



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

(signature) (I.O. Surname)

December 21, 2021

E.V. Khozhaenko

WORKING PROGRAM OF THE DISCIPLINE

System and entropy patterns of information processing

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 2

lectures 4 hours.

practical classes 18 hours.

total classroom hours 22 hours.

independent work 50 hours.

credit 3 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

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. _____
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I. Goals and objectives of mastering the discipline:

The purpose of the discipline: Preparing students for the study of subsequent disciplines, both forming the scientific and theoretical foundations of the specialty, and others. Assimilation of the main provisions of the information approach to the analysis and synthesis of objects, phenomena and systems; introduction to the information theory of measurements and measuring devices, assimilation of its axiomatic provisions and methods developed on their basis for processing measurement results.

Discipline tasks:

- Familiarization with the ways of reflection in the mind of a person of the world around and the corresponding types of information; about ontological and semiotic aspects of information;
- Know and be able to use mathematical models, system and entropy patterns; different approaches to assessing the amount of information; methods for assessing the accuracy and quality of measurements using entropy values of measurement uncertainty; practical methods for determining the entropy value; measurement uncertainties based on both theoretical and experimental data;
- Be able to determine the quantitative characteristics of information processes; correct use of various types of information; definitions of entropy value; measurement uncertainties; transition from information estimates of measurement accuracy to estimates based on the use of confidence intervals.

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
research	PC-3 The ability to organize, plan and control the activities of a structural unit of a medical organization	PC-3.1 Knows the standards of medical care PC-3.2 Knows how to assess the resources of a medical organization and implement a quality management system PC-3.3 Possesses the necessary skills for compiling reporting documentation, evaluating the activities of a healthcare institution

Code and name of the indicator of achievement of competence	Name of the assessment indicator (the result of training in the discipline)
PC-3.1 Knows the standards of medical care	Knows the standards of medical care Able to provide first aid Proficient in first aid

PC-3.2 Knows how to assess the resources of a medical organization and implement a quality management system	Knows the quality management system of a medical organization Knows how to evaluate the resources of a medical organization and implement a quality management system Possesses the skill of assessing the resources of a medical organization and implementing a quality management system
PC-3.3 Possesses the necessary skills for compiling reporting documentation, evaluating the activities of a healthcare institution	Knows the reporting documentation of the medical organization Able to prepare reporting documentation of a medical organization Possesses the necessary skills for compiling reporting documentation, evaluating the activities of a healthcare institution

For the formation of the above competencies within the discipline "System and entropy patterns of information processing» the following methods of active / interactive learning are used: lectures - conferences, problematic lectures, visualization lectures; 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 complexity of the discipline is 2 credit units (72 academic hours).
(1 credit unit corresponds to 36 academic hours)

The types of training sessions and work of the student in the discipline are:

Designation	Types of training sessions and work of the student
Lek	Lectures
Lek electr.	
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

Discipline structure:

Full-time form of education.

N o.	Section name disciplines	S e m	The number of hours by type of training sessions and work of the student	Forms of intermediate certification
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		e s t e r	Lek	Lab	Etc	OK	SR	Contr ol	
	MODULE 1. System and entropy patterns of information processing	2	2		18		54		
	Total:	2	2	-	18	-	50		offset

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

Lecture classes

Topic 1. REFLECTION AND INFORMATION

Two properties of matter: the property to exist and the property to be reflected (to have structure or information). Matter as a set of all primary sources of information. Reflection as a set of all ways of obtaining information. Information is a product of the reflection of matter in the human mind, a reflected diversity. The Dialectic of Reflection. Ontological and semiotic aspects of information.

Qualitatively different ways of reflection and the corresponding types of information: sensory (syntactic), logical (semantic), pragmatic.

Measuring instruments as devices that expand the possibilities of reflection of the human senses. Measuring instruments as sources of information, messages.

Topic 2. PROBABILISTIC - STATISTICAL CHARACTERISTICS OF THE MESSAGE SOURCE

Discrete message source. Series of distributions, distribution function and numerical characteristics of a discrete random variable.

