

Federal State Autonomous Educational Institution of Higher Education
«Peoples' Friendship University of Russia»

Medical Institute

Recommended MCSD

SYLLABUS
(STUDY GUIDE)

Subject

Medical Informatics

Recommended for the direction of training (specialty)

31.05.01 General Medicine

Program (profile, specialization)

General Medicine

1. **Goals and objectives of the discipline:** formation and development of competencies aimed at using modern computer technologies in medicine and health care, familiarizing students with the basics of modern information technologies, their development trends, teaching students the principles of building information models, analyzing the results obtained, using modern information technologies. technologies for solving problems in the field of medicine and health care.

2. **Place of discipline in the structure of high education program:**

The discipline "Medical informatics" refers to the basic part of block 1 of the curriculum. Table 1 shows the previous and subsequent disciplines aimed at the formation of discipline competencies in accordance with the competence matrix of EP HE.

Table № 1

Prior and subsequent disciplines aimed at the formation of competencies

№ II/II	Code and name of competence	Previous disciplines	Subsequent disciplines (groups of disciplines)
Universal Competence Category			
General Professional Competences			
	GPC-10	Mathematics	Telemedicine; Public health and health care, health economics; Biostatistics

3. **Requirements for the results of the discipline:**

The discipline program is designed to form the following competencies:

Table 2

Formed competencies

Competences	Name of competence	Competence achievement indicators
GPC-10 Information literacy	GPC-10. Being able to understand the operation principles of modern IT and use them to solve professional tasks	GPC-10.1. Being able to use information technology in professional activity. GPC-10.2 Being able to observe the information security rules in professional activity. GPC-10.3. Being able to use information and communication technologies, including applied software for general and special purposes in dealing with professional tasks.

As a result of studying the discipline student should:

To know:

- the theoretical foundations of computer science, collection, storage, search, processing, transformation, distribution of information in medical and biological systems,
- how to use IT systems in medicine and health care.

Be able to:

- use educational, scientific, popular scientific literature, Internet for professional activities;
- work on a personal computer, use an operating system, carry out text and graphic processing of medical data using standard office applications, develop a database structure;
- search medical data and generate reports using database management systems.

Have skills:

- basic technologies of information transformation: text, table processors,
- basic skills in the use of medical information systems and Internet resources for the implementation of professional tasks.

4. The scope of the discipline and types of educational work

The total workload of the course is **3 credit units**.

Type of educational work	Total hours	Semesters			
		2			
Class hours (total)	68	68			
Including:	-	-	-	-	-
<i>Lectures</i>	34	34			
<i>Practice work (PW)</i>					
<i>Seminars (S)</i>					
<i>Laboratory work (LW)</i>	34	34			
Self study	40	40			
Total workload	hours	108			
	credit units	3			

5. Discipline contents

5.1. Content of the discipline's sections

Module 1 Basic technologies for processing medical data

1.1. Particular module. Introduction to Medical Informatics.

1.1.1 Modular unit. Basic concepts of medical informatics.

Section contents: Concept of information, presentation of information in a computer.

General characteristics of the collection, transmission, processing and accumulation of information.

Methods and means of informatization in medicine and health care.

1.1.2 Modular unit. Medical Informatics Hardware.

Section contents: The concept of information, representation information in the computer. Computer architecture, main units of IBM PC (system unit, keyboard, monitor), principle of open architecture. Input devices (keyboard, mouse, scanner, joystick, and digitizer). Output device (monitor, printer, plotter). Random access memory. Permanent storage device. External storage devices.

1.1.3 Modular unit. Программные средства реализации информационных процессов.

Section contents: Types of software (system software, applications, programming systems), file archiver (Zip, Arj, Rar), virus protection programs. The concept of "operating system", types of operating systems interface (command, graphic). Family of operating systems DOS, Solaris, Linux, Mac OS. Organization of the file system: files, directories (folders), the types of files and folders, current directory, path to the file, names of the devices, the full file name. Logical and physical discs.

1.2. Particular module. Technology for processing medical data using word processors.

1.2.1. Modular unit. Introduction to word processors Microsoft Word, Open Office Writer.

Section contents: Structure of the Program Writer, basic control elements: title bar, menu bar, toolbar, control line, status bar, scroll bar, document window, indicators (input cursor, mouse). Creation, saving and closing the document, work with windows search a saved document. Menu structure (File, Edit, View, Insert, Format, Tools, Table, Window). Entering text. Symbols formatting (changing the tracing, font type and size), paragraph formatting (set line spacing, paragraph alignment), tabulation, preview.

