop investment projects and conduct their verification<br>He owns the methods of formulating and implementing strategies at the business unit level, developing and implementing marketing programs, as well as methods of investment analysis and analysis of financial markets, a process approach in managing a medical organization and the ability to use flow charts of the processes of a medical organization. |
| PC-6.1 Knows the features of the formation of a system of indicators of a medical organization  | Knows the features of the formation of a system of indicators of a medical organization<br>Able to form and fulfill the indicators of a medical organization<br>Possesses the skill of forming and fulfilling the indicators of a medical organization  |
| PC-6.2 Is able to evaluate the effectiveness of the medical organization, taking into account the formed system of indicators   | Knows the main performance indicators of a medical organization<br>Knows how to evaluate the effectiveness of the activities of a medical organization, taking into account the formed system of indicators<br>Possesses the skill of evaluating the effectiveness of the activities of a medical organization, taking into account the formed system of indicators   |
| PC-6.3 Has the skills to form performance indicators, evaluate their effectiveness, as well as the ability to develop management decisions with an assessment of the risks associated with their implementation | Knows the main performance indicators of a medical organization<br>Knows how to form performance indicators, evaluate their effectiveness, assess the risks associated with their implementation<br>Possesses the skills of forming performance indicators, evaluating their effectiveness, as well as the ability to develop management decisions with an assessment of the risks associated with their implementation   |

## VI. CONTROL OF ACHIEVEMENTS OF THE GOALS OF THE COURSE

| No . p / p | Controlled modules / sections / topics of the discipline | Codes and stages of formation of competencies | Appraisal tools - name |                                  |                         |
|------------|--|---|------------------------|----------------------------------|-------------------------|
|            |  |   | current control        | intermediate certification       |                         |
| 1          |  | PC-5.1;<br>PC-5.2;                            | Knows                  | Interview<br>UO-1, abstract PR-4 | offset<br>Questions 1-3 |

|   |  |   |                      |   |                        |
|---|--|---|----------------------|---|------------------------|
|   | Subject and methods of systems theory. Types and properties    | PC-5.3;<br>PC-6.1;<br>PC-6.2;<br>PC-6.3                       | Can<br>owns          | Tests PR-1, essay PR-3, case-tasks PR-11, presentation<br>Work in small groups, UO-3                                  |                        |
| 2 | .The concept of structure in systems theory                    | PC-5.1;<br>PC-5.2;<br>PC-5.3;<br>PC-6.1;<br>PC-6.2;<br>PC-6.3 | Knows<br>Can<br>owns | Interview UO-1, abstract PR-4<br>Tests PR-1, essay PR-3, case-tasks PR-11, presentation<br>Work in small groups, UO-3 | offset Questions 4-6   |
| 3 | Basic Methods of Systems Theory                                | PC-5.1;<br>PC-5.2;<br>PC-5.3;<br>PC-6.1;<br>PC-6.2;<br>PC-6.3 | Knows<br>Can<br>owns | Interview UO-1, abstract PR-4<br>Tests PR-1, essay PR-3, case-tasks PR-11, presentation<br>Work in small groups, UO-3 | offset Questions 7-9   |
| 4 | cybernetic systems. The concept of structure in systems theory | PC-5.1;<br>PC-5.2;<br>PC-5.3;<br>PC-6.1;<br>PC-6.2;<br>PC-6.3 | Knows<br>Can<br>owns | Interview UO-1, abstract PR-4<br>Tests PR-1, essay PR-3, case-tasks PR-11, presentation<br>Work in small groups, UO-3 | offset Questions 10-12 |
| 5 | Freedom and expediency of systems                              | PC-5.1;<br>PC-5.2;<br>PC-5.3;<br>PC-6.1;<br>PC-6.2;<br>PC-6.3 | Knows<br>Can<br>owns | Interview UO-1, abstract PR-4<br>Tests PR-1, essay PR-3, case-tasks PR-11, presentation<br>Work in small groups, UO-3 | offset Questions 13-15 |
| 6 | Synthetic method in systems theory. Tasks of system analysis   | PC-5.1;<br>PC-5.2;<br>PC-5.3;<br>PC-6.1;<br>PC-6.2;<br>PC-6.3 | Knows<br>Can<br>owns | Interview UO-1, abstract PR-4<br>Tests PR-1, essay PR-3, case-tasks PR-11, presentation<br>Work in small groups, UO-3 | offset Questions 16-18 |
| 7 | Systems Research Methods                                       | PC-5.1;<br>PC-5.2;<br>PC-5.3;<br>PC-6.1;<br>PC-6.2;<br>PC-6.3 | Knows<br>Can<br>owns | Interview UO-1, abstract PR-4<br>Tests PR-1, essay PR-3, case-tasks PR-11, presentation<br>Work in small groups, UO-3 | offset Questions 19-21 |
| 8 |  |   | Knows                | Interview   | offset                 |