Continuous source of messages. Distribution density, distribution function and numerical characteristics of a continuous random variable.

Systems of random variables. Numerical characteristics of multidimensional distributions.

Topic 3. ENTROPY

Entropy is a measure of the uncertainty of the state of the message source on average. R. Hartley and C. Shannon's measure of uncertainty. Properties of the entropy of a discrete source. A priori (unconditional) entropy. A posteriori (conditional) entropy of a discrete source and its properties. Venn diagrams.

Entropy of a continuous source of messages. Differential entropy. Properties of differential entropy. Epsilon is the entropy of a random variable.

Entropy of a system of random variables. Mutual entropy.

Topic 4. Amount of information

Three approaches to the definition of the concept “Amount of information”: combinatorial, probabilistic, algorithmic. The amount of information as a measure of the removed uncertainty. The amount of syntactic information. The amount of semantic information.

Topic 5. INFORMATION CHARACTERISTICS OF MESSAGE SOURCES AND CHANNELS

Classification of message sources and channels.

Informational characteristics of message sources: entropy (unconditional, conditional), amount of information, message redundancy, source performance.

Information characteristics of channels: information transfer rate, maximum information transfer rate (channel capacity), channel utilization factor.

Information characteristics of sources of discrete messages. Models of sources of discrete messages. Properties of ergodic sources. Redundancy and performance of a discrete source. Binary message source.

Information characteristics of discrete channels. Ideal (no interference) and real (noisy) channels. Transmission speed and channel capacity. Binary and “m-ary” channel.

Efficient optimal coding as a way to match the information characteristics of the source and channel. Coding sources without memory (message symbols are independent) and with memory (symbols are correlated with each other).

Information characteristics of sources of continuous messages. Differential entropy. Entropy of uniform distribution. Entropy of Gaussian white noise. Epsilon is the entropy and epsilon is the productivity of the source. redundancy.

Information characteristics of continuous channels. Models of continuous channels. Information transfer rate and bandwidth.

Comparison of capacities of discrete and continuous channels.

Topic 6. MEASUREMENT INFORMATION. INFORMATION IN CONTROL SYSTEMS

Measurement is the stage of obtaining (perceiving) information. Model of the measurement process in classical (orthodox) metrology. Real measurement conditions and the corresponding probabilistic-statistical model. Information model of measurement.

Sources of measurement information. Digital instrument as a discrete source of measurement information. Analog device as a continuous source of measuring information. Entropy interval of measurement result uncertainty, entropy coefficient. Measurement by order scales, interval scales and ratio scales. Information-measuring systems.

The amount of measurement information. Natural change in signal volume. Influence of signal parameters on its volume. Regular change in signal volume. Optimal estimation of the measured value. Use of broadband signals in measurements. Own volume of the measuring information of the object.

Chain structures of systems. information chain. Sources and consumers of information. Varieties of connections of sources and receivers of information.

Transition modes in information chains. Information chains with memory. Rigid information chains. Information chains with memory and rigidity. Hierarchical and non-linear circuits. Automatic systems. Nonlinear circuits.

Topic 7. INFORMATION AND ENERGY

Information about a physical system in a state of thermodynamic equilibrium. Generalized second law of thermodynamics. The influx of Shannon information and the transformation of heat into work. Energy costs for the creation, recording and transmission of information.

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

Practical lessons

Topic 1. Calculation of entropy and amount of information of message sources. Calculation of entropy and amount of information of discrete and continuous sources of messages.

Subject2. Determination of information characteristics of message sources and channels. Determination of information characteristics of message sources and channels.

Subject3. Calculation of the amount of measurement information. Calculation of the amount of measurement information

Subject4. Determination of the entropy value of the measurement uncertainty. Determination of the entropy value of the measurement uncertainty.

Schedule for the implementation of independent work on the discipline

No. p/n	Date/Due dates	Type of independent work	Approximate lead times	form of control
1	1-6th week	Preparation of abstracts	16 hours	Protection
2	7-12th week	Presentation preparation	16 hours	Protection
3	13th-18th week	Preparation for the test	18 hours	offset

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, preparing equipment);
- 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.

