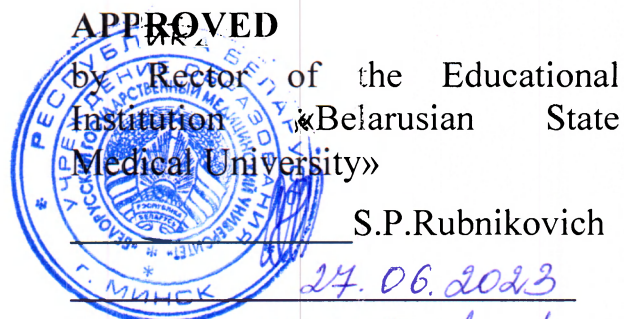**MINISTRY OF HEALTH OF THE REPUBLIC OF BELARUS**
Educational Institution
BELARUSIAN STATE MEDICAL UNIVERSITY

APPROVED
by Rector of the Educational Institution «Belarusian State Medical University»
_____ S.P.Rubnikovich
27. 06. 2023
Reg. # UD-0911-01-06/2324 edu.

INFORMATICS IN MEDICINE

**Curriculum of the educational institution
in the academic discipline for the specialty**

7-07-0911-01 «General Medicine»

2023

Curriculum is based on the educational program «Informatics in Medicine» for the specialty 7-07-0911-01 «General Medicine», approved 27.06.2023, registration № УД-0911-01-06/2324/уч.; on the educational plan in the specialty 7-07-0911-01 «General Medicine», approved 17.05.2023, registration # 7-07-0911-01/2324/mf.

COMPILERS:

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RECOMMENDED FOR APPROVAL:

by the Department of Medical and Biological Physics of the educational institution «Belarusian State Medical University»
(protocol # 10 of 18.05.2023);

by the Scientific and Methodological Council of the Educational Institution «Belarusian State Medical University» (protocol # 6 of 27.06.2023)

EXPLANATORY NOTE

«Informatics in Medicine» is an academic discipline of the module «Information Technologies in Health Care», which contains systematized scientific knowledge about information processes and methods of creation, storage, reproduction, processing and transmission of medical information by means of computing, as well as the principles of operation and methods of personal computer management.

The aim of the discipline «Informatics in Medicine» is the formation of universal competencies for studying the latest scientific data on the ways and means of processing, storing and transmitting information and is focused on the formation of the skills of a health system specialist in the field of information technology for the processing of professional-significant information.

The objectives of the academic discipline «Informatics in Medicine» are to form students' scientific knowledge about:

the main software products of information technology used by a healthcare specialist;

methods and means of information protection; about the basic concepts of statistical analysis of experimental data and interpretation of the results obtained; on the methods and means of computer processing, storage and transmission of information; formation of skills and abilities in the field of information technology necessary for the preparation of reporting medical documentation; competent use of clinical databases.

The knowledge, skills, and abilities acquired during the study of the academic discipline «Informatics in Medicine» are necessary for the successful study of the academic discipline «Medical and Biological Physics», «Biomedical statistics» of the module «Public Health and Healthcare».

A student who has mastered the content of the educational material of the academic discipline should have the following universal competencies:

master the basics of research, be able to search, analyze and synthesize information in medicine and biology;

solve standard tasks of professional activity based on the use of information and communication technologies.

As a result of studying the discipline «Informatics in Medicine», the student should

know:

the role of modern information technologies in medicine, scientific research and healthcare;

fields and prospects of application of information technology in the health care system;

principles for creating, formatting and editing text documents;

methods of spreadsheets creating, structuring of Excel workbook sheets, linking and protection of worksheets and books;

fundamentals of statistical processing of medical data;

fundamentals of designing and creating of database management systems;

the main functionality of medical information systems;

be able to:

work with the modern Windows operating system;

work in the environment of the Microsoft Office integrated applications package;

perform information exchange between the applications in this package;

create charts, summary tables for analysis of biomedical data in MS Excel;

determine the statistical characteristics of the sample, the presence of relationships, using the built-in statistical functions of MS Excel and specialized data analysis tools;

create and demonstrate multimedia presentations for representation of scientific works in PowerPoint;

use queries to sample data in MS Access databases;

work in the program of the automated workplace of a specialist;

use educational and scientific information resources of local networks and the Internet;

master:

techniques of preparation of large documents with a complex structure, creation of different levels of headings and electronic contents in Microsoft Word text processor;

automatization of complex calculations, data reporting in the form of tables, charts and graphs using Microsoft Excel spreadsheet tools;

methods of solution of research tasks: data analysis, statistical calculations on sampling data and assessment of the results obtained, statistical processing and analysis of biomedical data;

methods of using multimedia presentations MS PowerPoint to promote sanitary and hygienic knowledge and a healthy lifestyle;

methods of organizing large amounts of information in MS Access databases and using queries to sample data;

techniques of work in local and global networks, using the information resources of the Internet;

methods to organization of large amounts of information in databases;

methods of ensuring the protection of information;

techniques of processing of biomedical data using specialized programs designed for health professionals.

