

APPROVED ИТС ИФИБ

Protocol No. 3.1

dated 30.08.2024

### ACADEMIC COURSE OUTLINE

#### MEDICAL INFORMATICS

Educational program track (speciality) [1] 31.05.01 General Medicine

<b>Semester</b>	<b>Labour input, credits</b>	<b>Total course academic, hours</b>	<b>Lectures, hrs.</b>	<b>Practical sessions, hrs.</b>	<b>Laboratory sessions, hrs.</b>	<b>In the form of practical studies, hrs.</b>	<b>Independent studies, hrs.</b>	<b>Independent studies monitoring, hrs.</b>	<b>Course progress, Exam/Pass-fail exam/Term</b>
3	2	72	18	0	18		36	0	PFE
Total	2	72	18	0	18	0	36	0	

## ABSTRACT

The development of modern means of telecommunications, a significant expansion of their functionality, previously unthinkable, is primarily associated with the inclusion of information computer systems and the development of computer networks of various scales. The intelligent and effective use of these tools requires a clear understanding of the fundamentals of computer science that underlie the achievements in this field. Since its inception, computer science has been quite closely linked to medicine. Even the terminology in computer science was partly borrowed from medicine (computer anatomy, viruses, virology, and further applied to computer viruses-latent period, disease, vaccine, treatment, quarantine, etc.). At the same time, there was a mutual penetration of both the possibilities of computer science in a wide variety of areas of practical medicine, significantly changing its appearance, and the desire to use the main achievements of medical science in improving the efficiency of modern computers.

### 1. ACADEMIC COURSE GOALS AND OBJECTIVES

The goals of mastering the discipline (module) "Medical Informatics" are: understanding the main components, stages of development and levels of research of information objects, processes and systems; familiarizing students with the basics of modern information technologies, trends in their development, teaching students the principles of building information models, analyzing the results obtained and their application in professional medical activities.

### 2. PLACE OF THE ACADEMIC COURSE IN THE MAIN HIGHER EDUCATION CURRICULUM

The discipline (module) "Medical Informatics" is a general education course that is the basis for a more in-depth study of various sections of computational mathematics; system analysis; operations research in the course of studying the training module And Artificial intelligence in medicine in accordance with the curriculum of the profile department (medical science).

### 3. DEVELOPED COMPETENCIES AND INTENDED LEARNING OUTCOMES

Universal and/or general professional competencies:

Competency code and title	Code and title of competency-based rubrics
OPIK-10 [1] – Capable of understanding the principles of modern information technologies and using them to solve professional tasks.	3-OPIK-10 [1] – Know: - rules for working with the information systems and telecommunications network "Internet"; - main medical information systems. Y-OPIK-10 [1] – Be able to: - use information systems and the "Internet" information and telecommunications network in professional activities while complying with information security rules. B-OPIK-10 [1] – Possess skills in: - practical application of information and communication technologies, telemedicine technologies, and medical information systems, considering basic information security requirements, as well as skills in using intelligent computer medical systems.

--	--

#### 4. PEDAGOGIC POTENTIAL OF THE COURSE

Pedagogic tracks/objectives	Pedagogic goals (code)
Professional education	Establishing conditions for: formation of culture of information security (B23)
Professional education	Establishing conditions for: formation of motivation to improve the quality of medical care to the population and the desire to follow the rules and norms of interaction between the doctor, colleagues and the patient, contributing to the creation of the most favorable environment for the patient's recovery (B34)

#### 5. ACADEMIC COURSE STRUCTURE AND CONTENT

Academic course sections, their scope, terms of study and assessment:

No.	Academic course section name	Weeks	Lectures/ Practical (seminars)/ Laboratory sessions, hrs.	Compulsory current assessment (form*, week)	Maximum grade per section**	Section assessment (form*, week)	Competency-based rubrics
	<i>3 Semester</i>						
1	The first section	1-8	9/0/9		25	SA-8	3-ОПК-10, У-ОПК-10, В-ОПК-10
2	The second section	9-16	9/0/9		25	SA-16	3-ОПК-10, У-ОПК-10, В-ОПК-10
	<i>Totals for 3 Semester</i>		18/0/18		50		
	<b>Assessment events for 3 Semester</b>				50	PFE	3-ОПК-10, У-ОПК-10, В-ОПК-10