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).

Methodological recommendations for independent work of students

As the material on the subject of the discipline is mastered, it is envisaged to carry out independent work of students to collect and process literary material to expand the field of knowledge in the discipline being studied, which allows deepening and consolidating specific practical knowledge gained in the classroom. 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 for classes, 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. To consolidate the material, it is enough, turning over the abstract or reading it, to mentally restore the material. If necessary, refer to the recommended educational and reference literature, write down incomprehensible points in the questions to clarify them in the upcoming lesson.

Preparation for practical exercises. This type of independent work consists of several stages:

1) Repetition of the studied material. For this, lecture notes, recommended basic and additional literature are used;

2) Deepening knowledge on the topic. It is necessary to differentiate the available material in lectures, teaching aids in accordance with the points of the practical lesson plan. Separately write out unclear questions, terms. It is better to do this in the margins of the lecture notes or textbook. Clarification should be carried out with the help of reference literature (dictionaries, encyclopedias, etc.);

3) Drawing up a detailed plan for a speech, or making calculations, solving problems, exercises, etc. In preparation for practical classes, students outline the material, prepare answers to the questions given on the topics of practical classes. In addition to the practical material, students 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.).

Requirements for the presentation and presentation of the results of independent work

There are no special requirements for the presentation and presentation of the results of this independent work.

Recommendations for summarizing educational and scientific literature

Abstracting educational and scientific literature involves an in-depth study of individual scientific works, which should ensure the development of the necessary skills to work on a book. All this will contribute to the expansion of scientific

horizons, increase their theoretical training, and the formation of scientific competence.

Textbooks, individual monographic studies and articles on issues provided for by the program of the academic discipline are offered for abstracting. When selecting literature on the chosen issue, it is necessary to cover the most important directions in the development of this science at the present stage. Pay special attention to those literary sources that (directly or indirectly) can assist a specialist in his practical activities. However, this section also includes works and individual studies on issues that go beyond the discipline under study. This literature is recommended to use if you want to expand your knowledge in any branch of science.

Along with literature on general issues, masters are supposed to read literature, taking into account the profile of their professional activity, obtained independently. Not all of the proposed literature is equivalent in content and volume, so a different approach to its study is possible. In one case, this may be a general abstract of several literary sources by various authors devoted to the consideration of the same issue, in another case, a detailed study and abstract of one of the recommended works or even its individual sections, depending on the degree of complexity of the issue (problematics). In order to decide what to do in each case, you should consult with the teacher.

The choice of a specific work for abstracting should be preceded by a detailed acquaintance with the list of all literature given in the curriculum of the discipline. It is recommended that you first familiarize yourself with the selected work by viewing subtitles, highlighted texts, diagrams, tables, and general conclusions. Then it must be read carefully and thoughtfully (delving into the ideas and methods of the author), making notes along the way on a separate sheet of paper about the main provisions, key issues. After reading, you should think over the content of the article or a separate chapter, paragraph (if we are talking about a monograph) and briefly write it down. Literally, only strict definitions, formulations of laws should be written out. Sometimes it is helpful to include one or two examples in the entry to illustrate. In the event that there are incomprehensible places, it is recommended to read the following presentation,

The result of work on literary sources is an abstract.

When preparing an abstract, it is necessary to highlight the most important theoretical provisions and substantiate them independently, paying attention not only to the result, but also to the methodology used in studying the problem. Reading scientific literature should be critical. Therefore, one should strive not only to assimilate the main content, but also the method of proof, to reveal the features of different points of view on the same issue, to evaluate the practical and theoretical significance of the results of the work being reviewed. A highly desirable element

of the abstract is the listener's expression of his own attitude to the ideas and conclusions of the author, supported by certain arguments (personal experience, statements of other researchers, etc.).

Abstracts of monographs, journal articles of a research nature must certainly contain, as already mentioned above, the definition of the problem and specific objectives of the study, a description of the methods used by the author, as well as the conclusions that he came to as a result of the study. The proposed literature for referencing is constantly updated.

