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-0911-03-01/2324/edu.

INFORMATICS IN MEDICINE

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

7-07-0911-03 «Dentistry»

2023

Curriculum is based on the educational program «Informatics in Medicine», approved 27.06.2023, registration # УД-0911-03-01/2324/уч.; on the educational plan in the specialty 7-07-0911-03 «Dentistry», approved 17.05.2023, registration # 7-07-0911-03/2324/mf.

COMPILERS:

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RECOMMENDED FOR APPROVAL:

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

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

EXPLANATORY NOTE

«Informatics in Medicine» is the academic discipline of the module «Introduction to the Specialty» containing systematized scientific knowledge concerned with information processes and procedures of acquisition, storage, representation, processing, and communication of medical information by means of computer technologies.

The aim of the academic discipline «Informatics in Medicine» is the formation of universal professional competencies for solving medical and biological problems with the use of modern information technologies.

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

features and capabilities of modern healthcare software;

basic concepts of statistical analysis of experimental data and interpretation of the obtained results;

procedures of computer acquisition, storage, processing and communication of information concerned with public health and morbidity dynamics;

skills and abilities necessary for:

preparation of reporting medical documentation;

accounting data reflecting the activity of healthcare organizations;

medical information protection.

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

Studying the educational discipline «Informatics in Medicine» should ensure the formation of the following students' universal professional competencies:

solve professional, scientific and innovative tasks based on the use of information and communication technologies;

be capable of self-development and improvement in professional activity, develop innovative competence and ability to innovative activity;

take the initiative and adapt to changes in professional activity, be able to predict the conditions for the implementation of professional activity and solve professional tasks in conditions of uncertainty.

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 information technologies application in the healthcare system;

basic functionalities of modern medical information systems;

principles of creating, formatting and editing text documents;

principles of creating and editing Microsoft Excel documents, linking and protection of Microsoft Excel worksheets and workbooks;

basis of statistical processing medical data;

fundamentals of designing and creating database management systems;

rules for ensuring computer security.

be able to:

work with computer in Windows operating system environment;

work with Microsoft Office package applications, share information between integrated applications of this package;

create charts, graphs, and pivot tables for data analysis;

perform statistical processing biomedical data: determination of statistical characteristics of the sample, assessment of reliability of differences, establishing existence of relationships between data using built-in statistical functions in Excel and specialized data analysis tools;

create and demonstrate multimedia presentations of scientific papers with the use of PowerPoint application;

create, update and maintain databases;

work with the software of the physician's automated workplace;

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

master:

techniques of preparing large documents with a complex structure, creating different levels of headings and electronic contents in Microsoft Word;

techniques of automatizing complex calculations and data presentation in the form of tables, charts and graphs using Microsoft Excel tools;

computer techniques of statistical processing and analysis of biomedical data;

techniques for organization of large amounts of information in databases;

techniques of presenting scientific work using multimedia presentations in MS PowerPoint;

techniques of working in local networks and the Internet;

methods of ensuring the information protection;

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

Total number of hours for the study of the discipline is 90 academic hours. Classroom hours according to the types of studies: practical classes – 36 hours, student independent work (self-study) – 54 hours.

Intermediate assessment is carried out according to the syllabus of the specialty in the form of credit (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 of classes						Form of intermediate assessment
		total	in-class	including			out-of-class self-studies	
				lectures	supervised student independent work	practical classes		
7-07-0911-03 «Dentistry»	1	90	36	-	-	36	54	credit

THEMATIC PLAN

Topic name	Number of class hours
	practical
1. Information and information processes. Information technologies in medicine	**2**
2. Techniques of preparing documents using word processing program Microsoft Word	**4**
2.1. Creating, formatting, and editing official medical documents. Imbedded graphics	2
2.2. Automation of creating documents with complex structure	2
3. Techniques of working with spreadsheets in Microsoft Excel	**6**
3.1. Creating, formatting and editing spreadsheets. Processing arrays of scientific research materials	2
3.2. Graphic representation of medical data arrays	2
3.3. Using templates for preparing official documents	2
4. Statistical processing medical research data using spreadsheet program Microsoft Excel	**6**
4.1. Descriptive statistics techniques. Estimation of population parameters using the sample	2
4.2. Data analysis tools in MS Excel and their application for statistical processing medical data. Graphical representation of the statistical distribution of the sample	2
4.3. Correlation analysis techniques	2
5. Technologies for organizing, storing and processing data in the database management system MS Access	**6**
5.1. Concepts of database construction. Creating medical databases and their processing. Data retrieval using queries	2
5.2. Setting criteria for data retrieval in queries	2
5.3. Summarizing in database	2
6. Preparing research paper presentation using MS Power Point	**4**
6.1. Creating and saving a presentation. Object management	2
6.2. Animation and multimedia in MS Power Point. Importing content from other Microsoft Office documents into a Power Point presentation	2
7. Basis of modelling in biology and medicine. Local and global internet networks. Telemedicine. Systems of distance learning	**2**
8. Information security. Methods and techniques of information protection	**2**