Total number of hours for the study of the discipline is 108 academic hours. Classroom hours according to the types of studies: practical classes - 36 hours, student independent work (self-study) - 72 hours.

Intermediate assessment is carried out according to the syllabus of the specialty in the form of a credit (2 (1) semester).

Form of higher education – full-time.

ALLOCATION OF ACADEMIC TIME
ACCORDING TO SEMESTERS OF STUDY

Code, name of the specialty	semester	Number of academic hours						Form of intermediate assessment
		total	in-class	including			out-of-class self-studies	
				lectures	supervised student independent work	practical studies		
7-07-0911-01 «General Medicine»	1 (2)	108	36	-	-	36	72	credit

THEMATIC PLAN

Section (topic) name	Number of classroom hours
	practical
1. Information and information processes. Information technologies in medicine	2
2. Methods of preparing of text documents using text processor MS Word	4
2.1. Creation, editing and formatting of service medical text documents. Integrated graphics	2
2.2. Automation the creation of complex documents	2
3. Methods of work with spreadsheets Excel	6
3.1. Creation, editing and formatting of spreadsheets. Processing of the research materials data set	2
3.2. Graphical representation of medical data	2
3.3. Using templates to prepare professional documents	2
4. Statistical processing of medical data with spreadsheets Excel	6
4.1. Methods of descriptive statistics. Estimation of the parameters of the general population by its sample	2
4.2. Using the Analysis Package for Statistical Processing of Medical Data. Graphic view of the statistical distribution of the sample	2
4.3. Techniques of correlational analysis	2
5. Technologies of organization, storage and processing of data in the database management system MS Access	6
5.1. Principles of building databases. Using Queries to Sample Data	2
5.2. Setting criteria for selecting data in queries	2
5.3. Summarizing in the database	2
6. Preparation of the presentation of the scientific report by means of the MS PowerPoint program	4
6.1. Creation and saving of presentation. Object management	2
6.2. Animation and multimedia in MS PowerPoint. Import content from other Office documents into a presentation file	2
7. Biology and Medicine. Local Fundamentals of Modeling in and global computer networks. Telemedicine. Distance learning systems	2
8. Information security. Methods and means of information protection	2
9. Specialized medical software	4
9.1. Medical information systems used in health care organizations. Electronic patient file cabinet	2
9.2. Collection of primary accounting information and processing	2
Total hours	**36**

CONTENT OF THE EDUCATIONAL MATERIAL

1. Information and information processes. Information technologies in medicine

The purpose and objectives of the academic discipline «Informatics in Medicine». Rules of personal safety in the computer class and rules for the safe operation of computer equipment.

Definition of information. The role of information in human life and society. The content of information and the forms of its presentation. Information processes. Encoding of information (numerical, text, graphic, audio and video). Units of measurement of information. Properties of medical information.

Information technologies and their application in medicine and health care. Prospects for the development of information technologies in medicine and healthcare.

Computer software. Classification of programs. Application software. Expert systems.

Computerization of medical equipment (systems of computer analysis of tomography data, ultrasound diagnostics, radiography and electrocardiography). The use of a computer in combination with measuring and control technology in medicine. The composition of the medical instrument-computer system.

Practicing practical skills in the environment of a modern operating system of the Windows family.

2. Methods of preparing of text documents using text processor MS Word

2.1. Creation, editing and formatting of service medical text documents. Integrated graphics

The procedure for preparing an abstract, a scientific article, official medical documents. Modes of operation with the word processor MS Word. Special tools for typing, editing, and reviewing text. Format the document.

Insert and edit graphics (pictures, charts, SmartArt, WordArt). Manipulation of graphic objects.

Work with tables and formulas.

Development of practical skills in the application environment of the integrated MS Office package, the exchange of information between the applications of this package.