Guidelines for writing and designing an abstract

An abstract (from Latin *refero* - I report, I report) is a summary of a practical or theoretical problem with the formulation of certain conclusions on the topic under consideration. The problem chosen by the student is studied and analyzed on the basis of one or more sources. Unlike term paper, which is a comprehensive study of the problem, the abstract is aimed at analyzing one or more scientific papers.

*Goals*essay writing are:

- developing students' skills to search for topical problems of modern legislation;
- developing the skills of concise presentation of the material, highlighting only the most significant points necessary to reveal the essence of the problem;
- developing the skills of analyzing the studied material and formulating one's own conclusions on the chosen issue in writing, in a scientific, literate language.

*tasks*essay writing are:

- to teach the student to accurately convey the opinions of the authors, on the basis of whose work the student writes his essay;
- to teach the student to correctly express his position on the problem analyzed in the abstract;
- prepare the student for further participation in scientific and practical conferences, seminars and competitions;
- help the student decide on the topic of interest to him, the further disclosure of which can be carried out when writing a term paper or diploma;
- to clarify for themselves and state the reasons for their agreement (disagreement) with the opinion of one or another author on this issue.

An abstract is a creative activity of a master student, 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 a master's student, graduate student, applicant 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 is carried out under the guidance of a supervisor and 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.

An abstract is an independent educational and research activity of a master student, postgraduate student and applicant. The supervisor provides advisory assistance and evaluates the process and results of activities. He provides an approximate topic of abstract papers, clarifies the problem and the topic of research together with the undergraduate, helps to plan and organize research activities, appoints the time and the minimum number of consultations. The supervisor 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, supervisor, 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.

Basic requirements for the content of the abstract

The student should use only those materials (scientific articles, monographs, manuals) that are directly related to the topic he has chosen. Distracted reasoning that is not related to the analyzed problem is not allowed. The content of the abstract should be specific, only one problem should be investigated (several are allowed, only if they are interconnected). The student must strictly adhere to the logic of presentation (start with the definition and analysis of concepts, move on to posing the problem, analyze ways to solve it and draw appropriate conclusions). The abstract should end with a conclusion on the topic.

In its structure, the abstract consists of:

1. Title page;
2. Introductions, where the student formulates a problem to be analyzed and researched;
3. The main text, in which the chosen topic is consistently revealed. Unlike a term paper, the main text of the abstract involves the division into 2-3 paragraphs without highlighting chapters. If necessary, the text of the abstract can be supplemented with illustrations, tables, graphs, but they should not "overload" the text;
4. Conclusions, where the student formulates conclusions based on the main text.
5. List of used literature. This list refers to both those sources that the student refers to when preparing the essay, and others that were studied by him when preparing the essay.

The volume of the abstract is 10-15 pages of typewritten text, but in any case should not exceed 15 pages. Spacing - 1.5, font size - 14, margins: left - 3 cm, right - 1.5 cm, top and bottom - 1.5 cm. Pages must be numbered. The paragraph indent from the beginning of the line is 1.25 cm.

The procedure for submitting the abstract and its evaluation

Abstracts are written by students during the semester within the time limits set by the teacher in a particular discipline, reported by the student and submitted for discussion. The printed version is handed over to the teacher leading the discipline.

Based on the results of the test, the student is given a certain number of points, which is included in the total number of student points scored by him during the semester. When evaluating the abstract, the correspondence of the content to the chosen topic, the clarity of the structure of the work, the ability to work with scientific literature, the ability to pose a problem and analyze it, the ability to think logically, knowledge of professional terminology, literacy of design are taken into account.

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;
- textual content of the presentation - oral speech or reading, which should include arguments, facts, evidence and emotions;
- recommended number of slides 17-22;
- obligatory 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 student 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).

Students submit 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 student with the review a few days before the defense. Opponents are appointed by the teacher from among the students. For an oral presentation, a student needs 10-20 minutes (approximately so much time answers the tickets for the exam).

Grade 5 is put, 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, given correct answers 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– The abstract is not submitted by the student.