Topic name	Number of class hours
	practical
9. Specialized medical software used in healthcare organizations	**4**
9.1. Medical information systems applied in healthcare organizations. Electronic patient record system	2
9.2. Acquisition and processing primary accounting information	2
Total hours	**36**

CONTENT OF THE EDUCATIONAL MATERIAL

1. Information and information processes. Information technologies in medicine

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

Information technologies and their application in medicine and healthcare. The development prospects of information technologies in medicine and healthcare.

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

Medical equipment computerization (computer systems in tomography, ultrasound diagnostics, radiography and electrocardiography). The use of a computer in combination with measuring and controlling equipment in medical practice. The composition of the medical instrument-computer system.

Mastering the practical skills in working with computer in Windows operating system environment.

2. Techniques of preparing documents using word processing program Microsoft Word

2.1. Creating, formatting, and editing official medical documents. Imbedded graphics

The procedure of preparing abstract, scientific article, official medical documents. Special tools of typing, editing, and reviewing text. Formatting document.

Inserting and editing graphic objects (pictures, charts, SmartArt graphic, WordArt). Manipulation with graphic objects.

Work with tables and formulas.

2.2. Automation of creating documents with complex structure

Tools of automating the preparation of documents (styles, templates, themes). The concept of style and template. Creating and using styles.

Creating a multi-level headering structure. Creating a table of content of a large document. Inserting footnotes, reference lists, index, list of illustrations.

Creating and saving document templates.

Mastering the practical skills in working with Microsoft Office package applications and sharing information between integrated applications of this package.

3. Techniques of working with spreadsheets in Microsoft Excel

3.1. Creating, formatting and editing spreadsheets. Processing arrays of scientific research materials

Creating and editing worksheets. Modifying rows, columns, and cells. Formatting cells. Using number formats. Applying borders. Calculations using formulas. Relative and absolute cell references. Data processing using functions. Applying Function Wizard. The use of fill handle. Conditional formatting. Formatting spreadsheet. Use of styles.

3.2. Graphic representation of medical data arrays

Types of chats. Creating, formatting and editing chats. Using chat tools design.

3.3. Using templates for preparing official documents

Creating and editing template of workbook. Creating new workbook using template. Data consolidation. Protection of cells, worksheets, and workbooks.

Mastering the practical skills in creating and using MS Excel chats, graphs and pivot tables for the data analysis.

4. Statistical processing medical research data using spreadsheet program Microsoft Excel

4.1. Descriptive statistics techniques. Estimation of population parameters using the sample

Creating variation series of research data. Understanding descriptive statistics techniques. Calculation of basic numerical characteristics of the distribution. Point and interval estimates of the population parameters based on the sample data. Calculation of confidence intervals. Confidence probability. The significance level. Verification of the similarity of the sample distribution with the theoretical normal one.

4.2. Data analysis tools in MS Excel and their application for statistical processing medical data. Graphical representation of the statistical distribution of the sample

The use of tools for automatic analysis of scientific research data (Analysis ToolPak). Construction of a polygon of frequencies and histograms of distribution, illustrating the distribution of the studied indicator. Formatting charts.

Mastering the practical skills in statistical processing biomedical data: determination of statistical characteristics of the sample using built-in statistical functions in MS Excel and specialized data analysis tools.

4.3. Correlation analysis techniques

Establishing qualitative and quantitative relationships between data set by means of correlation analysis techniques. The correlation coefficient calculation in MS Excel. Creating and editing correlation chats.

Mastering the practical skills in the use of MS Excel tools for statistical assessment of reliability of differences, establishing existence of relationships between data.

5. Technologies for organizing, storing, and processing data in the MS Access database management system

5.1. Concepts of database construction. Creating medical databases and their processing. Data retrieval using queries

Basic capabilities and principles of working with MS Access databases. Structure of the database. Records and fields. Creating and opening database.

Creating and saving the database table. Various field's data types of the database table.

Adding entries to the database table, adding and deleting records in database table, viewing table content, record sorting. Import/export of data in MS Access. Database query, using queries to retrieve data.

5.2. Setting criteria for data retrieval in queries

Multi-table queries. Queries wizard. Design and editing queries using the Query Designer. Entering, modifying and viewing data using a form. Restrict access to data through a form.

5.3. Summarizing in database

Data retrieval satisfying criteria. Running query. Use of summarizing for the medical database analysis. Basics of report design.

