

MINISTRY OF HEALTH OF UKRAINE

ODESA NATIONAL MEDICAL UNIVERSITY

Department of general and clinical pharmacology and pharmacognosy

ЗАТВЕРДЖУЮ



Проректор з науково-педагогічної роботи

Едуард БУРЯЧКІВСЬКИЙ

01 вересня 2023 року

**WORKING PROGRAM IN THE DISCIPLINE  
«INFORMATION TECHNOLOGIES IN PHARMACY»  
(full-time education)**

**Level of higher education:** second (master's degree)

**Field of knowledge:** 22 «Health care»

**Specialty:** 226 «Pharmacy, industrial pharmacy»

**Educational and professional program:** Pharmacy, industrial pharmacy

The program was compiled on the basis of the educational and professional program "Pharmacy, industrial pharmacy", training of specialists of the second (master's) level of higher education in the specialty 226 "Pharmacy, industrial pharmacy" field of knowledge 22 "Health care", approved by the Scientific Council of ONMedU (from 29.06 .2023, protocol No. 8).

Authors:

Head of the department, Doctor of Medical Sciences, Prof. Rozhkovsky Yaroslav  
 Head of the educational part of the department, Ph.D. in biology, docent Prystupa Bohdan  
 Assistant of the department Gerasimiyuk Natalia

The work program was approved at the meeting of the department of pharmacology and pharmacognosy  
 Protocol No. 1 dated August 28, 2023

Head of the department



Yaroslav ROZHKOVSKY

Approved by the guarantor of  
 the educational and professional program



Liana UNGURYAN

Approved by the subject-cycle methodological commission on pharmacy of ONMedU  
 Protocol No. 1 dated 29.08.2023

Head of the subject-cycle methodological  
 commission on pharmacy of ONMedU



Natalia FIZOR

Revised and approved at the meeting of the department of Pharmacology and Pharmacognosy  
 Protocol No. \_\_ dated \_\_/\_\_/20\_\_.

Head of the department

\_\_\_\_\_ Yaroslav ROZHKOVSKY

Revised and approved at the meeting of the department of Pharmacology and Pharmacognosy  
 Protocol No. \_\_ dated \_\_/\_\_/20\_\_.

Head of the department

\_\_\_\_\_ Yaroslav ROZHKOVSKY

### 1. Description of the discipline:

Name of indicators	Field of knowledge, specialty, specialization, level of higher education	Characteristics of the discipline
Total number:	Field of knowledge 22 «Health care»	<i>Full-time (day) education</i> <i>Compulsory discipline</i>
Credits of ECTS: 4	Specialty 226 « Pharmacy, industrial pharmacy »  Level of higher education second (master's degree)	<i>Course:</i> II
Hours: 120		<i>Semester:</i> III
Content modules: 3		<i>Lectures</i> 10 hours
		<i>Practical classes</i> 40 hours
		<i>Independent work</i> 70 hours
		<i>including individual tasks</i> 0
		<i>Form of final control</i> Credit Test

### 2. The purpose and tasks of the educational discipline, competencies, program learning outcomes

**Purpose:** to familiarize getter with the basics of modern computer information technologies, trends in their development, teaching the principles of building information models, processing medical images in professional activities, etc.

**Gols:**

1. Mastering the methods of computer processing of biomedical information.
2. Drawing up algorithms for solving biomedical problems.
3. Application of the latest information technologies for obtaining, processing and visualizing medical and biological data.
4. Demonstration of skills in working with biomedical data and biomedical information.

**The process of getting the discipline is aimed at forming the elements of the following competencies:**

The ability to solve problems of a research and/or innovative nature in the field of pharmacy and to critically consider and solve practical problems in professional pharmaceutical activity using the provisions, theories and methods of fundamental, chemical, technological, biomedical and socio-economic sciences; integrate knowledge and solve complex issues, formulate judgments based on insufficient or limited information; clearly and unambiguously convey one's own knowledge, conclusions and their validity to a professional and non-professional audience. Ability to continue learning with a high degree of autonomy.