1.2.2. Modular unit. Complex document formatting, special functions.

Section contents: Page settings, headers and footers, input text in multiple columns. Working with lists (bulleted, numbered, multilevel). Stylistic formatting, patterns. Indexes and table of contents. Creating sections. Inserting special symbols, drawings, objects. Editing formulas. Inserting graphics into a document. SmartArt and WordArt.

1.2.3. Module unit. Word processor writer, tables

Course contents: Creating a table, cells, rows, columns, headers, borders and flood fill, automatic formatting, inserting rows and columns in the table. Using formulas.

1.3. Particular module. Medical data processing technologies using spreadsheets.

1.3.1. Modular unit. Introduction to spreadsheet processors Microsoft Excel, OpenOffice Calc

Course contents: Main components of the program: title menu, toolbar, string of formulas, worksheet labels, status bar, the working area. Working area of the program: columns and rows, cells, workbooks and worksheets. Cells addressing. Types of data. Entering and editing data. Cells formatting.

1.3.2. Modular unit. Using math functions in Microsoft Excel, Open Office Calc.

Section contents: Sorting and searching data, entering formulas, priorities of mathematical operations, actions in a cell. Introduction to basic mathematical, statistical, logical functions.

1.3.3. Modular unit. Medical data visualization in a spreadsheet.

Section contents: Construction and editing of charts, histograms, graphs. Diagram wizard. Chart options. Exploring the construction of a linear function diagram.

1.4. Particular module. Technologies for storing and processing medical data using Database Management Systems.

1.4.1. Modular unit. Introduction to data base Microsoft Access and OpenOffice Base.

Section contents: Database concept, database management system (DBMS), relational databases. Relational database structure: table, record, field. Data types., Basic elements: tables, forms, reports, queries, macros, modules. Table constructor, form wizard. Database design. Editing field properties, key fields. Direct data entry into a table, data entry using a form.

1.4.2. Modular unit. Working in a DBMS with medical data.

Section contents: Working with information: search, sorting, queries. Creation of queries. Select query, query to create tables, query to update, add, delete, query designer. Selection conditions, wildcards, operators and operands. Functions, group operations. Search, sorting, selection of records using filter.

1.5. Particular module. Computer networks in medicine

1.5.1. Modular unit. Network technologies

Section contents: Types of computer networks: local, corporate network. Network architecture. Search for information in the WWW, search engines, browser. Unified resource locator, keywords, types of information resources. Medical Internet resources for finding professional information.

1.5.2. Modular unit. Internal electronic resources of RUDN University.

Section contents: e-mail, client and server mail services. Email service providers. Working with letters, attachments, address book. E-mail security basics, SPAM. Internal electronic resources of RUDN University, Telecommunication educational and information system of RUDN University.

1.6. Particular module. Medical Information Systems (MIS)

1.6.1. Modular unit. Introduction to MIS

Section contents: Classification of medical information systems. General requirements for medical information systems. The importance of standards in creating and ensuring the interaction of medical information systems. Organizational support for the functioning of medical information systems.

1.6.2. Modular unit. Information model of the treatment and diagnostic process.

Section contents: The main components of the treatment-diagnostic or health-improving-prophylactic process. Compliance of MIS components with the components of production processes. The activity of a medical worker as an object of informatisation. Introduction to the Remsmed platform. Material, technical and personnel support of the IIA. Business games in the study of IIAs. Models of the activities of the departments of health care facilities. EMMAREHA rehabilitation planning and monitoring system. Medical Information System according to the method of Tavrovsky V.M.

Module 2 Application of mathematical methods to describe biomedical processes.

2.1. Particular module. Application of probability theory for processing the results of biomedical experiments.

Section contents: Types of random events. Venn diagrams in medicine. The probability of a random event. Combinatorial formulas: permutations, combinations, placement. Basic formulas of the theory of probability. Repeated independent tests. Principles of probabilistic approaches to the problems of diagnosis and prognosis of diseases.

2.2. Particular module. Basic of statistical analysis of biomedical data.

Section contents: Basic concepts of evidence-based medicine. Discrete and continuous random variables, numerical characteristics of random variables. Variational series. Basic distribution laws. Statistical hypotheses. Analysis of relationships.

