"APPROVED"

Head of Department
_____ Lyudmila DUDARENKO
"31" August 2022

WORKING PROGRAM OF EDUCATIONAL DISCIPLINE

" Medical informatics"

LEVEL OF HIGHER EDUCATION Second (master's) level
DEGREE OF HIGHER EDUCATION Master's degree
BRANCH OF KNOWLEDGE 22 Healthcare
SPECIALTY 222 Medicine, 221 Dentistry

Reviewed and approved
at the meeting of the department of social medicine and
humanitarian disciplines
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Working program of educational discipline **Medical informatics** for the preparation of students of higher education of the second (master's) level of higher education in specialtys 222 Medicine , 221 Dentistry.

Developer : Phd in medicine Tyutyunikov I.E.

Agreed

The first vice-rector _____ Oleksandra SOROKA

Introduction

The program on the educational discipline " Medical Informatics " is compiled in accordance with the educational and professional program for training specialists of the second (master's) level of specialty 222 Medicine, fields of knowledge 22 Health care, the Law of Ukraine "On Higher Education" dated 07.01.2014 No. 1556- VII (Article 13, Clause 7), the provision "On the organization of the educational process at the International Academy of Ecology and Medicine" of the methodological recommendations approved by the Central Methodical Office of Higher Medical Education of the Ministry of Health of Ukraine regarding the development of programs of educational disciplines in accordance with industry standards of higher education. The discipline "Medical informatics" belongs to the Professional training section of the training plan for applicants of higher education of the second educational (master's) level.

1. Description of the academic discipline

Name of indicators	Field of knowledge, direction of training, educational and qualification level	Characteristics of the academic discipline	
The number of credits is 3	Branch of knowledge 22 "Healthcare" (code and name)	**full-time education**	
The total number of hours is 90	Specialty: 222 " Medicine " 221 "Dentistry"	Normative	
		Year	
		2nd	
		Semester	
		3rd	
		Lectures	
	Education level: master	6 hours	
		Practical, seminar	
		44 hours	
		Laboratory	
		0 hours	
		Independent work	
		40 hours	
		Individual tasks:	
		Type of control: Current and final, modular	

Note.
The ratio of the number of classroom hours to independent and individual work is (%): 1 credit ECTS – 30 hours , classroom load -52.4%, S.S -47.6%.

2. PURPOSE AND OBJECTIVES OF THE EDUCATIONAL DISCIPLINE

The educational discipline "Medical informatics" is part of the cycle of professional training of specialists of the second (master's) level of higher education in the field of knowledge 22 "Health care" specialty 222 "Medicine". The working curriculum of the discipline "Medical Informatics" is intended for students of the 2nd year and is based on the requirements of the industry standards of specialist training (OPP, OKH).

The educational discipline "Medical informatics" is taught with the aim of familiarizing students with the use of modern information and communication technologies in the field of health care, since the development of computer technologies, their implementation in medicine and health care requires medical workers to analyze morbidity, conduct medical documentation, processing of medical and social information using standard procedures, including modern computer information technologies.

The subject of study of the educational discipline is the means of computer technology, software of personal computers, modern technologies of medical and biological information processing.

Interdisciplinary connections: the discipline "Medical Informatics" is based on the study of the disciplines (elective courses) "Informatics" and "European Standard of Computer Literacy" and is integrated with the discipline "Informatics and Statistics"; promotes students' study of clinical, hygienic and social disciplines;

I. The purpose and tasks of the educational discipline

1.1.   The goal of teaching the educational discipline "Medical Informatics" is the formation of theoretical knowledge, practical abilities and skills of working with a personal computer and various application programs, which are necessary for the effective use of modern software and technical means of computerization in the educational process, scientific and professional activities, familiarization with the latest information technologies and the possibilities of their application in professional activities.

1.2.   The main tasks of studying the discipline "Medical informatics" are mastering the basics of modern information and communication technologies, trends in their development, familiarization with the principles of building information models, methods of processing medical images, methods of searching, saving, processing and transmitting medical and biological data, mastering the basic principles formalization and algorithmization of medical problems.