2.2. Automation the creation of complex documents

Techniques and tools for automating the preparation of documents (styles, templates, themes). The concept of style and template. Create and use styles.

Create a multi-level header structure. Create a table of contents for a large document. Insertion, footnotes, reference lists, index, list of illustrations.

Create and save your own document templates.

Development of practical skills in the preparation of text documents using the text editor MS Word.

3. Methods of work with spreadsheets Excel
3.1. Creation, editing and formatting of spreadsheets. Processing of the research materials data set

Formulas in spreadsheets and their editing. Absolute and relative cell references. Processing arrays of data using built-in functions.

Conditional formatting. Format workbooks and worksheets. Use styles.

3.2 Graphical representation of medical data

Types of charts. Build, format, and edit charts. Use design effects to design charts.

Development of practical skills in the implementation of calculations using formulas and functions, with the creation of diagrams in the MS Excel application.

3.3 Using templates to prepare professional documents

The definition of a template. Use AutoComplete features. Create and edit a document template. Create a new document based on the template. Data consolidation. Protect cell, worksheet, workbook data.

4. Statistical processing of medical data with spreadsheets Excel
4.1. Methods of descriptive statistics. Estimation of the parameters of the general population by its sample

Creation of a variation series of scientific research data. Study of descriptive statistics methods. Calculation of the main numerical characteristics of the distribution. Point and interval estimates of the general population on the sample. Calculation of confidence intervals. Confidence probability. Significance level. Verification of the belonging of the sample distribution to the theoretical normal.

4.2 Using the Analysis Package for Statistical Processing of Medical Data. Graphic view of the statistical distribution of the sample

Use of tools for automatic analysis of scientific research data (Analysis Toolkit). Construction of a polygon of frequencies and histograms of distribution, illustrating the distribution of the studied indicator. Format charts.

Development of practical skills in the analytical processing of biomedical data: determination of the statistical characteristics of the sample and the general population, determination of the presence of relationships, using the built-in statistical functions of MS Excel and specialized data analysis tools.

4.3 Techniques of correlational analysis

Establishing a connection between the features of the methods of correlation analysis qualitatively and quantitatively. Calculation of the correlation coefficient. Build and edit scatter plots.

Construction of a trend line to determine the general direction of changes in indicators. Display on the diagram the equation of the trend line and the magnitude of the approximation confidence.

5. Technologies of organization, storage and processing of data in the database management system MS Access
5.1. Principles of building databases. Using Queries to Sample Data

The main features and principles of work in MS Access databases. The structure of the database. Records and fields. Database creation and opening

operations. Create and save a database table project. Different data types of the database table.

Enter information in a table, add records to a table, view the contents of a table, sort table records. Export/import data in MS Access. The concept of a query. Use queries to sample data.

5.2. Setting criteria for selecting data in queries

Multi-table queries. Build queries wizard. Design and edit a query by using the Query Designer. Enter and edit data using a form. Restrict access to data through a form.

Practicing practical skills in editing and viewing the contents of a table in the MS Access environment. Use queries to fetch data. Use pivot tables to analyze data.

5.3. Summarizing in the database

Sampling of data that meets the criterion. Run an execution query. Summing up for the analysis of the medical database. Basics of report design.

6. Preparation of the presentation of the scientific report by means of the MS PowerPoint program

6.1 Creation and saving of presentation. Object management

Create and save a presentation. Enter slide content. Work with lists. Graphic objects in the presentation. Insert pictures, graphs, SmartArt, WordArt, charts, and tables.

Practicing practical skills in creating and demonstrating multimedia presentations for presenting scientific papers in MS PowerPoint.

6.2. Animation and multimedia in MS PowerPoint. Import content from other MS Office documents into a presentation file

Dynamic effects: animations, slide change effects, control buttons, hyperlinks. Customize animation effects, work with the main types of objects. Insert media content (audio and video files) into the presentation. Customize slide changes. Set the slide show time. Set the slide show mode. Preparation of a multimedia presentation on the results of educational and scientific activities. Ways to protect your presentation

7. Biology and Medicine. Local Fundamentals of Modeling in and global computer networks. Telemedicine. Distance learning systems

Define a model. General classification of models. Basic concepts of mathematical modeling in medicine. Mathematical models and numerical methods of solving problems in the field of medicine. Stages of construction of mathematical models. Mathematical apparatus used in mathematical medical models. Examples of mathematical models. An overview of popular computer mathematics packages used for mathematical modeling (MathCad, MatLab).