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

Essay topics

1. History of development of socio-hygienic monitoring and implementation information and analytical modeling of social and hygienic processes in healthcare.

2. Systemic characteristics of scientific research in the course of socio-hygienic monitoring using information-analytical modeling of socio-hygienic processes in medicine.

3. Principles of practical and scientific approach in social and hygienic monitoring using information and analytical modeling of social and hygienic processes in health care.

4. The main methods of socio-hygienic monitoring using information-analytical modeling of socio-hygienic processes in medicine.

5. Formation of databases during social and hygienic monitoring using information and analytical modeling of social and hygienic processes in medicine.

6. The importance of socio-hygienic monitoring in the activities of health authorities and medical organizations using information and analytical modeling of socio-hygienic processes in medicine.

7. Indicators and criteria for the activities of health authorities and medical organizations in the conduct of social and hygienic monitoring using information and analytical modeling of social and hygienic processes in medicine.

8. Methods and means of using the results of social and hygienic monitoring in making managerial decisions in the activities of healthcare institutions using information and analytical modeling of social and hygienic processes in medicine.

9. Evaluation of the effectiveness of decisions under conditions of uncertainty and risk using information and analytical modeling of social and hygienic processes in medicine.

10. Methods and tools for hygienic diagnostics in the healthcare system using information and analytical modeling of social and hygienic processes in medicine.

11. The study of relationships in the "population-environment-health" system using information and analytical modeling of social and hygienic processes in medicine.

12. Scientific research in assessing the impact of environmental factors on the health of the population using information and analytical modeling of social and hygienic processes in medicine.

V. EDUCATIONAL AND METHODOLOGICAL SUPPORT FOR 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.

IV. CONTROL OF ACHIEVEMENT OF COURSE OBJECTIVES

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	MODULE 1. System and entropy patterns of	PC-3	Knows the standards of medical care Knows how to evaluate the resources of a medical	Interview, abstract	offset

	information processing		organization and implement a quality management system Possesses the necessary skills for compiling reporting documentation, evaluating the activities of a healthcare institution		
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VII. REFERENCES AND INFORMATION AND METHODOLOGICAL SUPPORT OF THE DISCIPLINE

Main literature

1. Borisova, I.V. Digital methods of information processing / Borisova I.V. - Novosibirsk: NSTU, 2014. - 139 p.: ISBN 978-5-7782-2448-3. - Text : electronic. - URL: <https://znanium.com/catalog/product/546207> (date of access: 04/04/2023). – Access mode: by subscription.
2. Tsarev, R. Yu. Fundamentals of Distributed Information Processing: Textbook / Tsarev R.Yu., Prokopenko A.V., Nikiforov A.Yu. - Krasnoyarsk: SFU, 2015. - 180 p.: ISBN 978-5-7638-3386-7. - Text : electronic. - URL: <https://znanium.com/catalog/product/967646> (date of access: 04/04/2023). – Access mode: by subscription.
3. Maskaeva, A.M. Fundamentals of information theory: a reference book: textbook / A.M. Maskaeva. - 2nd ed., revised. and additional - Moscow: INFRA-M, 2021. - 194 p. — (Secondary vocational education). — DOI 10.12737/1072323. - ISBN 978-5-00091-761-9. - Text : electronic. - URL: <https://znanium.com/catalog/product/1072323> (date of access: 04/04/2023). – Access mode: by subscription.

additional literature

1. Antamoshkin, O. A. Control technology for heterogeneous information processing systems: Monograph / Antamoshkin O.A. - Krasnoyarsk: SFU, 2017. - 238 p.: ISBN 978-5-7638-3566-3. - Text : electronic. - URL: <https://znanium.com/catalog/product/978587> (date of access: 04/04/2023). – Access mode: by subscription.
2. Automation of information processing processes in statistics: textbook / I. A. Kashina, V. K. Kashin, D. Yu. Nechaev, Yu. V. Chekmarev. - Moscow: DMK Press, 2012. - 199 p. - ISBN 978-5-94074-499-3. - Text : electronic. - URL: <https://znanium.com/catalog/product/1873501> (date of access: 04/04/2023). – Access mode: by subscription.