|        |  |   |       |  |                           |
|--------|--|---|-------|--|---------------------------|
|        | Methods of system analysis in relation to solving the problems of organizing medical care for the population | PC-5.1;<br>PC-5.2;<br>PC-5.3;<br>PC-6.1;<br>PC-6.2;<br>PC-6.3 |       | UO-1, abstract PR-4                                    | Questions 22-24           |
|        |  |   | Can   | Tests PR-1, essay PR-3, case-tasks PR-11, presentation |                           |
|        |  |   | owns  | Work in small groups, UO-3                             |                           |
| 9      | Stages of research systems. Characteristics and classification of scientific research                        | PC-5.1;<br>PC-5.2;<br>PC-5.3;<br>PC-6.1;<br>PC-6.2;<br>PC-6.3 | Knows | Interview<br>UO-1, abstract PR-4                       | offset<br>Questions 25-27 |
|        |  |   | Can   | Tests PR-1, essay PR-3, case-tasks PR-11, presentation |                           |
|        |  |   | owns  | Work in small groups, UO-3                             |                           |
| 10     | System regularities as a basis for designing control mechanisms for complex social and medical systems       | PC-5.1;<br>PC-5.2;<br>PC-5.3;<br>PC-6.1;<br>PC-6.2;<br>PC-6.3 | Knows | Interview<br>UO-1, abstract PR-4                       | offset<br>Questions 28-30 |
|        |  |   | Can   | Tests PR-1, essay PR-3, case-tasks PR-11, presentation |                           |
|        |  |   | owns  | Work in small groups, UO-3                             |                           |
| eleven | Particular methods of system analysis in relation to solving problems in the field of medical service        | PC-5.1;<br>PC-5.2;<br>PC-5.3;<br>PC-6.1;<br>PC-6.2;<br>PC-6.3 | Knows | Interview<br>UO-1, abstract PR-4                       | offset<br>Questions 31-33 |
|        |  |   | Can   | Tests PR-1, essay PR-3, case-tasks PR-11, presentation |                           |
|        |  |   | owns  | Work in small groups, UO-3                             |                           |
| 12     | Quantitative methods for describing systems in health care   | PC-5.1;<br>PC-5.2;<br>PC-5.3;<br>PC-6.1;<br>PC-6.2;<br>PC-6.3 | Knows | Interview<br>UO-1, abstract PR-4                       | offset<br>Questions 34-36 |
|        |  |   | Can   | Tests PR-1, essay PR-3, case-tasks PR-11, presentation |                           |
|        |  |   | owns  | Work in small groups, UO-3                             |                           |
| 13     | Qualitative Methods of System Analysis   | PC-5.1;<br>PC-5.2;<br>PC-5.3;<br>PC-6.1;<br>PC-6.2;<br>PC-6.3 | Knows | Interview<br>UO-1, abstract PR-4                       | offset<br>Questions 37-39 |
|        |  |   | Can   | Tests PR-1, essay PR-3, case-tasks PR-11, presentation |                           |
|        |  |   | owns  | Work in small groups, UO-3                             |                           |
| 14     | Methods of formalized representation of systems  | PC-5.1;<br>PC-5.2;<br>PC-5.3;<br>PC-6.1;<br>PC-6.2;<br>PC-6.3 | Knows | Interview<br>UO-1, abstract PR-4                       | offset<br>Questions 40-42 |
|        |  |   | Can   | Tests PR-1, essay PR-3, case-tasks PR-11, presentation |                           |
|        |  |   | owns  | Work in small groups, UO-3                             |                           |



