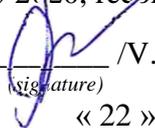


Ministry of Science and High Education of RF Ulyanovsk State University Medical faculty of T.Z. Biktimirov, IMEiPC	Form	
F-Educational plan of the discipline		

**APPROVED**  
by the decision of the Academic Council of the USU  
Institute of Medicine, Ecology and Physical Culture  
June «22» 2020, record no. №10/220

Chairman  /V.I. Midlenko/  
(signature)  
« 22 » of June 2020.

### EDUCATIONAL PLAN

Subject	<b>Informatics (in medicine)</b>
Faculty	<b>Faculty of High Technology Physics and Engineering</b>
Department	<b>Material Physics</b>
Course	<b>1</b>

Speciality: **31.05.01 «General medicine»**  
(code of the speciality, full name)

Form of education: **full time education**

Date of introducing in the instruction process at USU: **«01» of September 2020.**

The program was updated at the meeting of the department: № \_\_\_\_\_ of \_\_\_\_\_ 20\_\_\_\_.

The program was updated at the meeting of the department: № \_\_\_\_\_ of \_\_\_\_\_ 20\_\_\_\_.

The program was updated at the meeting of the department: № \_\_\_\_\_ of \_\_\_\_\_ 20\_\_\_\_.

Information about the authors:

Initials	Department	Degree, Scientific rank
Rybin V.V.	Material Physics	PhD, Associate Professor

Agreed	Agreed
Head of the department of Material Physics	Head of the department of Hospital Ther- apy
<u></u> / V.N. Golovanov / Signature « 28 » of May 2020.	<u></u> / M.A. Vize-Khripunova / Signature « 28 » of May 2020.

Ministry of Science and High Education of RF Ulyanovsk State University Medical faculty of T.Z. Biktimirov, IMEiPC	Form	
F-Educational plan of the discipline		

## 1. OBJECTIVES AND AIM OF INFORMATICS (IN MEDICINE)

The aim of the course is mastering the student theoretical fundamentals of medical informatics and practice of application of modern information and telecommunication technologies in medicine and health care.

The process of discipline development «Informatics (in medicine)» is to form general professional competences (GPC-1, GPC-7).

### List of Objectives that students have to solve after Informatics (in medicine):

- studying by students of the medical informatics theoretical fundamentals necessary for its application in medicine and health care;
- studying by students of applied and special computer programs for the solution of medicine and health care problems taking into account the latest information and telecommunication technologies;
- formation of informatization methods ideas, automation of clinical trials, informatizations of management in health system;
- studying of medical decisions support information systems;
- development by students of practical abilities on use of medical information systems for diagnostics, prevention, treatment and rehabilitation.

## 2. PLACE OF THE SUBJECT IN THE STRUCTURE OF GEP

In accordance with the Federal State Educational Standard of Higher Education, the discipline "Informatics (in medicine)" refers to the basic part of the specialty disciplines on 31.05.01 "Medicine" (level of specialty) of higher medical education and is studied in the first semester.

Requirements to entrance knowledge, competences and abilities for studying of discipline: possession of theoretical knowledge and practical skills of work with computer systems in volume of a school course of fundamentals of informatics, and also knowledge of disciplines of a mathematical, natural-science cycle.

## 3. LIST OF EXPECTED RESULTS OF INSTRUCTION ON THE SUBJECT (UNIT), CORELATED WITH PLANNED RESULTS OF COMPLETING THE PROGRAM

The study of the subject «Informatics (in medicine)» within the completion of the educational program is directed towards the formation of the following general and professional competences in students:

<b>Competence index. Content of a competence (or a part of it)</b>	<b>The proposed results of the course students are:</b>
<b>GPC-1</b> readiness to solve standard tasks of professional activity using information and bibliographic resources, biomed-	<b>To know:</b> the principles of automation of management of healthcare institutions with use of modern information technologies. <b>To be able to:</b> to use statistical and heuristic algorithms, knowledge acquisition methods from data, expert systems for