1.3 Competencies and learning outcomes, the formation of which contributes to the discipline (interrelationship with the normative content of the training of higher education applicants, formulated in terms of learning outcomes in the Standard of Higher Education).

According to the requirements of the Standard of Higher Education, the discipline "Medical Informatics" ensures that students acquire ***the following competencies:***

- general: ability to abstract thinking, analysis and synthesis; the ability to learn and master modern knowledge; ability to apply knowledge in practical situations; knowledge and understanding of the subject area and understanding of professional activity; the ability to make informed decisions; skills in using information and communication technologies; determination and persistence in relation to assigned tasks and assumed duties; the ability to apply knowledge in practical situations.

- special (professional, subject): ability to maintain medical documentation; the ability to intelligent multidimensional data analysis and their operational analytical processing with visualization of analysis results using modern information technologies; demonstration of skills in working with a personal computer and searching for medical and biological data using information technologies.

Detailing of competencies in accordance with the NQF descriptors in the form of the "Competence Matrix".

Matrix of competences

Competence	Knowledge	Skill	Communication	Autonomy and responsibility
Ability to abstract thinking, analysis and synthesis, ability to learn and master modern knowledge	Know the methods of analysis, synthesis and further modern education	Be able to analyze information, make informed decisions, be able to acquire modern knowledge	I will install cotton wool appropriate connections to achieve goals	Carry responsibility for timely acquisition of modern knowledge
Ability to apply knowledge in practical situations	Know methods of applying knowledge in solving problems practical questions	Be able to use knowledge in a variety of ways practical situations	Establish connections vertically and horizontal depending on practical situations	Carry responsibility for the timeliness of decisions made in these situations.
Knowledge and understanding of the subject area and understanding of professional activity. Ability to make informed decisions	Have specialized conceptual knowledge acquired in the learning process.	Be able solve complex tasks and problems that arise in professional activity.	Clear and unambiguous presentation of one's own conclusions, knowledge and explanations to specialists and non-specialists.	Be responsible for making decisions in difficult conditions
The ability to evaluate and ensure the quality of the work performed	Know the methods of quality assessment performed works	Be able provide quality performance of works	I establish connections for ensuring quality performance of works	Carry responsibility for the quality performance of works.
Skills in using information and communication technologies	Have deep knowledge in the field of information and communication technologies used in professional activities	Be able use information and communication technologies in a professional field that requires updating and integration of knowledge.	Use information and communication technologies professional activity	Carry responsibility for the development of professional knowledge and skills.
Determination and persistence in relation to assigned tasks and assumed responsibilities	Know responsibilities and ways of performing assigned tasks	To be able to determine the purpose and task of being persistent and conscientious in the performance of duties	I will install cotton wool interpersonal dreams connections for effective performance of tasks and duties	Be responsible for the timely and high-quality performance of assigned tasks
Ability to maintain medical records	To know the system of official document flow in the professional work of a doctor, and the methods of its management using modern information technologies	The ability to determine the source of finding the required information depending on its type; to be able to process it	I establish the necessary connections to ensure high-quality management of medical documentation	Be responsible for timely and high-quality maintenance of medical documentation
Ability to intelligent multidimensional data analysis and their operational analytical processing with visualization of analysis results using modern information technologies.	Know the methods of multidimensional data analysis and their operational analytical processing with visualization of analysis results using modern information technologies	The ability to perform statistical processing of material, analysis and presentation of the received information	Form conclusions based on the analysis and statistical processing of the received information	Be responsible for high-quality and timely performance of statistical processing and analysis of received information

Learning outcomes:

Integrative final program learning results, the formation of which is facilitated by the discipline "Medical Informatics": the formation of the student's basic competence in the field of information and computer technologies.