General (GC):

- GC 01. Ability to think abstractly, analyze and synthesize, learn and be modernly educated.
- GC 02. Knowledge and understanding of the subject area and understanding of professional activity.
- GC 03. Ability to communicate in the national language both orally and in writing.
- GC 04. The ability to communicate in a foreign language (mainly English) at a level that ensures effective professional activity.
- GC 05. The ability to evaluate and ensure the quality of the work performed.
- GC 06. Ability to work in a team.
- GC 07. The ability to realize one's rights and responsibilities as a member of society; to realize the values of a civil (free democratic) society and the need for its sustainable development, the rule of law, the rights and freedoms of a person and a citizen in Ukraine.
- GC 09. Ability to use information and communication technologies.
- GC 10. The ability to act socially responsibly and consciously.
- GC 11. Ability to apply knowledge in practical situations.
- GC 12. The desire to preserve the environment.
- GC 13. Ability to show initiative and entrepreneurship.
- GC 14. Ability to adapt and act in a new situation

GC 15. Knowledge and understanding of the subject area and understanding of professional activity

GC 16. The ability to conduct experimental research at the appropriate level.

Specialists (SC):

Professional competences are formed taking into account the standard of higher education in the specialty 226 Pharmacy, industrial pharmacy specialization 226.01 Pharmacy of the field of knowledge 22 Health care for the second (master's) level of education.

SC 01. Ability to integrate knowledge and solve complex pharmacy problems in broad or multidisciplinary contexts.

SC 02. The ability to collect, interpret and apply data necessary for professional activity, research and implementation of innovative projects in the field of pharmacy.

SC 04. The ability to clearly and unambiguously convey one's own knowledge, conclusions and arguments in the field of pharmacy to specialists and non-specialists, in particular to people who are studying.

SC 10. The ability to monitor the effectiveness and safety of the population's use of medicines according to data on their clinical and pharmaceutical characteristics.

SC 24. Ability to use knowledge of regulatory and legislative acts of Ukraine and recommendations of proper pharmaceutical practices in professional activities.

SC 25. The ability to demonstrate and apply in practical activities communicative communication skills, fundamental principles of pharmaceutical ethics and deontology based on moral obligations and values, ethical norms of professional behavior and responsibility in accordance with the Code of Ethics.

Program learning outcomes for the discipline:

PLO01. Have and apply specialized conceptual knowledge in the field of pharmacy and related fields, taking into account modern scientific achievements.

PLO 02. Critically understand scientific and applied problems in the field of pharmacy.

PLO 03. Have specialized knowledge and skills/skills for solving professional problems and tasks, including for the purpose of further development of knowledge and procedures in the field of pharmacy.

PLO 04. Communicate freely in the national and English languages orally and in writing to discuss professional problems and results of activities, presentation of scientific research and innovative projects.

PLO 05. To assess and ensure the quality and efficiency of activities in the field of pharmacy.

PLO 06. Develop and make effective decisions to solve complex/complex problems of pharmacy personally and based on the results of joint discussion; formulate the goals of one's own activity and the activity of the team, taking into account public and industrial interests, the general strategy and existing limitations, determine the optimal ways to achieve goals. PRN07. Collect the necessary information on the development and production of medicinal products, using professional literature, patents, databases and other sources; systematize, analyze and evaluate it, in particular, using statistical analysis.

PLO 08. Develop and implement innovative projects in the field of pharmacy, as well as related interdisciplinary projects taking into account technical, social, economic, ethical, legal and environmental aspects.

PLO 21. To ensure competitive positions and effective development of pharmaceutical organizations, including taking into account the results of marketing research and market processes at the national and international levels

PLO 24. Conducts and professional activity in social interaction based on humanistic and ethical principles; to identify future professional activity as socially significant for human health.

PLO 25. Adhere to the norms of the sanitary and hygienic regime and the requirements of safety equipment when carrying out professional activities.

PLO 26. Argue information for decision-making, bear responsibility for them in standard and non-standard professional situations; adhere to the principles of deontology and ethics in professional activity.

PLO 27. Perform professional activities using creative methods and approaches. PRN28. To carry out professional communication in the state language, use oral communication skills in a foreign language, analyzing specialized texts and translating foreign language information sources.

PLO 29. To carry out professional activities using information technologies, "Information databases", navigation systems, Internet resources, software and other information and communication technologies.

PLO 30. Adhere to the norms of communication in professional interaction with colleagues, management, consumers, work effectively in a team.

PLO 32. Analyze information obtained as a result of scientific research, summarize, systematize and use it in professional activities.

PLO 34. Use the data of clinical, laboratory and instrumental studies to monitor the effectiveness and safety of the use of medicinal products.

PLO 36. Plan and implement professional activities on the basis of normative legal acts of Ukraine and recommendations of proper pharmaceutical practices.