Ministry of Science and High Education of RF Ulyanovsk State University Medical faculty of T.Z. Biktimirov, IMEiPC	Form	
F-Educational plan of the discipline		

ical terminology, information and communication technologies with considering of information security basic requirements	diagnostics and management of treatment of diseases. <b>To own to:</b> the terminology connected with modern information and telecommunication technologies in relation to the solution of problems of medicine and health care.
<b>GPC-7</b> readiness to use basic physical and chemical, mathematical and other natural science concepts and methods in solving professional problems	<b>To know:</b> the main approaches to formalization and structuring of various types of the medical data used for formation of decisions during medical and diagnostic process. <b>To be able to:</b> to use modern Internet resources for search of professional information at independent training and professional development on separate sections of medical knowledge. <b>To own to:</b> the the main skills of use of medical information systems and Internet resources for realization of professional tasks.

#### 4. VOLUME OF THE SUBJECT

4.1. Volume of the subject in credit points (total): 3 credit points

4.2. On types of academic workload (in hours)

Type of academic work	Number of hours (form of education – full-time)	
	Total according to the plan	Including on semesters №
		semester 1
1	2	3
Work of students with a teacher	72	72
Classes:		
• lectures	18	18
• practical classes and seminars	Not provided	Not provided
• lab classes (practical lessons)	54	54
Self-study work	36	36
Concurrent control (number and type: a test, a colloquium, a report)		Questioning, testing, demonstration of practical skills
Course paper	Not provided	Not provided
Types of intermediate attestation (examination, test)	credit	credit
Total number of hours on the subject	<b>108</b>	<b>108</b>

4.3. Contents of the discipline (module). Distribution of hours on themes and kinds of study: Number of hours – 108 h

The form of training: full-time

Name of sections and themes	Total	Activity format					Form of current control
		Classroom studies			Interactive classes	Self-study work	
		lect.	pract.cl.	Laboratory work			
1	2	3	4	5	6	7	8
Concept of information. General char-	15	2		9		4	

Ministry of Science and High Education of RF Ulyanovsk State University Medical faculty of T.Z. Biktimirov, IMEiPC	Form	
F-Educational plan of the discipline		

acteristic of processes of collecting, transfer, processing and accumulation of information. Methods and means of informatization in medicine and health care							
Telecommunication technologies and Internet resources in medicine	9	2		3		4	
Basic technologies of transformation of information	12	2		6		4	
Modeling of physiological, morphological, molecular and genetic and biochemical processes	12	2		6		4	
Information systems of treatment-and-prophylactic establishments	12	2		6		4	
Information support of medical and diagnostic process	12	2		6		4	
Medical and technological systems for monitoring and controlling body functions	12	2		6		4	
Automated medical and technological systems for clinical and laboratory research and functional diagnostics	12	2		6		4	
Information systems in healthcare management at territorial and federal level	12	2		6		4	
<b>Total:</b>	<b>108</b>	<b>18</b>	<b>-</b>	<b>54</b>		<b>36</b>	<b>-</b>

## 5. COURSE CONTENT

*Unit 1. Concept of information. General characteristic of processes of collecting, transfer, processing and accumulation of information. Methods and means of informatization in medicine and health care*

Ministry of Science and High Education of RF Ulyanovsk State University Medical faculty of T.Z. Biktimirov, IMEIPC	Form	
F-Educational plan of the discipline		

Information and information process. Types of information. Informatics as independent science. Subject and problems of medical informatics. Main stages of development of domestic medical informatics. Features of medical information. Classes and types of medical information systems.

***Unit 2. Telecommunication technologies and Internet resources in medicine***

Concept of a telemedicine. Standard and legal base of development of a telemedicine in the Russian Federation. Distance learning. Application of telecommunication technologies in clinical practice. Internet resources for search of professional information.

***Unit 3. Basic technologies of transformation of information***

Possibilities of standard software for the solution of problems of applied medicine.

***Unit 4. Modeling of physiological, morphological, molecular and genetic and biochemical processes***

The principles of creation of mathematical models of the pharmacokinetic, physiological and other processes proceeding in a human body for the subsequent their use as a part of the automated systems of support of adoption of medical decisions. Types of mathematical models.

***Unit 5. Information systems of treatment-and-prophylactic establishments***

Methodology of creation of medical information system of LPU. Levels of informatization of LPU. The purposes, tasks, structure, the main functions and principles of development of the automated information systems of LPU. Role of automation of separate services and divisions of LPU.