\* – abbreviated name of assessment

\*\* – 100 maximum points per semester including a pass/fail exam and (or) an exam

Abbreviated current assessment forms and section assessment

Abbreviation	Full name
SA	Summative assessment
PFE	Pass/fail examination

Weeks	Topics / Content	Lect., hrs.	Pr./sem., hrs.	Lab., hrs.
	<i>3 Semester</i>	18	0	18
<b>1-8</b>	<b>The first section</b>	9	0	9
1 - 2	<b>Lecture1</b> Definition of computer science, main sections and a brief history of development. The structure of modern data processing tools and their characteristics. The Von Neumann architecture, the components of a computer. Functional purpose of the main parts (blocks).	All		
		2	0	2
		Online		
		0	0	0
3 - 4	<b>Lecture2</b> Hierarchy of computer storage devices. The central processor-purpose, methods of implementation of the main functions, the principle of firmware control. The concept of interfaces and their varieties. The main directions of computer architecture development, parallel processing (Flynn classification).	All		
		2	0	2
		Online		
		0	0	0
5 - 6	<b>Lecture3</b> Supercomputers and mainframes, purpose, brief characteristics, dynamics of development, architecture. Microprocessors, microcomputers, personal computers, servers and workstations, definition, current state, direction of development.	All		
		2	0	2
		Online		
		0	0	0
7 - 8	<b>Lecture4</b> Global computing networks - the evolution of distributed computing systems, methods of data transmission over physical lines, a reference model of open systems, a brief description of protocols at various levels. Local area networks, main purpose, topology features, access methods, structure of technical means.	All		
		2	0	2
		Online		
		0	0	0
<b>9-16</b>	<b>The second section</b>	9	0	9
9 - 10	<b>Lecture5</b> The main trends in the development of programming languages, classification and brief characteristics of modern programming languages. programming. Structure and comparative characteristics of procedure-oriented (imperative) programming languages	All		
		2	0	2
		Online		
		0	0	0
11 - 12	<b>Lecture6</b> General information, classification of computer software, software composition, and a brief description of the individual parts. Operating systems (OS) their composition, evolution and functional purpose of individual parts.	All		
		2	0	2
		Online		
		0	0	0
13 - 14	<b>Lecture7</b> Types of OS construction for various data processing systems, network operating systems and their components. The structure of personal computer software, the composition and functional purpose, the main OS commands, the types of user interfaces. Types of operating systems used for personal computers. A brief overview of personal computers.	All		
		2	0	2
		Online		
		0	0	0
15 - 16	<b>Lecture8</b> Problems of information security. Protection of information from unintended influences. Computer viruses. Legal provision of information security Wireless networks and data transmission networks Wireless connection of nodes in local	All		
		2	0	2
		Online		
		0	0	0

networks.			
-----------	--	--	--

Abbreviated names of online options:

Abbreviation	Full name
EC	E-course
FtM	Full-text material
FtL	Full-text lectures
VM	Video materials
AM	Audio materials
Prs	Presentations
T	Tests
ERM	E-reference materials
IS	Interactive site

#### LABORATORY (LAB) SESSIONS TOPICS

Weeks	Topics / Content
	<i>3 Semester</i>
1 - 4	<b>Laboratory work No. 1</b> Introduction to the MS Excel interface. Creating MS Excel formulas.( Data Types. Objects of research). Methods for calculating blood cell types.
5 - 8	<b>Laboratory work No. 2</b> Working with MS Excel graphs, charts, and histograms. Constructing a histogram of the ratio of blood cell types by object classes.
9 - 16	<b>Laboratory work No. 3</b> Creating a database in MS Excel. Entities, relationships, attributes using the example of creating a database for covid, influenza.

## 6. EDUCATIONAL TECHNOLOGIES

The lecture course uses multimedia tools for a more visual representation of the solution methods being studied. Most of the time in the course is devoted to practical classes in the computer class of the university.