5.2. Discipline sections and type of activities

№	Discipline sections	Lec..	Pract.	Lab.	Sem.	Self	Total (hours).
1.1	Introduction to Medical Informatics.	6				4	10
1.2	Technology for processing medical data using word processors.	2		6		6	14
1.3	Medical data processing technologies using spreadsheets.	2		8		8	18
1.4	Technologies for storing and processing medical data using Database Management Systems.	2		4		4	10
1.5	Computer networks in medicine	6		2		2	10
1.6	Medical Information Systems (MIS)	6		6		6	18
2.1	Application of probability theory for processing the results of biomedical experiments.	4		4		6	18
2.2	Basic of statistical analysis of biomedical data.	6		4		4	10
Total		34		34		38	108

6. Laboratory workshop

№ п/п	Discipline sections	Topics of lab classes	Hours
1.	1.2.1	Introduction to word processors Microsoft Word, Open Office Writer	2
2.	1.2.2	Complex document formatting, special functions.	2
3.	1.2.3	Word processor writer, tables	2
4.	1.3.1	Introduction to spreadsheet processors Microsoft Excel, OpenOffice Calc	2
5.	1.3.2	Using math functions in Microsoft Excel, Open Office Calc.	2
6.	1.3.3	Medical data visualization in a spreadsheet.	4
7.	1.4.1	Introduction to data base Microsoft Access and OpenOffice Base.	2
8.	1.4.2	Working in a DBMS with medical data	2
9.	1.5.1	Network technologies	1
10.	1.5.2	Internal electronic resources of RUDN University	1
11.	1.6.1	Introduction to Medical Information Systems (MIS).	2
12.	1.6.2	Information model of the treatment and diagnostic process.	4
13.	2.1	Application of probability theory for processing the results of biomedical experiments.	4
14.	2.2	Basic of statistical analysis of biomedical data.	4

7. *Practical workshop is not provided*

8. Material and technical support of the discipline:

For classes, group and individual consultations, monitoring and intermediate certification, computer classes 426, 428, 429, 434, 448, 451, 452 and 453 are used located at the address: Moscow, st. Miklukho-Maklaya, 10, building 2. and a lecture hall located at the address: Moscow, st. Miklukho-Maclay, 8.

A set of workstations consisting of computer tables, chairs, marker board; technical means: interactive whiteboard, projection screen, multimedia projector, teacher's laptop, monoblocks.

Computing server HP ProLiant ML350 Gen 10, Monoblock Acer Aspire C24-865 - 16 pcs., Monoblock Lenovo V30a-24IML All-In-One 23.8" - 19 pcs., Monoblock Acer Z3-615 - 12 pcs., Workplace as part of the Dell Optiplex 3010MT system unit and Dell S2240L monitor - 6 pcs., Gladius 210XT0808R-21064 server - 3 pcs.

9. Information support of the discipline

a) software:

- Microsoft Subscription Enrollment for Education Solutions (EES) No. 56278518 dated 04/23/2019 (renewed annually, the program is assigned a new number).
- Operating system Windows 10.0, Office 365, Information systems developed by iFors (EMMAREHA, RemsMed, RemsFarm, MIS according to the methodology of Professor V.M. Tavrovsky)

б) databases, reference and search systems:

1. EBS of RUDN University and third-party EBS to which students have access on the basis of concluded agreements:

- RUDN University Library System <http://lib.rudn.ru/MegaPro/Web>
- EBS "University Library Online" <http://www.biblioclub.ru>
- EBS "Yurayt" <http://www.biblio-online.ru>
- EBS "Student Consultant" www.studentlibrary.ru
- EBS "Lan" <http://e.lanbook.com/>
- TUIS: <http://esystem.rudn.ru/>
- All-Russian Institute for Scientific and Technical Information of the Russian Academy of Sciences (VINITI RAS) <http://www2.viniti.ru/>

2. Database of medical and biological publications:

- Yandex search engine <https://www.yandex.ru/>
- Google search engine <https://www.google.ru/>
- SCOPUS abstract database <http://www.elsevier.com/locate/scopus/>
- WHO Documentation Center <http://whodc.mednet.ru/>
- NCBI: <https://pubmed.ncbi.nlm.nih.gov/>
- RUDN University Bulletin: access mode from the RUDN University territory and remotely <http://journals.rudn.ru/>
- Scientific library Elibrary.ru: access by IP-addresses of RUDN University at: <http://www.elibrary.ru/defaultx.asp>
- ScienceDirect (ESD), "FreedomCollection", "Cell Press" ID "Elsevier". There is remote access to the database, access by IP-addresses of RUDN University (or remotely by individual login and password).
- Google Academy (eng. Google Scholar) - a free search engine for full texts of scientific publications of all formats and disciplines. Indexes full texts of scientific publications. Access mode: <https://scholar.google.ru/>
- Scopus - scientometric database of the publishing house "Elsevier". There is remote access to the database.