Learning outcomes for the discipline "Medical Informatics":

- the ability to effectively use modern general-purpose software in educational and cognitive

activities and everyday life;
- the ability to independently master software tools of various purposes and to update and integrate acquired knowledge;
- the ability to evaluate the role of new information and communication technologies in professional activity with prospects for the development of computer technology.
- the ability to use statistical functions and criteria for the analysis of medical and biological data;
- mastering the basic principles of developing medical information systems
- familiarization with the basic principles of telemedicine

2. Information volume of the academic discipline
3 ECTS credits, 90 hours, are assigned to the study of the academic discipline.
The discipline "Medical informatics" is structured into content modules.

Content module 1. Basics of information technologies in the health care system. Processing and analysis of medical and biological data.
Topic 1. Introduction and structure of medical informatics.
- Safety equipment.
- Basic tasks and components of medical informatics.
- Computer technologies in the health care system.
- Data and information. Presentation of information in computer systems.
- Hardware and software of modern computer equipment.
Topic 2. Transfer of information. Network technologies.
- The main components of communication systems.
- Technical and software support of communication systems. Global and local networks. Topologies of computer networks.
- Internet services.
- Peculiarities of searching for information on the Internet.
- Standards for transmission of medical information in electronic form.
Topic 3. Coding and classification of medical and biological data.
- Classification: definitions, goals, principles, types of classifications.
- Methods and types of coding.
- Medical classification systems. Problems of classification and coding in the field of health care.
Topic 4. Visualization of medical and biological data. Processing and analysis of medical images.
- Types of images and their characteristics.
- Methods of obtaining medical images.
- Digital processing of medical images. Software for image processing and analysis.
Topic 5. Analysis of biosignals. Biosignal processing methods
- Biosignals: registration, conversion and classification of signals.
- Acquisition and analysis of biosignals. Digital methods of biosignal processing
Topic 6. Basics of statistical analysis of medical and biological data.
- Modern technologies of data analysis. Sorting medical and biological data. Working with filters.
- Random variables. Laws of distribution of random variables.
- Statistical data analysis. Elements of selective theory.
Topic 7. Verification of statistical hypotheses. Correlation analysis.
- Experiment planning. Formulation of hypotheses. Statistical criteria.
- Estimation of statistical parameters and testing of hypotheses.
- Correlation analysis.

Content module 2. Medical knowledge and decision-making in medicine. Information systems in health care
Topic 8. Formalization and algorithmization of medical problems.
- Basics of algorithmization of medical problems. Algorithms and their properties. Ways of presenting algorithms. Types of algorithms.
- Compilation of the structural scheme of a simple and branched algorithm.

• Compilation of the structural diagram of the algorithm with an internal loop.

Topic 9. Formal logic in solving the problems of diagnosis, treatment and prevention of diseases.
• Logical operations and truth tables.
• A logical approach to the diagnosis of diseases.

Topic 10. Decision support methods. Strategies for obtaining medical knowledge.
• Types of medical knowledge and their representation in computer systems.
• Decision support systems. Expert systems, their structure and modes of operation.

Topic 11. Clinical decision support systems. Means of forecasting. Modeling of the decision support system.
• Application of clinical decision support systems. Types of medical expert systems.
• Design of decision support systems.
• Peculiarities of decision-making in medical expert systems. Means of forecasting.

Topic 12. Medical and biological data: data types, processing and management. Database management systems
• Types of medical and biological data, their structure, data processing and presentation
• Database management systems (DBMS). DBMS functions . DBMS models . Peculiarities of designing and working with medical databases.

Topic 13. Medical information systems and their development.
• Medical information systems (MIS): clinical use and technical implementation. Architecture of MIS. Application of MIS. Examples of MIS.
• Peculiarities of medical information systems in various branches of the health care system.

Topic 14. Individual electronic medical records. Structure of electronic medical records (EMC). Ethical and legal principles of information management in the health care system.
• Traditional and electronic medical records (electronic medical history). General structure of EMC. Data entry methods and forms. Software implementation of EMC. Access to EMC data.
• Protection of medical information - security, privacy and confidentiality of data in medical information systems. Information security threats. Selection of necessary measures to protect medical information.