Mastering the practical skills in creating, updating and maintaining databases.

6. Preparing research paper presentation using MS Power Point

6.1. Creating and saving presentations. Object management

Creating and saving a presentation. Entering slide content. Working with bullets. Graphic objects in the presentation. Inserting pictures, graphs, SmartArt, WordArt, charts, and tables.

6.2. Animation and multimedia in MS Power Point. Importing content from other Microsoft Office documents into a Power Point presentation

Dynamic effects: animation, slide transition effects, control buttons, hyperlinks. Customizing animation effects, working with the main types of objects. Inserting media content (audio and video files) into the presentation. Customizing slide transitions. Setting the slide show time. Preparation of a multimedia presentation of scientific research results. Ways of presentation protection.

Mastering the practical skills in creating and demonstrating multimedia presentations of research papers using MS PowerPoint.

7. Basics of modelling in biology and medicine. Local and global networks. Telemedicine. Systems of distance learning

Definition of a concept «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 constructing mathematical models. Mathematical tools applied in the medical mathematical models. Examples of mathematical models.

Overview of popular computer mathematics packages applied for mathematical modeling (MathCad, MatLab).

Local and global computer networks. Medical resources of the Internet. Telemedicine technologies. Means of searching information on the network. Social and scientific networks. Processing of large arrays. Cloud technologies.

Classification of distance learning systems. Implementation of distance learning systems in healthcare and pharmacy. Examples of distance learning systems. Distance learning system of the medical university.

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

8. Information security. Methods and techniques of information protection

Network security. Organizational and legal aspects of information protection and copyright. Problems of personal and professional information protection in computer networks. Crimes in the field of information technology (distribution of malware or virus attacks, hacking passwords, theft of banking or other personal data, phishing, distribution of illegal information through the Internet, malicious interference with the operation of various systems through computer networks). Responsibility for unlawful acts in the field of information technology.

Methods and means of protecting information from unauthorized access to data and impact of malware in medical information systems. Account system. Rules of creating computer passwords. Differentiation of user's access permissions to data in medical information systems.

Technical and cryptographic means of protecting information. Electronic signature.

9. Specialized medical software used in healthcare organizations

9.1. Medical information systems used in healthcare organizations. Electronic patient record system

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

Learning the electronic patient records. Work with directories. Reference Materials. Electronic recording of a doctor's appointment and issuing coupons. Preparation of reports using electronic patient records.

9.2. Collection and processing primary accounting information in electronic patient record system

Medical statistics based on data provided by the registries and attending physicians. Collection of primary accounting information, followed by its automatic processing, grouping and preparation of reports.

Mastering in working with the software of the physician's automated workplace.

EDUCATIONAL DISCIPLINE CURRICULAR CHART

Section, topic #	Section (topic) name	Number of class hours	self-studies	Form of control
		practical		
1.	**Information and information processes. Information technologies in medicine**	**2**	**5**	interview, written reports with the oral defense
2.	**Techniques of preparing documents using word processing program Microsoft Word**	**4**	**5**	
2.1.	Creating, formatting, and editing official medical documents. Imbedded graphics	2	3	electronic workshop
2.2.	Automation of creating documents with complex structure	2	2	electronic workshop
3.	**Techniques of working with spreadsheets in Microsoft Excel**	**6**	**7**	
3.1.	Creating, formatting, and editing spreadsheets. Processing of arrays of scientific research materials	2	2	interview
3.2.	Graphic representation of medical data arrays	2	2	electronic workshop
3.3.	Using templates for preparing official documents	2	3	electronic test
4.	**Statistical processing medical research data using spreadsheet program Microsoft Excel**	**6**	**10**	
4.1.	Descriptive statistics techniques. Estimation of the population parameters using the sample	2	3	interview
4.2.	Data analysis tools in MS Excel. Application of data analysis tools for statistical processing medical data. Graphical representation of the statistical distribution of the sample	2	4	electronic workshop

4.3.	Correlation analysis techniques	2	3	electronic test
5.	Technologies for organizing, storing and processing data in the MS Access database management system	**6**	**5**	
5.1.	Concepts of database construction. Creating medical databases and their processing. Using queries for data retrievel	2	1	electronic workshop
5.2.	Setting criteria for data retrieval in queries	2	2	electronic workshop
5.3.	Summarizing in database	2	2	electronic test
6.	**Preparing research paper presentation using MS Power Point**	**4**	**10**	
6.1.	Creating and saving presentations. Object management	2	5	electronic workshop
6.2.	Animation and multimedia in MS Power Point. Importing content from other Microsoft Office documents into a Power Point presentation	2	5	electronic workshop
7.	**Basis of modelling in biology and medicine. Local and global network. Telemedicine. Systems of distance learning**	**2**	**5**	interview, written reports with the oral defense
8.	**Information security. Methods and techniques of information protection**	**2**	**5**	interview, written reports with the oral defense
9.	**Specialized medical software used in healthcare organizations**	**4**	**2**	
9.1.	Medical information systems used in healthcare organizations. Electronic patient record system	2	1	interview, written reports with the oral defense
9.2.	Acquisition and processing primary accounting information	2	1	electronic workshop, credit
	Total hours	**36**	**54**	