Access by IP-addresses of RUDN University and remotely by login and password (Grant of the Ministry of Education and Science). Access mode: <http://www.scopus.com/>

- Web of Science. There is remote access to the database. Access to the platform is carried out by IP-addresses of the RUDN University or remotely. Remote access to WOS is activated without administrator intervention after registering on the platform from RUDN University <http://login.webofknowledge.com/>

10. Methodical support of discipline:

a) Main literature

- Protsenko V.D., Lukyanova E.A., Lyapunova T.V., Shimkevich EM. MEDICAL INFORMATICS. Laboratory workshop: Study guide. - M., 2018.
- Medical informatics: textbook / T.V. Zarubina [and others]; under total. ed. T.V. Zarubina, B.A. Kobrinsky. - M.: GEOTAR-Media, 2016.-- 512 p.
- Lukyanova, Shimkevich EM, Lyapunova TV Statistical methods of analysis. M.: RUDN. 2020, 117 p.
- Lukyanova E.A., Lyapunova T.V., Shimkevich E.M. [and etc.]. Medical Informatics. Laboratory Practice. M.: RUDN. 2020, 32 p.
- Lukyanova E.A. Medical statistics. M.: Publishing house of RUDN-2002
- Course: Medical Informatics (General Medicine) (<http://esystem.pfur.ru/course/view.php?id=1504>)

b) additional literature

- Medical informatics: textbook / V. P. Omelchenko, A. A. Demidova. - M.: GEOTAR-Media, 2016.-- 528 p.
- Information biology: textbook of institutions / M.A. Kamenskaya - M: Academy Publishing Center, 2009.
- Wentzel E.S. Probability theory. - Textbook for universities, 8th edition. M.: Higher school, 2002 - 575 p., Ill.
- Ventzel E.S., Ovcharov L.A. Applied Problems of Probability Theory. - 2nd ed., Erased. - M.: Higher school, 2000. - 480 p.
- Gmurman V.E. Probability theory and mathematical statistics: Textbook. pos. for universities. Ed. 9th, erased. - M.: Higher school, 2003.-- 480 p.: Ill.
- Rebrova O. "Statistical analysis of medical data. Application of the STATISTICA application package". Media Sphere: Moscow, 2002.
- Shmoilova R.A. Workshop on the theory of statistics: Textbook - M.: Finance and statistics, 2000. - 416 p.: ill.

11. Methodical instructions for students on mastering the discipline (module)

Lectures and laboratory classes on the discipline "Medical Informatics" "are conducted by teachers of the Department of Medical Informatics and Telemedicine. The course includes lectures, laboratory sessions, and students' independent work. This discipline is a compulsory discipline for the direction of "General Medicine".

The teachers of the department recommended modern literature, and attention is paid to the fact that the recommended literature contains the latest changes and additions.

In laboratory classes in classrooms, the relevant topics are analyzed using multimedia technology (computer, projector). For each lecture, there are presentations prepared in Microsoft PowerPoint, containing from 10 to 60 slides. For each laboratory task, step-by-step instructions for their implementation are prepared. The main goal of laboratory classes is to form students' understanding and holistic perception of the basic concept of medical informatics, the acquisition of knowledge about modern information technologies, medical information systems and their development trends.

Independent work of students during extracurricular hours can take place in the classrooms of the department and at home. The student's extracurricular independent work includes:

Study of material according to the textbook, teaching aids.

Independent study of data processing programs.

Work in the information and educational environment.

12. Fund of assessment tools for intermediate certification of students in the discipline

Materials for assessing the level of mastering the educational material of the discipline "Medical informatics" (evaluation materials), including a list of competencies with an indication of the stages of their formation, a description of indicators and criteria for evaluating competencies at various stages of their formation, a description of the assessment scales, typical control tasks or other materials necessary for assessing knowledge, skills, skills and (or) experience of activity, characterizing the stages of the formation of competencies in the process of mastering the educational program, methodological materials that determine the procedures for assessing knowledge, skills, skills and (or) experience of activities that characterize the stages of formation of competencies, developed in full and available for students on the discipline page at TUIS RUDN.

The program has been drawn up in accordance with the requirements of the ES HE RUDN.

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