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

1. Patent Database and Patent Search <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://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. <http://edu.znate.ru/docs/3997/index-94535-6.html>
7. Student library <http://www.studmedlib.ru>
8. <http://www.rmj.ru/medjurnrus.htm>
9. Spravochno-legal system Consultant plus.
10. <http://vladmedicina.ru> Medical portal of Primorsky Krai
11. <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 "System and entropy patterns of information processing» is revealed in practical classes, where the teacher gives the

basic concepts of 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 practical exercises 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.

Lecture classes are focused on highlighting the main topics in each section of the course and are designed to orient students in the proposed material, lay the scientific and methodological foundations for further independent work of students.

Particularly significant for the professional training of students is independent work on the course. In the course of this work, students select the necessary material on the issue under study and analyze it. Independent work with literature includes such techniques as drawing up a plan, theses, abstracts, annotating sources, writing tests.

Students need to be introduced to the main sources, without which it is impossible to fully understand the issues of the course. Therefore, these sources are recommended for students to study at home and are included in the program.

Mastering the course should contribute to the development of skills for reasonable and independent assessments of facts and scientific concepts. Therefore, in all forms of knowledge control, especially when passing a test, attention should be paid to understanding the main problem field, to the ability to critically use its results and conclusions.

IX. LOGISTICS AND TECHNICAL SUPPORT OF THE DISCIPLINE

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 special rooms and rooms for independent work	Equipment special rooms and rooms for independent work	List of licensed software. Details of the supporting document
690922, Primorsky Territory, Vladivostok, Russian Island, Saperny Peninsula, Ayaks village, 10, School of Biomedicine, room M 422, area 158.6 m ²	Multimedia Audience: Motorized Screen 236*147cm Trim Screen Line; Projector DLP, 3000 ANSI Lm, WXGA 1280x800, 2000:1 EW330U Mitsubishi; document camera CP355AF Avervision, 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 village, 10, School of Biomedicine, room M 419, area 74.9 m ²	Multimedia Audience: Motorized Screen 236*147cm Trim Screen Line; Projector DLP, 3000 ANSI Lm, WXGA 1280x800, 2000:1 EW330U Mitsubishi; document camera CP355AF Avervision, 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 ²	Computer class for 22 workplaces: 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	

IX. VALUATION FUNDS

FOS passport

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
research	PC-3 The ability to organize, plan and control the activities of a structural unit of a medical organization	PC-3.1 Knows the standards of medical care PC-3.2 Knows how to assess the resources of a medical organization and implement a quality management system PC-3.3 Possesses the necessary skills for compiling reporting documentation, evaluating the activities of a healthcare institution

Code and name of the indicator of achievement of competence	Name of the assessment indicator (the result of training in the discipline)
PC-3.1 Knows the standards of medical care	Knows the standards of medical care Able to provide first aid Proficient in first aid
PC-3.2 Knows how to assess the resources of a medical organization and implement a quality management system	Knows the quality management system of a medical organization Knows how to evaluate the resources of a medical organization and implement a quality management system Possesses the skill of assessing the resources of a medical organization and implementing a quality management system
PC-3.3 Possesses the necessary skills for compiling reporting documentation, evaluating the activities of a healthcare institution	Knows the reporting documentation of the medical organization Able to prepare reporting documentation of a medical organization Possesses the necessary skills for compiling reporting documentation, evaluating the activities of a healthcare institution

Monitoring the achievement of course goals

No. p / p	Controlled modules / sections /	Codes and stages of formation of competencies	Appraisal tools - name	
			current control	intermediate certification

	topics of the discipline				
1	MODULE 1. System and entropy patterns of information processing	PC-3	Knows the standards of medical care Knows how to evaluate the resources of a medical organization and implement a quality management system Possesses the necessary skills for compiling reporting documentation, evaluating the activities of a healthcare institution	Interview, abstract	offset

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.

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.

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 certification have been successfully passed, the student is given an intermediate certification (test).