PLO 37. To contribute to the preservation of health, in particular the prevention of diseases, the rational prescription and use of medicinal products. To conscientiously fulfill one's professional duties, to comply with the legislation on the promotion and advertising of medicinal products. Possess psychological communication skills to achieve trust and mutual understanding with colleagues, doctors, patients, consumers.

**As a result of studying the discipline, the getter has to know:**

- principles of application of the latest information and communication technologies;
- functionality of general and special applications for solving professional problems;
- basic principles of building electronic documents;
- basic methods of statistical data analysis;
- the basics of using a DBMS when creating and maintaining a pharmaceutical database;

**Be able:**

- use computer equipment and information technology in the daily activities of a specialist;
- work with peripheral devices, control the input and output of information;
- use office software tools for performing calculations, compiling and grouping data, visualizing information, for processing statistical information in pharmacy;
- use information resources for the search, processing and presentation of biomedical and pharmaceutical information;
- create, edit and print professional texts, draw up reports on the work performed with the inclusion of graphic materials;

own:

- general competences;
- professional competences and integral competences within the framework of the discipline "Information technology in pharmacy".

possess

- to determine the possibilities of using information technologies and PCs in pharmacy and medicine;
- explain the principles of formalization and algorithmization of medical problems, the principles of modeling in pharmacy and medicine;
- demonstrate basic skills in working with a PC and searching for medical and pharmaceutical information using information technology;
- use methods of processing pharmaceutical information

### **3. The content of the educational discipline**

Fundamentals of information technology in the health care system. Processing and analysis of biomedical data.

Content block 1. Basic concepts of medical informatics. The computer in the activity of the future pharmacist.

Specific objectives:

- interpret the basic concepts of medical informatics in pharmacy;
- to interpret the features of the application of application software for the processing of medical data and medical and pharmaceutical information;
- analyze the role of information, communications and computer technology in pharmacy;
- treat the basic principles of telemedicine;
- Demonstrate skills in the use of DBMS in the processing of biomedical data;
- Demonstrate the basic skills of using the basic medical and financial resources of the Internet.

**Topic 1.** Safety. The initial level. The maintenance and structure of medical informatics.

- Safety precautions.
- Computer testing.
- Objectives of the course. Structure of the course.
- Basic tasks and components of information technology in pharmacy (ITF).
- Data and information.
- Computer applications in the health system

**Topic 2.** Transmission of information. Network technologies. Basics of telemedicine.

• Communication. Sender, channel, recipient. Receivers and converters of information. Information carriers. Properties of information. Entropy of information.

• Technical and software of communications. The Internet. Communication in the system of health protection.

- Basic principles of telemedicine.
- General formulation of the problem of computational and graphic work (RGR).

**Topic 3.** Basics of working with the Windows operating system

- The main objects and controls of Windows.
- Windows desktop.
- Windows files and folders.
- Operations with file structure.
- The Explorer program.
- Using the "Main Menu".

**Topic 4.** Creation of complex text documents.

- Enter formulas.
- Working with tables.
- Working with diagrams.
- Working with graphic objects

**Topic 5.** Computer data: data types, processing and management.

• Information processing systems: user, data entry, user interface, data processing and presentation.

• Database management systems (DBMS). Data structure. DBMS functions. Data models. Data management. Saving of data. DBMS models. Types of models: hierarchical, relational and model of the network type.

Content block 2. Medical data. Methodology of information processing and analysis.

Specific objectives:

- to interpret the principles of classification and coding of medical and biological information;
- to interpret the principles of application of statistical methods in processing the results of medical and biological research;

- demonstrate the skills of using statistical functions and criteria for the analysis of medical and biological data;

- to interpret the methods of processing and analyzing medical images.

**Topic 6.** Coding and classification.

- Classification: types, classification, definition, goals, principles. Codes: encoding, numeric and mnemonic codes, hierarchical and combination codes, matching codes.

- History of classification and coding. Classification systems. Problems of classification and coding.

**Topic 7.** Analysis of biosignals. Methods for processing biosignals.

- Biosignal analysis. Registration, transformation and classification of signals. biosignals and non-stationary signals. Types of signals.

- Applied application of biosignal analysis.

**Topic 8.** Visualization of medical and biological data. Processing and analysis of medical images.

- Means of obtaining images. Processing of medical images. Problems of image processing and analysis. Transformation of images. General and local transformation of images.

- Modern trends in image processing.

- Processing of two-dimensional and three-dimensional medical images.

**Topic 9.** Methods of decision support. Strategies for obtaining medical knowledge.

Types of medical knowledge. Training of people and "Training" of computers.

- Decision Support Systems.