|    |   |   |       |  |                           |
|----|---|---|-------|--|---------------------------|
| 15 | Systems Modeling  | PC-5.1;<br>PC-5.2;<br>PC-5.3;<br>PC-6.1;<br>PC-6.2;<br>PC-6.3 | Knows | Interview<br>UO-1, abstract PR-4                             | offset<br>Questions 43-45 |
|    |   |   | Can   | Tests PR-1, essay PR-3,<br>case-tasks PR-11,<br>presentation |                           |
|    |   |   | owns  | Work in small groups, UO-3                                   |                           |
| 16 | Biotechnical systems  | PC-5.1;<br>PC-5.2;<br>PC-5.3;<br>PC-6.1;<br>PC-6.2;<br>PC-6.3 | Knows | Interview<br>UO-1, abstract PR-4                             | offset<br>Questions 46-48 |
|    |   |   | Can   | Tests PR-1, essay PR-3,<br>case-tasks PR-11,<br>presentation |                           |
|    |   |   | owns  | Work in small groups, UO-3                                   |                           |
| 17 | Simulation  | PC-5.1;<br>PC-5.2;<br>PC-5.3;<br>PC-6.1;<br>PC-6.2;<br>PC-6.3 | Knows | Interview<br>UO-1, abstract PR-4                             | offset<br>Questions 49-50 |
|    |   |   | Can   | Tests PR-1, essay PR-3,<br>case-tasks PR-11,<br>presentation |                           |
|    |   |   | owns  | Work in small groups, UO-3                                   |                           |
| 18 | Models of decision making in the management of complex systems. ACS for medical and biological purposes | PC-5.1;<br>PC-5.2;<br>PC-5.3;<br>PC-6.1;<br>PC-6.2;<br>PC-6.3 | Knows | Interview<br>UO-1, abstract PR-4                             | offset<br>Questions 51-52 |
|    |   |   | Can   | Tests PR-1, essay PR-3,<br>case-tasks PR-11,<br>presentation |                           |
|    |   |   | owns  | Work in small groups, UO-3                                   |                           |

### Competence level assessment scale

| Code and wording of competence  | Stages of competence formation |   | Criteria  | Indicators   | Points |
|---|--------------------------------|---|---|--|--------|
| PC-5<br>The ability to assess the effectiveness of the activities of a medical organization, develop and select optimal management decisions, develop a business plan | knows<br>(threshold level)     | principles of goal setting, types and methods of organizational planning and fundamental concepts of financial management | knowledge of the basic concepts of research processes, incl. business processes in medicine | the ability to explain the main stages of the study of the business plan of a medical organization, the process approach in the management of a medical organization | 65-71  |
|   | can<br>(advanced)              | develop corporate, competitive and functional strategies  | the ability to analyze and compare the  | the ability to develop investment projects and   | 71-84  |