***Unit 6. Information support of medical and diagnostic process***

Information model of medical and diagnostic process. Elements of profession of a physician as object of informatization. Formalization and structurization of medical information. The main requirements to drawing up the formalized medical documents.

Features of decision-making in medicine. Information analysis algorithms - statistical and based on knowledge. Possibilities of expert systems.

***Unit 7. Medical and technological systems for monitoring and controlling body functions***

Composition, functions and principles of implementation of monitor-computer systems. Methods for processing electrophysiological signals. Algorithms for supporting medical decision-making and objectifying the assessment of the severity of an intensive care patient.

The models of physiological systems used for an assessment and management of a functional condition of an organism.

Use of specialized information and technological system of office of intensive therapy for the solution of a problem of forecasting of an outcome of a disease and an assessment of a condition of various systems of a homeostasis of the resuscitation patient.

***Unit 8. Automated medical and technological systems for clinical and laboratory research and functional diagnostics***

The organization of technological process in medical laboratory. Relevance of automation of laboratory activity. Structure and functions of laboratory information systems. Systems of genetic diagnostics and analysis. Medical instrument and computer systems for functional researches of physiological systems of an organism. Computer processing and analysis of signals and images. Information support

Ministry of Science and High Education of RF Ulyanovsk State University Medical faculty of T.Z. Biktimirov, IMEiPC	Form	
F-Educational plan of the discipline		

### ***Unit 9. Information systems in healthcare management at territorial and federal level***

The purposes, tasks, structure, the main functions and the principles of development of the automated information systems for municipal, territorial, federal levels of health care. Main sources of information. Groups of the analyzed indicators. Ways of representation and data processing. Organizational and legal support of the medical information systems (MIS). Main standards of an exchange of medical information. Abilities to integrate MIS. The basic concepts and definitions in the sphere of information security.

## **6. PRACTICAL CLASSES AND SEMINARS**

Not provided.

## **7. LABORATORY CLASSES**

Lab 1. Standard software (text editors, spreadsheets, DBMS, systems of computer presentations) for the solution of medical tasks (9 hs.)

Lab 2. Means of the Internet for search of professional information on separate sections of medical knowledge (3 hs.)

Lab 3. Algorithms of modeling of physiological processes for the solution of clinical tasks (6 hs.)

Lab 4. Information management systems treatment-and-prophylactic institution (AIS LPU) (6 hs.)

Lab 5. The Automated Workplace (AW) of the doctor of medical office — the main functions and the principles of work (6 hs.)

Lab 6. The principles of creation of specialized information and technological systems of office of a hospital on the example of the automated information system of the intensive care unit and intensive therapy (6 hs.)

Lab 7. Information medical systems of diagnostic services (offices of functional diagnostics and laboratory researches) (6 hs.)

Lab 8. Automated workplace of the doctor of functional diagnostics and the laboratory doctor - the main functions and the principles of work (6 hs.)

Lab 9. Information systems for management of health care of territorial level (6 hs.)

## **8. SUBJECTS OF COURSE PAPERS, TESTS, ESSAYS**

Not provided.

## **9. QUESTIONS FOR CREDIT ON DISCIPLINE**

1. Basic concepts of informatics: messages, information, data.
2. Types of information.
3. Subject and tasks medical information scientist.
4. Main stages of development of domestic medical informatics.
5. Concept of a telemedicine.
6. Concept of mathematical model.
7. Levels of health care informatization.
8. The purposes, tasks, structure, the main functions and the principles of development of the automated information systems of LPU.
9. Concept of information model of medical and diagnostic process.

Ministry of Science and High Education of RF Ulyanovsk State University Medical faculty of T.Z. Biktimirov, IMEiPC	Form	
F-Educational plan of the discipline		

10. The purposes, tasks, structure, the main functions and the principles of development of the automated information systems of LPU automated information systems.
11. Formalization and structuring of medical information.
12. The basic concepts and definitions in the sphere of information security and information security.
13. Levels of LPU informatization.
14. Information analysis algorithms - statistical and based on knowledge.
15. Information model of medical and diagnostic process

## 10. SELF-STUDY WORK OF STUDENTS

Education form: full-time.