Local and global networks. Medical resources Internet. Telemedicine technologies. Means of searching information on the network. Social and scientific networks. Big data processing. Cloud services.

Classification of distance learning systems. General requirements for distance learning systems. Effectiveness of distance learning. Implementation of distance learning systems in healthcare and pharmacy. Examples of distance learning systems.

Moodle – (modular object-oriented dynamic learning environment) – a free learning management system (LMS). Distance learning system of a particular medical university.

Development of practical skills and use of educational and scientific information resources of local networks and the Internet.

8.   Information security. Methods and means of information protection

Network security. Organizational and legal aspects of information protection and copyright. Problems of protection of personal and professional information in computer networks. Crimes in the field of information technology (distribution of malware, hacking passwords, theft of bank card numbers and other bank details, phishing, of illegal information via the Internet, malicious interference through computer networks i n th e o peration of var ious systems). R esponsibility for t he commission of unlawful acts in the field of information technology.

Methods and means of protecting information from unauthorized access to data, the impact of malicious programs in medical information systems. Account system. Rules for creating computer passwords. Differentiation of user access to data in medical information systems.

Protection of information by means of technical and cryptographic protection. Electronic signature.

Practicing practical skills in methods of protection against unauthorized access to data, the influence of malicious programs in medical information systems.

9.   Specialized medical software

9.1.   Medical information systems used in health care organizations. Electronic patient file cabinet

Definition of the concepts of «Information system» and «Medical information system». Goals, objectives and functions of the medical information system. Classification of medical information systems. Structure of the medical information system.

Study of the electronic file cabinet of patients. Work with directories. Appointment and issuance of coupons. Generation of reports on the patient file.

Development of practical skills in the program of the automated workplace of a specialist.

9.2.   Collection of primary accounting information and processing

Medical statistics based on data provided by the registry and doctors conducting the reception. Collection of primary accounting information, followed by centralized automatic processing, grouping and preparation of reports.

ACADEMIC DISCIPLINE CURRICULAR CHART

Section, topics #	Section (topic) name	Number of hours — practical	Self-studies	Forms of control
1.	**Information and information processes. Information technologies in medicine**	**2**	**5**	Interview
2.	**Methods of preparing of text documents using text processor MS Word**	**4**	**8**	Electronic workshop
2.1.	Creation, editing and formatting of service medical text documents. Integrated graphics	2	4	Electronic workshop
2.2.	Automation the creation of complex documents	2	4	Electronic tests
3.	**Methods of work with spreadsheets Exel**	**6**	**8**	Electronic workshop
3.1.	Creation, editing and formatting of spreadsheets. Processing of the research materials data set	2	4	Electronic workshop
3.2.	Graphical representation of medical data	2	2	Electronic workshop
3.3.	Using templates to prepare professional documents	2	2	Electronic tests
4.	**Statistical processing of medical data with spreadsheets Excel**	**6**	**10**	Electronic workshop
4.1.	Methods of descriptive statistics. Estimation of the parameters of the general population by its sample	2	3	Electronic workshop
4.2.	Using the Analysis Package for Statistical Processing of Medical Data. Graphic view of the statistical distribution of the sample	2	3	Electronic workshop
4.3.	Techniques of correlational analysis	2	4	Electronic workshop
5.	**Technologies of organization, storage and processing of data in the database management system MS Access**	**6**	**10**	Electronic workshop

№				
5.1.	Principles of building databases. Using Queries to Sample Data	2	3	Electronic workshop
5.2.	Setting criteria for selecting data in queries	2	4	Electronic workshop
5.3.	Summarizing in the database	2	3	Electronic tests
6.	**Preparation of the presentation of the scientific report by means of the MS PowerPoint program**	**4**	**8**	
6.1.	Creation and saving of presentation. Object management	2	4	Electronic workshop
6.2.	Animation and multimedia in MS PowerPoint. Import content from other MS Office documents into a presentation file	2	4	Electronic workshop
7.	**Biology and Medicine. Local Fundamentals of Modeling in and global computer networks. Telemedicine. Distance learning systems**	**2**	**5**	Interview
8.	**Information security. Methods and means of information protection**	**2**	**8**	Interview
9.	**Specialized medical software**	**4**	**10**	
9.1.	Medical information systems used in health care organizations. Electronic patient file cabinet	2	6	Electronic workshop
9.2.	Collection of primary accounting information and processing	2	4	Electronic tests Credit
		36	**72**	

INFORMATION AND INSTRUCTIONAL UNIT

LITERATURE

Basic (relevant):

1. Medical informatics : textbook / I. Ye. Bulach [и др.] – Kyiv : AUS Medicine Publishing, 2018. - 368 p.

2. Информатика в медицине = Medical informatics : пособие / С. И. Клинцевич [и др]. - Гродно : ГрГМУ, 2020.- 107 p.