|  |                         |   |   |  |        |
|--|-------------------------|---|---|--|--------|
| for the development of a medical organization, use a process approach in managing a medical organization, use technological maps of the processes of a medical organization  |                         | for the development of the organization, develop investment projects and conduct their verification   | stages of the process of strategic development of a medical organization, business planning and the use of technological maps of the processes of medical activity                  | conduct their verification based on the use of a process approach in the management of a medical organization and the use of technological maps of the processes of medical activity   |        |
|  | owns (high)             | methods for formulating and implementing strategies at the business unit level, developing and implementing marketing programs, as well as methods for investment analysis and analysis of financial markets. | methods of collecting, processing, analyzing information and presenting them to implement the business strategies of a medical organization using flow charts of medical activities | the ability to formulate the main stages and explain the tasks for the implementation of marketing programs and the analysis of financial markets using a process approach in the management of a medical organization and the use of technological process maps of medical activities | 85-100 |
| PC-6<br>the ability to develop plans and programs, form a system of indicators for the activities of a medical organization, evaluate the effectiveness of a medical organization, develop options for management decisions and assess the risks | knows (threshold level) | fundamentals of planning and principles of organizing and implementing measures to ensure the protection of public health, the main indicators of the activities of a medical organization                    | the basics of planning measures to ensure the protection of public health and is able to evaluate the effectiveness of a medical organization                                       | application of the basics of planning measures to ensure the protection of public health, a system of indicators of the activities of a medical organization, taking into account management decisions   | 65-71  |
|  | can (advanced)          | plan measures to ensure the protection of public health; develop plans and programs, form a system of indicators  | properly draw up official medical documents, maintain primary medical   | realize measures to ensure the protection of public health, form a system of indicators of the   | 71-84  |

|                                      |             |  |   |   |        |
|--------------------------------------|-------------|--|---|---|--------|
| associated with their implementation |             | for the activities of a medical organization   | records, develop options for management decisions and assess the risks associated with their implementation   | activities of a medical organization, evaluate the effectiveness of the activities of a medical organization  |        |
|                                      | owns (high) | skills in planning, organizing and implementing measures to ensure the protection of public health | skills in preparing a rationale for the volume of medical care in accordance with the resources of a medical organization and the needs of the population | justification of the volume of medical care in accordance with the resources of the medical organization and the needs of the population, options for management decisions and risk assessment associated with their implementation | 85-100 |

**Methodological recommendations that determine the procedures for evaluating the results of mastering the discipline**

**Current certification of students.** It is carried out in accordance with the local regulations of the Far Eastern Federal University and is mandatory. It is carried out in the form of control measures: the defense of a test, an interview to assess the actual results of students' learning and is carried out by a leading teacher.

The objects of assessment are:

- academic discipline (activity in the classroom, the timeliness of the implementation of various types of tasks, attendance at all types of classes in the discipline being certified);
- the degree of assimilation of theoretical knowledge (survey);
- the level of mastery of practical skills and abilities in all types of educational work (colloquium);
- results of independent work.

**Intermediate certification of students.** It is carried out in accordance with the local regulations of the Far Eastern Federal University and is mandatory. Provides for the accounting of the results of all stages of the development of the course. Provided that two stages of the current attestation have been successfully passed, the student is given an intermediate attestation (test, exam).

**Test and examination materials.** When assessing students' knowledge, intermediate control takes into account the amount of knowledge, the quality of their assimilation, understanding the logic of the academic discipline, the place of each topic in the course. The ability to freely, competently, logically coherently present what has been studied, the ability to reasonably defend one's own point of view are assessed.

*Certification* students in the discipline "Systems analysis and management in healthcare» is carried out in accordance with the local regulations of the FEFU in the form of a test.

### **I. Evaluation tools for intermediate certification**

Intermediate certification includes the student's response to test questions.

#### **Questions for offset**

1. The concepts of "complex system", "element of a complex system", "level of analysis of a complex system" and their relationship. Examples.
2. Manifestations of the time factor in complex systems. Examples.
3. Time as a system-forming factor and temporal organization of complex systems. Examples.
4. Groups of system characteristics, their difference and purpose. Examples.
5. Concepts about the phase space (state space) of a complex system, phase trajectory; phase portrait, bifurcations. Examples.
6. System characteristics reflecting the composition and structure of a complex system. Examples.
7. System characteristics displaying integrative (emergent) properties. Examples.
8. System characteristics that reflect the interaction of the system with the environment. Examples.
9. Groups of characteristics of elements of complex systems. Interrelation of characteristics of elements and characteristics of systems. Examples.
10. Functional characteristics of elements of complex systems. Examples.
11. Static and dynamic characteristics of elements of complex systems, their difference. Examples.
12. The concept of linear elements of systems and their characteristics. Examples.
13. The concept of nonlinear elements of systems and their characteristics. Examples.
14. Structure of complex systems. Interrelation of concepts "structure" and

"system". Examples.