Topic 15. Information resources of the health care system. Telemedicine
• Information resources of the health care system. Characteristics and features of medical Internet resources.
• Basics of telemedicine.
• Basics of working with hypertext documents.

Topic 16. Information technologies in evidence-based medicine.
• Use of evidence in medical decision-making. Sources of available evidence in medicine. Peculiarities of searching in international electronic medical databases. Use of information technologies in evidence-based medicine.

3. The structure of the academic discipline

Content module 1. *Basics of information technologies in the health care system.* *Processing and analysis of medical and biological data.*				
Topic	**L**	**Pr**	**S.S**	**Ind.**
1. Introduction and structure of medical informatics.	1	1		
2. Transfer of information. Network technologies.	1	4	4	
3. Coding and classification of medical and biological data.		4	4	
4. Visualization of medical and biological data. Processing and analysis of medical images.		1	2	
5. Analysis of biosignals. Biosignal processing methods.		4	2	
6. Basics of statistical analysis of medical and biological data.	1	4	4	
7. Verification of statistical hypotheses. Correlation analysis.		4	4	
Together according to content module 1	3	22	2 0	

Content module 2. **Medical knowledge and decision-making in medicine.** **Information systems in health care**				
Topic	**L**	**Pr**	**S.S**	**Ind.**
8. Formalization and algorithmization of medical problems.	1	1		
9. Formal logic in solving problems of diagnosis, treatment and prevention of diseases.		4	4	
10. Decision support methods. Strategies for obtaining medical knowledge.	1	4	4	
11. Clinical decision support systems. Means of forecasting. Modeling of the decision support system.		1	1	
12. Medical and biological data: types of data, processing and management. Database management systems		4	2	
13. Medical information systems and their development.	1	4	4	
14. Individual electronic medical records. Structure of electronic medical records (EMC). Ethical and legal principles of information management in the health care system.		4	4	
15. Information resources of the health care system. Telemedicine				
16. Information technologies in evidence-based medicine.				
Together according to content module 2	3	22	20	
Total hours - 90 / ECTS credits - 3	6	44	4 0	
Final control				test

4.   Thematic plan of lectures

No	Topic	Number of hours
Content module 1. Basics of information technologies in the health care system. Processing and analysis of medical and biological data.		
1	Introduction and structure of medical informatics.	1
2	Transfer of information. Network technologies.	1
3	Basics of statistical analysis of medical and biological data.	1
	In total	3
Content module 2. Medical knowledge and decision-making in medicine. Information systems in health care		
4	Formalization and algorithmization of medical problems.	1
5	Decision support methods. Strategies for obtaining medical knowledge.	1
6	Medical information systems and their development.	1
	In total	3
	The number of lecture hours in the discipline	6

5. Thematic plan of practical (seminar) classes

No	Topic	Number of hours
Content module 1. Basics of information technologies in the health care system. Processing and analysis of medical and biological data.		
1	Introduction and structure of medical informatics.	1
2	Transfer of information. Network technologies.	4
3	Coding and classification of medical and biological data.	4
4	Visualization of medical and biological data. Processing and analysis of medical images.	1
5	Analysis of biosignals. Biosignal processing methods.	4
6	Basics of statistical analysis of medical and biological data	4
7	Testing of statistical hypotheses. Correlation analysis.	4
	In total	22
Content module 2. Medical knowledge and decision-making. Information systems in health care		
8	Formalization and algorithmization of medical problems.	1
9	Formal logic in solving the problems of diagnosis, treatment and prevention of diseases.	4
10	Decision support methods. Strategies for obtaining medical knowledge.	4
11	Clinical decision support systems. Means of forecasting. Modeling of the decision support system	1
12	Medical and biological data: data types, processing and management. Database management systems	4
13	Medical information systems and their development	4
14	Individual electronic medical cards. Structure of electronic medical records (EMC). Ethical and legal principles of information management in the health care system.	4
15	Information resources of the health care system. Telemedicine.	1
16	Information technologies in evidence-based medicine	4
	In total	22
	The number of hours of practical classes in the discipline	44