## 7. ASSESSMENT TOOLKIT

The assessment toolkit ensures verification of the intended learning outcomes achievement (competency-based rubrics) using current, midterm and interim assessment of the course.

The link between developed competencies and their assessment is presented in the following table:

Competency	Achievement rubrics	Assessment activity (Syl 1)
ОПК-10	3-ОПК-10	PFE, SA-8, SA-16
	У-ОПК-10	PFE, SA-8, SA-16
	В-ОПК-10	PFE, SA-8, SA-16

### Educational achievement rubrics scales

The scale of each assessment activity varies from 0 to the maximum established point, inclusive. The final assessment of the course is performed on a 100-point scale and represents the sum of the points earned by the student in the section assessments, framework of current and interim assessment.

Sections and interim assessments are considered passed when the student achieves a minimum score equal to 60% of the maximum. The final grade is assigned only upon passing all sections and the interim assessment.

The final grade is assigned in accordance with the following scale:

Total score	Rating on a 4-point scale	Pass/fail examination	ECTS assessment
90-100	5 – « <i>excellent</i> »	« <i>pass</i> »	A
85-89	4 – « <i>good</i> »		B
75-84			C
70-74			D
65-69	3 – « <i>satisfactory</i> »		E
60-64		F	
below 60	2 – « <i>fail</i> »	« <i>fail</i> »	

An “excellent” grade indicates a deep and solid mastery of the program material by a student who presents their answers consistently, clearly, and logically, is able to closely link theory with practice, and uses materials from monographic literature in their answers.

A “good” grade corresponds to a student’s solid knowledge of the material, who presents their answers competently and to the point, without any significant inaccuracies.

A “satisfactory” grade corresponds to the basic level of mastery of the material by the student, in which the main material has been mastered, but its details have not been assimilated, the answers contain inaccuracies, insufficiently correct wording and logical inconsistencies.

A grade “pass” corresponds to at least a basic level of mastery of the program material, in which the student possesses the necessary knowledge, skills, and abilities, and is able to apply theoretical principles to solve typical practical problems.

A grade “fail” is given to a student who lacks a significant understanding of the curriculum material, makes significant errors in their answers, or fails all required assignments. These students are generally unable to continue their studies without additional classes.

## 8. ACADEMIC COURSE EDUCATIONAL, METHODOLOGICAL AND INFORMATIONAL SUPPORT

### CORE READING:

1. ЭИ Д 73 Имитационное моделирование : Учебное пособие для вузов, Древис Ю. Г., Москва: Юрайт, 2020

2. ЭИ Ж 91 Информатика. Практикум в среде Microsoft Office 2016 : учебное пособие, Журавлев А. Е., Санкт-Петербург: Лань, 2020
3. ЭИ О-66 Информатика. Практические задания : учебное пособие, Орлова И. В., Санкт-Петербург: Лань, 2022
4. 004 К63 Компьютерные системы гистологической диагностики: введение : Учеб. пособие, Степанов В.А. [и др.], Москва: МИФИ, 2002
5. 004 А19 Современная информатика : учебное пособие для вузов, Аверьянов Г.П., Дмитриева В.В., Москва: НИЯУ МИФИ, 2011

#### FURTHER READING:

1. 004 У62 Microsoft Excel 2016. Библия пользователя : Пер. с англ., Уокенбах Д., Москва [и др.]: Диалектика, 2017
2. ЭИ Б 61 Методы MS Excel для решения инженерных задач : учебное пособие, Бильфельд Н. В., Фелькер М. Н., Санкт-Петербург: Лань, 2020

#### SOFTWARE:

No special softwares is required

#### LMS AND ONLINE RESOURCES

<https://online.mephi.ru/>

<http://library.mephi.ru/>

## **9. LOGISTICAL SUPPORT**

Any special logistical support is not required

## **10. EDUCATIONAL AND METHODOLOGICAL RECOMMENDATIONS FOR STUDENTS**

### 1. General provisions

1.1. When implementing the discipline program, educational technologies are used in the form of practical exercises, laboratory work and independent work using Internet resources, methodological developments, educational, popular science and scientific literature.