15. The main components of the structure of a complex system, connection with the concept of "level of analysis". Examples.

16. The concept of a "subsystem" as an element of the structure and an element of the system. Examples.

17. Hierarchical levels in a complex system. Examples.

18. The main generalized characteristics of the structure of a complex system. Examples.

19. The category of purpose in the subject spaces of philosophy and systems theory.

20. K.E. Tsiolkovsky, A.N. Kolmogorov, N.N. Moiseev on the objective nature of goals.

21. Theoretical analysis of the content of the category "system goal".

22. The form of representation of the purpose of the system.

23. Behavior of systems, its conditionality and expediency.

24. Methods for studying the expediency of systems. Examples

25. Hierarchy of goals of the economic system. Examples

26. The contradiction between the applied and superficial levels in the hierarchy of goals of a commercial enterprise.

27. Methodology for identifying the causes of interaction effects.

28. The place of system analysis in the family of analytical methods of scientific research. Examples

29. Essence and applied value of the system analysis method.

30. Purpose and result of system analysis.

31. The sequence of system analysis.

32. Methods of system analysis.

33. The sequence of system analysis using the black box method.

34. The principle of modeling in system analysis. Connection between system analysis and operations research.

35. Application of the evolutionary method as a method of system analysis.

36. System description of economic analysis.

37. Tasks solved by examination. Sequence of examination.

38. Organization of collective examinations. Judgment and brainstorming methods.

39. Organization of collective examinations. Delphi method.

40. Organization of collective examinations. Scenario method and provocation method.

41. The method of mathematical modeling, its significance for systems theory and management practice.
42. Concepts of mathematical model and economic-mathematical modeling.
43. The role of modeling in the process of cognition.
44. Scope and limits of application of modeling.
45. The sequence of development of the mathematical model.
46. The concept of formalism. Examples of formalisms.
47. Essence and distinctive features of simulation modeling.
48. Basic assumption of simulation modeling.
49. Essence and practical significance of the system synthesis method.
50. Approaches to the synthesis of organizational management systems with specified characteristics.
51. Indicators of centrality and peripherality of an element of the organizational management system.
52. Methodical approaches to the synthesis of state policy of business regulation, public health.

## **II. Evaluation tools for current certification**

### **Abstract Evaluation Criteria**

- 100-86 points are given to the student if the student expressed his opinion on the formulated problem, argued it, accurately defining its content and components. The data of domestic and foreign literature, statistical information, information of a regulatory nature are given. The student knows and owns the skill of independent research work on the research topic; methods and techniques for analyzing the theoretical and / or practical aspects of the area under study.
- 85-76 - points - the work is characterized by semantic integrity, coherence and consistency of presentation; no more than 1 mistake was made when explaining the meaning or content of the problem. For argumentation, data of domestic and foreign authors are given. Demonstrated research skills and abilities. There are no actual errors related to understanding the problem.
- 75-61 points - the student conducts a fairly independent analysis of the main stages and semantic components of the problem; understands the basic foundations and theoretical justification of the chosen topic. The main sources on the topic under consideration are attracted. No more than 2 errors were made in the sense or content of the problem.
- 60-50 points - if the work is a retold or completely rewritten source text without any comments or analysis. The structure and theoretical component of the

topic is not disclosed. Three or more than three errors were made in the semantic content of the problem being disclosed.

**Criteria for grading a student in the test for the discipline "Systems analysis and management in healthcare"**

| Credit score  | Requirements for the formed competencies  |
|---------------|---|
| "passed"      | The grade "passed" is given to the student if he knows the material well, presents it competently and to the point, avoids significant inaccuracies in answering the question, correctly applies the theoretical provisions in solving practical issues and tasks, possesses the necessary skills and techniques for their implementation         |
| "not counted" | The grade "not passed" is given to a student who does not know a significant part of the program material, makes significant mistakes, uncertainly, with great difficulty answers the questions posed. As a rule, the "failed" mark is given to students who cannot continue their studies without additional classes in the relevant discipline. |

**Evaluation tools for current certification**

**Control tests** are intended for masters studying the course "Health of the population of the region and health care priorities".