- Knowledge base. Information needs and ways to solve them. Types of decision support systems and the base of medical knowledge.

**Topic 10** Formal logic in solving problems of diagnosis, treatment and prevention of diseases.

- Logical operations and truth tables.

- Logical operators and expressions. Algebra of logic.

- Binary notation and logic.

**Topic 11** Formalization and algorithmization of medical tasks.

- Fundamentals of the algorithmization of medical tasks. Algorithms and their properties. Methods of representing algorithms. Types of algorithms.

- Drawing up a structural diagram of a simple and branched algorithm. Drawing up a structural diagram of an algorithm with an internal cycle.

**Topic 12.** Methods of biostatistics.

- Data description: qualitative, ordinal and quantitative data. Estimation of parameters and hypothesis testing. Statistical analysis of data.

- Control of the execution of the stage of calculation and graphic work.

**Block 2** Medical knowledge and decision-making in medicine.

Content block 3. Medical knowledge and decision-making.

Specific objectives:

- to interpret the main formal models of the representation of medical knowledge;
- analyze the principles of building and functioning of decision support systems in medicine;
- to interpret the basic concept of mathematical logic;
- demonstrate the ability to present the conditions of medical and biological problems in a formal form;

- interpret the use of evidence in making medical decisions.

- to interpret types of information and hospital systems in the field of health protection

- demonstrate skills of working with electronic medical cards;

- demonstrate the ability to use information resources to search for medical information;
- treat ethical and legal principles of management of medical and biological information.

**Topic 13.** Clinical decision support systems. Means of forecasting. Modeling of decision support system.

- Application of clinical decision-making systems. Types of systems.
- Means of forecasting. Support for decision-making with the help of simple forecasting tools.
- Presentation of decision support systems. Expert systems. Building a knowledge base and structuring. Reusing ontologies. Modern architecture of the decision-making system.

**Topic 14.** Evidence-based medicine.

- Use of evidence in making medical decisions. Sources of available evidence in medicine

**Topic 15.** Types of information systems in the field of health protection. Hospital information systems and their development.

- Public health and health. Modeling and models of the health protection system (POPs). Requirements for information.

• Hospital information systems (GIS): clinical use and technical implementation. History of GIS. The future of GIS. GIS functions. The concept of GIS. GIS architecture. Application of GIS. Examples of GIS. Access and data protection. Administrative management.

- Clinical systems in various branches of the health system

**Topic 16.** Individual medical cards. Structuring the content of electronic medical cards (EMC).

- Traditional and electronic medical records (electronic medical history). History of development.

• Introduction of data: strategies and forms of data entry. Structure of data input: dynamics, interface, adaptation to the consumer. General structure of the EMC. Implementation of EMC. Use of EMC data

**Topic 17.** Information resources of the health protection system.

• Information resources of the health system. Characteristics and features of information resources of the health protection system. Areas of information resources of the health system. Health information networks with open access. Informational resources. Administrative systems. Registers. Epidemiological surveillance. Banks of organs, tissues and blood. Use of information resources in evidence-based medicine

**Topic 18.** Ethical and legal principles of information management in the health protection system.

- Information security - security, privacy and confidentiality of medical information systems. Threats. Selection of necessary measures. Legislation and regulation.

**Topic 19.** Linear programming. Optimization of characteristics of medicinal mixtures by the method of linear programming

- Stages of program development. Economic aspects and software quality standards. Optimization tasks.

**Topic 20.** Modeling of medical and biological processes.

• Biological, physical, cybernetic and mathematical models. Stages of mathematical modeling. Mathematical modeling of population growth of microorganisms. STAT-kit with 4 programs

**Topic 21.** The automated workplace of a pharmacist

- Workstation hardware and software

**Topic 22.** Automated control systems. in pharmacy

- Principles of medical records management. Data protection.