INFORMATION AND INSTRUCTIONAL UNIT

LITERATURE

Basic (relevant):

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

Additional:

2. Shelamova, M. A. Organization of calculation and graphical representation of biomedical data in EXCEL : teaching manual / M. A. Shelamova, V. G. Leschenko. Minsk : BSMU, 2017. - 48 c.

1. Shelamova, M. A. Organization and processing of medical databases in Excel: teaching manual / Minsk : BSMU, 2018. - 48 c.

2. Bulakh, I. Y. Medical informatics in modules : Textbook/ I. Y. Bulakh, L. P. Voitenko, O. S. Alita, T. I. Zhehriy, I. P. Krivenko, T. S. Slukhai, I. M. Shylo. Kyiv : AUS Medicine Publishing, 2014. - 40 p.

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

The time allotted for independent work can be used by students for:
preparation for practical classes;
implementation of practical tasks;
study of topics submitted for independent work;
fulfillment of research and creative tasks;
preparing thematic reports, abstracts, and presentations;
taking notes of educational literature;
compiling a review of scientific literature concerning the given topic;
compiling a thematic selection of literary sources, Internet sources;
preparation for the credit on the academic discipline.

Main forms of student independent work organization:
writing reports, reviews and abstracts;
presentations with reports;
electronic testing.

Control of student independent work is carried out in the forms of:
interview;
assessment of presentations and reports;
electronic tests.

LIST OF AVAILABLE DIAGNOSTIC TOOLS

The following forms are used for competences assessment:

Oral form:

interview;

Oral-written form:

credit.

Written form:

reports with the oral defense.

Technical form:

electronic tests;

electronic workshop.

LIST OF AVAILABLE TEACHING METHODS

Traditional method (practicals);

Active (interactive) methods:

Problem-Based Learning (PBL);

Research-Based Learning (RBL).

LIST OF PRACTICAL SKILLS

1. Working with computer in Windows operating system environment.
2. Working with Microsoft Office package applications and sharing information between integrated applications of this package.
3. Creating and using MS Excel chats, graphs and pivot tables for the data analysis.
4. Statistical processing biomedical data: determination of statistical characteristics of the sample using built-in statistical functions in MS Excel and specialized data analysis tools.
5. The use of MS Excel tools for statistical assessment of reliability of differences, establishing existence of relationships between data.
6. Creating, updating and maintaining databases.
7. Creating and demonstrating multimedia presentations of research papers using MS PowerPoint.
8. Working with the software of the physician's automated workplace.
9. The use of educational and scientific information resources of local networks and the Internet.

LIST OF PRACTICAL STUDIES

1. Information and information processes. Information technologies in medicine.
2. Creating, formatting, and editing official medical documents. Imbedded graphics.
3. Automation of creating documents with complex structure.
4. Creating, formatting and editing spreadsheets. Processing of arrays of scientific research materials.

5. Graphic representation of medical data arrays.
6. Using templates for preparing official documents.
7. Descriptive statistics techniques. Estimation of population parameters using the sample.
8. Data analysis tools in MS Excel. Application of data analysis tools for statistical processing medical data. Graphical representation of the statistical distribution of the sample.
9. Correlation analysis techniques.
10. Concepts of database construction. Creating medical databases and their processing. Using queries for data selection.
11. Setting conditions for data selection in queries.
12. Summarizing database.
13. Creating and saving a presentation. Object management.
14. Animation and multimedia in MS Power Point. Importing content from other Microsoft Office documents into a Power Point presentation.
15. Basis of modelling in biology and medicine. Local and global network. Telemedicine. Systems of distance learning.
16. Information security. Methods and techniques of information protection.
17. Medical information systems used in healthcare organizations. Electronic health record system
18. Acquisition and processing primary accounting information

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
Public Health and Healthcare	Public Health and Healthcare	No amendments	Protocol # 10 of 18.05.2023

COMPILERS:

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

Dean of the Medical Faculty for International Students of the Educational Institution «Belarusian State Medical University» _____ O.S.Ishutin
26.06. 2023

Methodologist of Scientific and Methodological Support Department of the Educational Process of the Educational Institution «Belarusian State Medical University» _____ S.V.Zaturanova
26.06. 2023