Name of the section / subject	Types of SSW	Total number of hours	Current control
Concept of information. General characteristic of processes of collecting, transfer, processing and accumulation of information. Methods and means of informatization in medicine and health care	Study of literature Mastering practical skills according check lists	4	Questioning, testing, checking practical skills according check lists
Telecommunication technologies and Internet resources in medicine	Study of literature Mastering practical skills according check lists	4	Questioning, testing, checking practical skills according check lists
Basic technologies of transformation of information	Study of literature Mastering practical skills according check lists	4	Questioning, testing, checking practical skills according check lists
Modeling of physiological, morphological, molecular and genetic and biochemical processes	Study of literature Mastering practical skills according check lists	4	Questioning, testing, checking practical skills according check lists
Information systems of treatment-and-prophylactic establishments	Study of literature Mastering practical skills according check lists	4	Questioning, testing, checking practical skills according check

Ministry of Science and High Education of RF Ulyanovsk State University Medical faculty of T.Z. Biktimirov, IMEiPC	Form	
F-Educational plan of the discipline		

			lists
Information support of medical and diagnostic process	Study of literature Mastering practical skills according check lists	4	Questioning, testing, checking practical skills according check lists
Medical and technological systems for monitoring and controlling body functions.	Study of literature Mastering practical skills according check lists	4	Questioning, testing, checking practical skills according check lists
Automated medical and technological systems for clinical and laboratory research and functional diagnostics.	Study of literature Mastering practical skills according check lists	4	Questioning, testing, checking practical skills according check lists
Information systems in healthcare management at territorial and federal level.	Study of literature Mastering practical skills according check lists	4	Questioning, testing, checking practical skills according check lists
Total		36	

## 11. EDUCATIONAL-METHODICAL AND INFORMATION SUPPORT OF DISCIPLINE

### a) List of recommended literature

#### Core reading:

1. Долгов В.В. Medical Informatics [Электронный ресурс]: учебное пособие/ Долгов В.В.— Электрон. текстовые данные.— Санкт-Петербург: Санкт-Петербургский медико-социальный институт, 2016.— 52 с.— Режим доступа: <http://www.iprbookshop.ru/74247.html>.
2. Health Informatics : A Systems Perspective / ed. Gordon D. Brown, Kalyan S. Pasupathy, Timothy B. Patrick. - Chicago, Ill : Health Administration Press. 2012. – eBook. — Режим доступа: <http://search.ebscohost.com/login.aspx?direct=true&db=e600xww&AN=643664&site=ehost-live>

#### Supplementary reading:

1. Тестовые вопросы по медицинской информатике для студентов English Medium : учебно-методическое пособие (на английском языке) / В. Д. Проценко, Е. А. Лукьянова, Т. В. Ляпунова [и др.]. — Москва : Российский университет дружбы наро-



Ministry of Science and High Education of RF Ulyanovsk State University Medical faculty of T.Z. Biktimirov, IMEiPC	Form	
F-Educational plan of the dicipline		

offered one of the following options for the perception of information, taking into account their individual psychophysical characteristics:

– for persons with visual impairment: in printed form in large print; in the form of an electronic document; in the form of an audio file (translation of educational materials into audio format); in printed form in Braille; individual consultations with the involvement of a tiflosurdo-perevodchika; individual tasks and consultations;

– for persons with hearing impairment: in printed form; in the form of an electronic document; video materials with subtitles; individual consultations with the assistance of a sign language interpreter; individual tasks and consultations;

– for persons with musculoskeletal disorders: in printed form; in the form of an electronic document; in the form of an audio file; individual tasks and consultations.

Разработчик



доцент кафедры ФМ, к.ф.-м.н. В.В. Рыбин

Ministry of Science and High Education of RF Ulyanovsk State University Medical faculty of T.Z. Biktimirov, IMEiPC	Form	
F-Educational plan of the dicipline		

## ЛИСТ ИЗМЕНЕНИЙ

<b>№ п/п</b>	<b>Содержание изменения или ссылка на прилагаемый текст изменения</b>	<b>ФИО заведующего кафедрой, реализующей дисципли- ну/выпускающей кафедры</b>	<b>Подпись</b>	<b>Дата</b>