6. Thematic plan of students' independent work

No	Topic	Number of hours
	Content module 1. Basics of information technologies in the health care system. Processing and analysis of medical and biological data.	
1	The current state of telecommunications in Ukraine. Trends in the development of computer and network technologies, both general and medical purposes.	6
2	Presentation of medical and biological data using presentation tools	7
3	Processing and analysis of medical images using graphic packages	7
	Together	20
	Content module 2. Medical knowledge and decision-making in medicine. Information systems in health care	
4	Formalization and algorithmization of medical problems	3
5	Application of logical functions in solving the problems of diagnosis, treatment and prevention of diseases	3
6	Modern methods of decision support in medicine	3
7	Principles of building medical information systems	3
8	Basics of document management in medicine. Creation of a combined medical document. Presentation of medical and biological data using text processors.	3
9	Use of information resources of the healthcare system Creation of the simplest web pages.	3
10	Principles of working with information in international electronic databases of systematic reviews	2
	In total	20
	In total	40

7. **Individual tasks** are not provided for in the curriculum.

8 . TEACHING METHODS.

The educational process is organized according to the credit-module system in accordance with the requirements of the Bologna process.

Types of educational activities of students according to the curriculum are:

a) lectures,

b) practical classes,

c) independent work of students.

In the lecture course, it is necessary to highlight the problematic issues of the relevant sections of pharmacology - the history of pharmacology, modern achievements of pharmacological science, the dependence of the action of drugs on the chemical structure and other factors depending on the drugs and the organism, the peculiarities of their pharmacokinetics and pharmacodynamics, modern mechanisms of action, indications for use, side effects effects, symptoms of overdose, help with poisoning.

At each practical session, students must keep a short protocol in which they write down recipes, write down the results of experiments and answers to situational problems.

During lectures and practical classes, it is necessary to use audiovisual teaching aids: tables, slides, windows, collections of medicines, educational films, computer equipment, etc.; when conducting experiments on animals, take into account the international requirements of bioethics.

10. CONTROL METHODS.

On-going control is carried out at each practical lesson according to the specific goals of each topic.

Students' educational activities are monitored in practical classes during ongoing monitoring in accordance with specific goals and during individual work of the teacher with the student. When evaluating students' educational activities, it is necessary to give preference to standardized control methods: testing, structured written works, structured according to the procedure of control of practical skills in conditions close to real ones.

It is recommended to use the following tools for diagnosing the level of students' training: computer tests, solving situational problems, writing prescriptions, determining whether drugs belong to a pharmacological group according to the international classification, possible indications for use; analysis and assessment of the results of instrumental studies and parameters characterizing changes in the function of the animal body under the influence of drugs.

A student can work on the missed topics or rewrite them for a positive assessment to the teacher during his consultations (individual work with students) no more than 3 times during the study of the module, thereby scoring at least the minimum number of points to be admitted to the final module control.

Control of independent work:

Control of students' independent work, which is provided for in the topic along with classroom work, is carried out during the current control of the topic in the corresponding classroom session. Topics that are presented only for independent work and are not included in the topics of classroom training sessions are controlled during the final module control.

Final modular control:

Final control of learning of each module, control of practical skills is carried out after the completion of study of all topics of the module at the last control session of the module.

Students who have completed all types of work provided for in the curriculum and have obtained a minimum number of points after studying the module are admitted to the final examination.

The form of final control should be standardized and include control of theoretical and practical training. Specific forms of control in pharmacology are defined in the work curriculum.

11. DISTRIBUTION OF POINTS RECEIVED BY STUDENTS

The grade for the module is defined as the sum of the grades of the current educational activity (in points) and the final module control grade (in points), which is assigned when evaluating theoretical knowledge and practical skills in accordance with the lists determined by the discipline program.

The maximum number of points assigned to students for mastering each module (credit) is 200, including 120 points (60%) for the current educational activity, 80 points (40%) based on the results of the module final control.