When working with tests, it is proposed to choose one answer option from three to four offered. At the same time, the tests are not the same in their complexity. Among the proposed there are tests that contain several options for correct answers. All correct answers must be provided.

Tests are designed for both individual and collective decision. They can be used in both classroom and self-study. The selection of tests necessary for the control of knowledge in the process of intermediate certification is made by each teacher individually.

The results of the test tasks are evaluated by the teacher on a five-point scale for attestation or according to the "pass" - "fail" system. The grade "excellent" is given with the correct answer to more than 90% of the tests proposed by the teacher. Rating "good" - with the correct answer to more than 70% of the tests. Grade "satisfactory" - with the correct answer to 50% of the proposed tests.

**Test tasks**

**«Systems analysis and management in healthcare»**

**1. An active participant in the directed activity will be called:**

- 1) subject;
- 2) an observer;
- 3) an object.

**2. Model is:**

- 1) simplified similarity of the object;
- 2) object of influence;
- 3) an economic phenomenon.

**3. Mathematical model:**

- 1) description of material objects;
- 2) a system of relations describing the process under study, or phenomenon;
- 3) conscientious description of something.

**4. Perturbations are:**

- 1) controlled variables;
- 2) uncontrolled variables;
- 3) controlled variables.

**5. The system is:**

- 1) an ordered representation of the object of study in terms of the goal set;
- 2) measure of quantitative description;
- 3) the side of the object, causing its difference or similarity with other objects.

**6. Subsystem is:**

- 1) a system that is an element of this system;
- 2) a set of homogeneous elements of the system;
- 3) an object that performs certain functions.

**7. The structure of the system is:**

- 1) a kind of feedback;
- 2) an object that influences the results of functioning;
- 3) stable ordering in space and time of its elements and connections between them.

**8. Methods for constructing a mathematical model are:**

- 1) analytical and statistical;
- 2) object and identification;
- 3) structural and graphic.

**9. Extrapolation is:**

- 1) dissemination of the results of observations obtained over one part of the phenomenon, to another part of it;
- 2) a naturally arising question about the causes of changes;
- 3) non-stationary system.



**10. A system whose state practically does not change during a certain period of its existence is called:**

- 1) dynamic system;
- 2) static system;
- 3) internal system.

**11. The process of processing input information into output is called:**

- 1) the functioning of the system;
- 2) the state of the system;
- 3) coefficient of the system.

**12. A system in which some element plays the main, dominant role in the functioning of the system is called:**

- 1) the leading part of the system;
- 2) decentralized system;
- 3) centralized system.

**13. If among the free members of the system there are other than 0, then the system is called:**

- 1) homogeneous;
- 2) heterogeneous;
- 3) joint.

**14. A system that has at least one solution is called:**

- 1) homogeneous;
- 2) heterogeneous;
- 3) joint.

**15. A homogeneous system will always be:**

- 1) joint;
- 2) incompatible;
- 3) indefinite.

**16. If two systems have the same set of solutions, then such systems are called:**

- 1) homogeneous;
- 2) joint;
- 3) equivalent.

**17. Consideration of the system in terms of its behavior in the environment to achieve goals is called:**

- 1) system-functional approach;
- 2) system-elemental approach;
- 3) system-structural approach.

**18. Strict scientific knowledge about the world of systems and an explanation of the origin of the device and the functioning of systems of various nature is called:**

- 1) system theory;
- 2) system analysis;
- 3) system method.

#### **Test Evaluation Criteria**

Evaluation is carried out in an e-learning session on a 100-point scale.

The test includes 100 tasks, the maximum score for the test is 100.

Within the framework of the current level of assimilation of knowledge in the discipline, the test result is allowed, not lower than 61 points.