1.2. When starting to study the discipline, the student should familiarize himself with the goals and objectives of the discipline, the content of the discipline's work program, recommended literary sources, methodological developments in this discipline, available on the educational portal and the website of the department.

### 2. Recommendations for preparing for practical exercises.

2.1. Preparation for a practical lesson includes ongoing work on educational materials using the recommended basic and additional literature.

2.2. When preparing for practical exercises, theoretical material should be worked out based on recommended literary sources related to this practical lesson.

2.3. During practical classes, give specific, clear answers to the substance of the questions, bring each task to a final solution, demonstrate an understanding of the calculations (analyses, situations) carried out, and contact the teacher in case of difficulties.

### 3. Independent work of students

3.1. Independent work involves the formation and assimilation of theoretical material based on the study and systematization of textbook materials, official government documents, laws, regulatory and reference materials using information retrieval systems, the Internet.

3.2. Students should be guided by the schedule of independent work defined by the work plan of the discipline and perform all scheduled tasks assigned by the teacher for independent work, and submit them within the prescribed time.

### 4. Recommendations on preparation and passing of certification in the discipline.

4.1. The assessment of the discipline is based on a point-rating system, which includes ongoing monitoring of academic performance, boundary control in the semester and interim assessment based on the results of mastering the discipline.

4.2. The current control involves checking the students' readiness for classes, for which various test tasks can be used. Passing the control lines is carried out in the middle and end of the semester and can be carried out in the form of test papers, surveys, etc.

The stage of intermediate certification based on the results of mastering the discipline as a whole implies passing the test and preparing for it independently.

## **11. EDUCATIONAL AND METHODOLOGICAL RECOMMENDATIONS FOR TEACHERS**

### 1. General provisions

1.1 When implementing the discipline program, educational technologies are used in the form of lectures, practical exercises and independent work using Internet resources, methodological developments, educational, popular science and scientific literature.

#### 1.2. In the first lesson, the teacher:

introduces students to the goals and objectives of the discipline being taught, determines its place in the educational program, and identifies interdisciplinary connections.;

clarifies the plans of practical (seminar, laboratory) classes in accordance with the work program of the discipline, taking into account the contingent and the level of training of students.;

recommends basic and additional literature for the successful development of the discipline;

brings the knowledge assessment system to the attention of students.

### 2. Recommendations for the preparation and teaching of the discipline

#### 2.1. Recommendations for the preparation and conduct of practical (seminar) classes:

2.1.1. The purpose of practical (seminar) classes is to provide opportunities for in-depth study of theory, mastering practical skills and developing independent creative thinking among students. At each such lesson, students solve practical problems and demonstrate the results of homework given in the previous lesson.

2.1.2. At each such lesson, students solve practical tasks and demonstrate the results of completing the homework given in the previous lesson.

#### 2.2. Recommendations on the organization of the management of students' independent work

2.2.1. Independent work involves the formation and assimilation of theoretical material based on the study and systematization of textbook materials, official government documents, laws, regulatory and reference materials using information retrieval systems, the Internet.

2.2.2. In the course of guiding the students' independent work, the teacher introduces them to scientific creativity, the search for and solution of urgent modern problems.

2.3. Recommendations for the control of students' knowledge

2.3.1. There is a point rating system for the discipline, which includes ongoing monitoring of academic performance and interim assessment based on the results of mastering the discipline.

2.3.2. The following types of certification are provided for in the discipline: current control, boundary control and final certification.

2.3.3. The current control involves checking the students' readiness for laboratory and practical exercises, various test tasks can be used.

2.3.4. Passing the control lines based on the results of mastering the discipline is carried out in the middle and at the end of the semester.

2.3.5. The intermediate assessment stage based on the results of mastering the discipline generally implies taking the test and preparing for it independently.

Author(s):

Nikitaev Valentin Grigorevich / НИКИТАЕВ ВАЛЕНТИН  
Григорьевич / , д.т.н., профессор