Evaluation of current educational activities:

The maximum number that a student can gain while studying the module is 200 points. It is calculated by multiplying the number of points corresponding to the grade "5" by the number of topics in the module with the addition of points for individual independent work. The minimum number of points that a student can score for the current educational activity is 120 points.

Recalculation of the average grade for the current activity into a multi-point scale

4-point scale	200-point scale	4-point scale	200-point scale	4-point scale	200-point scale	4-point scale	200-point scale
5	120	4.45	107	3.91	94	3.37	81
4.95	119	4.41	106	3.87	93	3.33	80
4.91	118	4.37	105	3.83	92	3.29	79
4.87	117	4.33	104	3.79	91	3.25	78
4.83	116	4.29	103	3.74	90	3.2	77
4.79	115	4.25	102	3.7	89	3.16	76
4.75	114	4.2	101	3.66	88	3.12	75
4.7	113	4.16	100	3.62	87	3.08	74
4.66	112	4.12	99	3.58	86	3.04	73
4.62	111	4.08	98	3.54	85	3	72
4.58	110	4.04	97	3.49	84	Less than 3	Not enough
4.54	109	3.99	96	3.45	83		
4.5	108	3.95	95	3.41	82		

A student is admitted to the modular control if he fulfills the conditions of the educational program and if he has scored at least 120 points for the current educational activity.

The modular control consists of a test part (45 tests) with a maximum number of points - 40; and written with a maximum score of -40. The written part consists of three questions (distribution of points between questions: 7, 7 and 6 points) and four recipes (each of which is valued at 5 points).

The final control of learning the module takes place after completing the study of the block of relevant content modules through testing, written answers to theoretical questions and solving situational problems.

A student is admitted to the final module control upon fulfilling the conditions of the study program and if the average score (for two modules) for the current educational activity is at least 120 points.

Before the final module control (PMK), based on the marks on the traditional scale given during the study of the module (for each lesson and for individual tasks), the arithmetic average (AA) of the marks on the traditional scale, rounded to 2 (two) decimal places, is calculated. The obtained value is converted into a score on a multi-point scale as follows:

Scale	200 points
Disciplines completed by test	AA/5*120
Disciplines ending with credit	AA/5*200

Assessment of final control:

The maximum number of points of the final control is 80 .

The final modular control consists of a written part (maximum number of points -40) and computer testing (maximum number of points 40).

The final module test is considered passed if the student scored ***at least 50 points.***

Assessment of discipline:

Pharmacology is graded only for students who have passed all modules in the discipline. According to the decision of the Academic Council, incentive points can be added to the number of points in the discipline for students who have scientific publications or won prizes for participation in the Olympiad in the discipline among universities of Ukraine, etc.

Forms of control and the evaluation system are carried out in accordance with the requirements of the

discipline program and the Instruction on the evaluation system of students' educational activities under the credit-module system of the organization of the educational process, approved by the Ministry of Health of Ukraine (2005).

The evaluation of the student's success in the discipline is a rating and is given according to the multi-point scale **of ECTS and the traditional scale adopted in Ukraine.**

Conversion of the number of points from the discipline into grades on the ECTS and 4-point (traditional) scales:

The number of points in the discipline awarded to students is converted to the *ECTS scale* as follows:

Estimation of ECTS	Statistical indicator
A	The best 10% of students
B	The next 25% of students
C	The next 30% of students
D	The next 25% of students
E	The last 10% of students

The percentage of students is determined on the sample for students of this course within the relevant specialty.

Discipline assessment FX, F ("2") is issued to students who have not passed at least one module in the discipline after completing its study.

A grade of FX ("2") is assigned to students who have achieved the minimum number of points for the current learning activity, but have not passed the module final control. They have the right to repeat the final modular control no more than 2 (two) times according to the schedule approved by the rector.

Students who received an F grade at the end of the study of the discipline (did not complete the curriculum from at least one module or did not score the minimum number of points for the current educational activity from the module) must undergo **repeated training from the corresponding module.** The decision is made by the management of the higher education institution in accordance with the regulatory documents approved in accordance with the established procedure.