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 " System and entropy patterns of information processing" is carried out in accordance with the local regulations of FEFU in the form of a test.

Evaluation tools for certification

Questions for offset

1. Describe the content and tasks of information theory.
2. List and describe the main stages in the development of information theory.
3. Describe the contribution of domestic scientists to the development of information theory.
4. Expand the meaning of concepts (terms): matter, reflection, information.
5. Give a comparative analysis of the concepts: syntactic (sensory), semantic (logical) and pragmatic information as from the standpoint of semiotics. as well as in terms of reflection methods.
6. Describe measuring instruments as devices that expand the possibilities of reflection of the sense organs, as sources of information (messages).
7. Describe the probabilistic-statistical characteristics of a discrete message source (number of distributions, distribution function and their numerical characteristics).
8. Give a description of the probabilistic-statistical characteristics of a continuous source of messages (distribution density, distribution function and their numerical characteristics).
9. Explain the need to consider the probabilistic-statistical characteristics of

a system of random variables in the analysis of information processes.

10. Describe the differences between R. Hartley and C. Shannon's measures of uncertainty.

11. Explain the need for additivity requirements to the measure of choice uncertainty.

12. Characterize the entropy properties of a discrete message source.

13. Consider the features of determining the entropy of a continuous source of messages.

14. Define differential entropy and formulate its main properties.

15. Consider which kinds of distributions have the maximum differential entropy.

16. List the properties of the epsilon entropy of a random variable.

17. Describe the existing approaches to the definition of the concept "Amount of information".

18. Consider the relationship between the concepts of entropy and the amount of information.

19. Formulate the main properties of the amount of information:

a) for a discrete source.

b) for a continuous source.

20. Describe the quantity and properties of semantic information.

21. List the main informational characteristics of message sources and channels; Give a definition of the performance of sources, the speed of information transfer and the bandwidth of the channel.

22. Give a description of the ergodic message source.

23. What is the redundancy of the message source alphabet, what are its causes?

24. Determine the performance of a discrete message source and indicate ways to improve it.

25. What are the main information characteristics:

a) discrete channel.

b) binary symmetric channel without memory.

26. Explain the difference between technical and informational bit rates.

27. Write and explain the expression for throughput:

a) discrete channel without interference.

b) discrete channel with interference.

c) continuous channel.

d) Gaussian channel.

28. Describe the concepts of "signal volume" and "channel volume".

29. Formulate the conditions for undistorted signal transmission over the

channel.

30. Consider the premises on which the measurement model in classical metrology is based.

31. Describe the features of real measurement conditions.

32. How is the concept of measurement related to the concept of narrowing the uncertainty interval.

33. Describe in terms of information theory the meaning of measurement.

34. What is the entropy value of measurement uncertainty.

35. What determines the value of the entropy coefficient.

36. How to determine the number of distinguishable gradations of the measured value.

37. Explain the essence of the method for determining the entropy coefficient based on the use of a distribution histogram constructed from the measurement results.

38. What is meant by the capacitance of the channel of the measuring instrument.

39. What is the difference between the structural and functional aspects of the development of measuring information systems.

40. What is one neos? What is the relationship between bits and neos?

41. How does the amount of measurement information depend on the physical characteristics of the signals? How to increase the amount of information received during measurements?

42. What is the best way to estimate the measured value?

43. Is it possible to provide a measurement accuracy higher than the accuracy used measuring instruments?

44. What is the effect of the signal base on the amount of measurement information?

45. Describe the concept of your own volume of measurement information real world object.

46. Describe the concept of information chain.

47. Give a classification of information chains.

48. Consider the types of connections between sources and sinks in information chains.

49. Describe the transition modes in the information chains:

a) with memory

b) rigid

c) with memory and rigid

50. Consider the characteristics of hierarchical and non-linear information chains.

51. Formulate the generalized second law of thermodynamics.
52. Describe the energy costs for the creation, recording and transmission of information.
53. List the main sections of information theory, describe from the relationship.
54. Consider the applications of information theory.

Criteria for grading a student in the test

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 "failed" mark 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.