Additional:

3. Shelamova, M. A. Organization of calculation and graphical representation of biomedical data in Excel : study guide / M. A. Shelamova, V. G. Leschenko. – Minsk : BSMU, 2017. - 40 p.

4. Shelamova, M. A. Organization and processing of medical databases in Excel : learning-method. manual / M. A. Shelamova - Minsk : BSMU, 2018. - 48 p.

METHODOLOGICAL RECOMMENDATIONS FOR THE ORGANIZATION AND PERFORMANCE OF STUDENT INDEPENDENT WORK IN THE ACADEMIC DISCIPLINE

Main forms of student independent work:

preparation for practical classes;

preparation for the test in the academic discipline;

performance of research and creative tasks;

preparation of thematic reports, abstracts, presentations;

performance of practical tasks;

taking notes of educational literature;

compilation of a review of scientific literature on a given topic;

compilation of a thematic selection of literary sources, Internet sources.

LIST OF AVAILABLE DIAGNOSTIC TOOLS

The following forms are used for competences assessment:

Oral form:

interviews.

Technical form:

electronic tests;

electronic workshop;

credit.

LIST OF AVAILABLE TEACHING METHODS

Traditional method (lecture, laboratory practicals);

Active (interactive) methods:

problem-based learning PBL (Problem-Based Learning).

LIST OF PRACTICAL SKILLS

1. Working in a modern Windows family operating system.
2. Working in the application environment of the integrated Microsoft Office package, sharing information between the applications of this package.
3. Preparation of text documents using MS Word text editor.
4. Perform calculations using formulas and functions. Create charts in MS Excel.
5. Statistical processing of biomedical data: determination of statistical characteristics of the sample and the general population, determination of the presence of relationships using the built-in statistical functions of MS Excel and specialized data analysis tools.
6. Edit and view the contents of a table in MS Access. Use queries to sample data. Use PivotTables to analyze data.
7. Create and share multimedia presentations to present scientific papers in MS PowerPoint.
8. Work in the program of automated workplace of a specialist.
9. Use of educational and scientific information resources of local networks and the Internet.
10. Possession of methods of protection against unauthorized access to data, the impact of malware in medical information systems.

LIST OF PRACTICAL STUDIES

1. Information and information processes. Information technologies in medicine.
2. Creation, editing and formatting of service medical text documents. Integrated graphics.
3. Automation the creation of complex documents.
4. Creation, editing and formatting of spreadsheets. Processing of the research materials data set.
5. Graphical representation of medical data.
6. Using templates to prepare professional documents.
7. Methods of descriptive statistics. Estimation of the parameters of the general population by its sample.
8. Using the Analysis Package for Statistical Processing of Medical Data. Graphic view of the statistical distribution of the sample.
9. Techniques of correlational analysis.
10. Principles of building databases. Using Queries to Sample Data.
11. Setting criteria for selecting data in queries.
12. Summarizing in the database.
13. Creation and saving of presentation. Object management.
14. Animation and multimedia in MS PowerPoint. Import content from other MS Office documents into a presentation file.
15. Biology and Medicine. Local Fundamentals of Modeling in and global computer networks. Telemedicine. Distance learning systems.
16. Information security. Methods and means of information protection.
17. Medical information systems used in health care organizations. Electronic patient file cabinet.
18. Collection of primary accounting information and processing.

PROTOCOL OF THE CURRICULUM APPROVAL BY OTHER DEPARTMENTS

Title of the discipline requiring approval	Department	Amendments to the curriculum of the academic discipline	Decision of the department, which designed the curriculum (date, protocol #)
Public Health and Healthcare Management	Public Health and Health	No additions or changes	protocol No.10 of 19.05.2023

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M.A.Shelamova

Curriculum content, composition and the accompanying documents comply with the established requirements.

Dean of the Medical Faculty for International Students of the educational institution «Belarusian State Medical University»
26. 06.   2023

O.S.Ishutin

Methodologist of the educational institution «Belarusian State Medical University»
26. 06.   2023

S.V.Zaturanova