12. METHODOLOGICAL SECURITY

The integration of the processes of planning, management and control of the assimilation of knowledge in "Pharmacology" is due to the methodical support of the educational process:

• Work program on discipline;

• Working thematic plans of lectures, practical classes and SRS;

• Abstracts (summaries, presentations) of lectures;

• Methodical instructions for practical classes;

• Methodical guidelines for independent work of students;

• Methodical developments for teachers;

• Instructional and methodical materials for intermediate and final control of knowledge (bases of test tasks, list of tasks for control of practical skills and theoretical knowledge in practical classes and PMK);

• Educational literature used in the study of the discipline;

• Tables;

• Collections of drugs;

8.   Recommended Books

Basic (Basic)

1. Medical informatics: textbook / I.E. Bulah, Yu.E. Lyakh, V.P. Martsenyuk, 1.1. Haimzon. - T.: Ukrmedknyga, 2018. - 308 p.

2. Vuytsik V., Gotra O.Z., Grigoriev V.V. Expert systems: Study guide. - Lviv: Liga-Press, 2016. - 290p.

3. Registration, processing and control of biomedical electrographic signals/[V.Vuytsyk, O.Z.Gotra, N.V.Dorosh, O.I.Dorosh, P.F.Kolisnyk, S.V.Pavlov]; under the editorship Z. Yu. Gotry.— Lviv: Liga-Press, 2019. - 308 p.

4. Voytyushenko N.M. Informatics and computer technology: education. manual [for students higher education app.] / N.M. Voytyushenko, A.I. Ostapets - 2nd edition. - K.: Center of Educational Literature, 2019. - 564 p.

5. Hrytsunov O. V. Information systems and technologies: teaching. manual - Kh.: KhNAMG, 2020. - 222 p.

6. Information technologies in medicine: teaching. manual for students higher honey. education closing / V.I. Fediv, V.F. Myslitskyi, K.B. Tymochko, V.F. Boyechko, M.V. Shaplavsky // - Chernivtsi, 2019. - 242 p.

7. Gelman V.Ya. Medical informatics: workshop. - Saint Petersburg: Peter, 2018. - 480 p.

Auxiliary

1. Gerasevych V.A. A computer for a doctor. Self-taught. - 2nd ed., revised. and additional - St. Petersburg: BHV-Petersburg, 2004. - 512 p

2. Informatics in tables and diagrams: PC and its components, Windows operating system , Internet, main and auxiliary devices, system and application software, modeling and programming / [Bilousova L.I., Olefirenko N.V.]. — Kharkiv: Torsing plus, 2014. — 111 p.

3. Lopoch S.N., Chubenko A.V., Babych P.N. Statistical methods in medical and biological research using EXCEL. - K.: Morion, 2001. - 408 p.

4. Information systems and technologies: Education. manual for students higher education close./ S.G. Karpenko, V.V. Popov, Yu.A. Tarnavskyi, G.A. Shportyuk. - K.: MAUP, 2004. - 192 p.

5. Paul J. Perry. Secrets of the World Wide Web. "Dialectics". Kyiv. 1996. 576p.

9.   Information resources

1. http://ir.lib.vntu.edu.ua/bitstream/handle/123456789/9994/%D0%A2%D0%B5%D0%BA%D1%8_1%D1%82-2.pdf ? sequence= 1 &isAllowed=y

2. https://help.libreoffice.org/Writer/Instructions_for_Using_Writer/ru

3. http :// msk . edu . ua / ivk / Informatika / Uch __posobiya /% D 0%9 F % D 0% B 0% D 0% B 2% D 0% BB % D 1% 83% D 1%88% D 0% B 8% D 0% BD % D 0% B 0.%20% D 0% A 2% D 0% B 5% D 1%85% D 0 %BD%D0%BE%D0%BB%D0%BE%D0% B3%D0%B8%D 1 %8F%20%D 1 %80%D0%B0%D0%B 1 %D0%BE %D1%82%D 1 %8B%20%D0%B2%20Libre%20Office. pdf