- Sorting the data. Creating reports. Statistical reporting functions

#### 4. The structure of the discipline

Topic	Number of hours					
	That's all	Including				
		lec	sem	pract	IWG	IWG, which is not part of the classroom lesson plan
<b>Chapter 1. Basic concepts of medical informatics. The computer in the activity of the future pharmacist.</b>						
Topic 1. Safety technology. Output level. Management and structure of medical informatics	4	2	0	2	0	
Topic 2. Transfer of information. Network technologies. Basics of telemedicine	6	4	0	2	0	
Topic 3. Basics of working with the Windows operating system	2	0	0	2	0	
Topic 4. Creation of complex text documents	2	0	0	2	0	
Topic 5. Computer data: data types, processing and management.	8	0	0	2	6	
<b>Section 2. Medical data. Information processing and analysis methodology.</b>						
Topic 6. Coding and classification.	4	2	0	2	0	
Topic 7. Analysis of biosignals. Biosignal processing methods	2	0	0	2	0	
Topic 8. Visualization of medical and biological data. Processing and analysis of medical images.	2	0	0	2	0	
Topic 9. Decision support methods. Strategies for obtaining medical knowledge.	8	0	0	2	6	
Topic 10 Formal logic in solving problems of diagnosis, treatment and prevention of diseases	10	0	0	2	8	
Topic 11 Formalization and algorithmization of medical problems	2	0	0	2	0	
Topic 12. Methods of biostatistics	2	0	0	2	0	
<b>Chapter 3. Medical knowledge and decision-making.</b>						
Topic 13. Clinical decision support systems. Means of forecasting. Modeling of the decision support system.	8	0	0	2	6	
Topic 14. Evidence-based medicine.	8	0	0	0	8	
Topic 15. Types of information	10	0	0	4	6	

systems in the field of health care. Hospital information systems and their development						
Topic 16. Individual medical cards. Structuring the content of electronic medical records (EMC).	10	0	0	2	0	
Topic 17. Information resources of the health care system	2	0	0	2	0	
Topic 18. Ethical and legal principles of information management in the health care system.	2	0	0	2	0	
Topic 19. Linear programming. Optimization of the characteristics of medicinal mixtures by the method of linear programming.	6	0	0	0	6	
Topic 20. Modeling of medical and biological processes	10	2	0	0	8	
Topic 21. Automated workplace of a pharmacist	14	0	0	2	12	
Topic 22. Automated control systems. in pharmacy. Internet pharmacies	2	0	0	2	4	
<b>Hours in general:</b>	120,0	10,0	0	40,0	70,0	70,0

## 5. Topics of lectures / seminars / practical / laboratory classes

### 5.1 Thematic plan of lectures

№	Theme	hours
1.	Information Technology. Basic concepts and definitions.	2
2	Basic concepts of information coding. Number systems	2
3	Basics of computer networks	2
4	Internet business, e-commerce	2
5.	Expert systems and modeling in pharmacy and medicine.	2
	<b>TOTAL</b>	<b>10</b>

### 5.2. Topics of seminar classes

Seminar classes are not provided.

### 5.3. Thematic plan for practicals classes

№	Topic	Hours
1	Safety technique. Introduction and structure of medical informatics.	2
2	Transfer of information. Network technologies. Basics of telemedicine.	2
3	Basics of working with the Windows operating system	2
4	Creation of complex text documents	2
5	Computer data: data types, processing and management.	2
6	Coding and classification.	2

7	Analysis of biosignals. Biosignal processing methods.	2
8	Visualization of medical and biological data. Processing and analysis of medical images.	2
9	Decision support methods. Strategies for obtaining medical knowledge	2
10	Formal logic in solving the problems of diagnosis, treatment and prevention of diseases	2
11	Formalization and algorithmization of medical problems	2
12	Methods of biostatistics.	2
13	Means of forecasting. Information technologies of functional approximation and forecasting of statistical data	2
14	Types of information systems in the field of health care. Hospital information systems and their development	2
15	Information systems in health care (MAKS and hospital systems)	2
16	Individual medical cards. Structuring the content of electronic medical records (EMR).	2
17	Information resources of the health care system	2
18	Ethical and legal principles in the health care system	2
19	Automated workplace of a pharmacist. Software for the pharmacist pharmacist. "PC Pharmacy"	2
20	Automated management systems in pharmacy. Electronic commerce. Work on trading Web sites. Internet pharmacies	2
	Total	40

#### 5.4. Topics of laboratory classes

Laboratory classes are not provided.

### 6. Independent work of a getter of higher education

#### 6.1. THEMATIC PLAN OF INDEPENDENT WORK OF GETTER (IWS)

№ п.п.	Topic	Hours
1	Database management systems in medicine	6
2	Principles of building neural networks. Neural networks in pharmacy and medicine.	6
3	Application of logical operations and truth tables in the diagnosis and treatment of diseases.	8
4	Clinical decision support systems.	6
5	Principles and aspects of evidence-based medicine.	8
6	Hospital information systems.	6
7	Linear programming. Optimization of the characteristics of medicinal mixtures by the method of linear programming.	6
8	Modeling of medical and biological processes	8
9	Medical hardware and computer systems	6
10	Principles of using video communication in medicine and pharmacy.	6
11	Protection of medical information	4
	Total	<b>80</b>

## 7. Teaching methods

**Lectures:** story, explanation, conversation

**Practical exercises:** conversation, solving situational problems, preparing and presenting reports, performing tasks on a computer.

**Independent work:** independent work with a textbook, independent work with a computer.

## 8. Control methods and criteria for evaluating learning outcomes

**Current control:** oral survey, testing, assessment of the performance of theoretical skills, solving situational tasks, assessment of class activity.

**Final control:** diff. exam.

Evaluation of the current educational activity in a practical session:

1. Evaluation of theoretical knowledge on the subject of the lesson:

- methods: survey, solving a situational problem

- maximum score – 5, minimum score – 3, unsatisfactory score – 2.

2. Evaluation of practical skills and manipulations on the subject of the lesson:

- methods: assessment of the correctness of the performance of practical skills

- maximum score – 5, minimum score – 3, unsatisfactory score – 2.

3. Evaluation of work with a PC on the subject of the lesson:

- methods: assessment of the correctness of the performance of practical skills

- maximum score – 5, minimum score – 3, unsatisfactory score – 2.

The grade for one practical session is the arithmetic average of all components and can only have a whole value (5, 4, 3, 2), which is rounded according to the statistical method.

### Current evaluation criteria in practical training

Rating	Evaluation criteria
"5"	The applicant is fluent in the material, takes an active part in discussing and solving the situational problem, confidently demonstrates practical skills when working with Microsoft Office software packages, databases, the "PC Pharmacy" program, expresses his opinion on the subject of the lesson, demonstrates an individual approach to the presentation and solution of the problem algorithm.
"4"	The applicant has a good command of the material, participates in the discussion and solution of the situational problem, demonstrates practical skills when working with Microsoft Office software packages, databases, the "PC Pharmacy" program, expresses his opinion on the subject of the lesson, demonstrates an individual approach to the formulation and solution of the algorithm tasks
"3"	The applicant does not have sufficient knowledge of the material, participates uncertainly in the discussion and solution of the situational problem, demonstrates practical skills when working with Microsoft Office software packages, databases, the "PC Pharmacy" program, expresses his opinion on the topic of the lesson, demonstrates an individual approach to posing and solving algorithm of problems with significant errors.
"2"	The applicant does not possess the material, does not participate in the discussion and solution of the situational problem, does not demonstrate practical skills when working with Microsoft Office packages, databases, the PC Pharmacy program.

The grade for the discipline consists of 50.0% of the grade for the current academic performance and 50.0% of the grade for the diff. exam

The differential credit is given at the last lesson of the discipline based on the results of the final interview, with the mandatory performance by the getter of all types of work provided for in the working curriculum and rated for the current educational activity on average not lower than 3.00. The grade received for the answer to the differential assessment and the average current success score during the study of the discipline are used to calculate the arithmetic average, which makes up the overall grade in the discipline.

In the getter's record book, the teacher enters the assessment of the discipline according to the traditional and 200-point scales.

### 9. Distribution of points received by higher education applicants

The obtained average score for the academic discipline for applicants who have successfully mastered the work program of the academic discipline is converted from a traditional four-point scale to points on a 200-point scale, as shown in the table:

Conversion table from traditional grade to multi-point:

National assessment for discipline	ballsmaximum possible value this indicator
Excellent ("5")	185-200
Good ("4")	151-184
Satisfactory ("3")	120-150

A multi-point scale (200-point scale) characterizes the actual success of each applicant in learning the educational component. The conversion of the traditional grade (average score for the academic discipline) into a 200-point grade is performed by the information and technical department of the University.

According to the obtained points on a 200-point scale, the achievements of the applicants are evaluated according to the ECTS rating scale. Further ranking according to the ECTS rating scale allows you to evaluate the achievements of getter from the educational component who are studying in the same course of the same specialty, according to the points they received.

The ECTS scale is a relative-comparative rating, which establishes the applicant's belonging to the group of better or worse among the reference group of fellow getter (faculty, specialty). An "A" grade on the ECTS scale cannot be equal to an "excellent" grade, a "B" grade to a "good" grade, etc. When converting from a multi-point scale, the limits of grades "A", "B", "C", "D", "E" according to the ECTS scale do not coincide with the limits of grades "5", "4", "3" according to the traditional scale. Acquirers who have received grades of "FX" and "F" ("2") are not included in the list of ranked acquirers. The grade "FX" is awarded to students who have obtained the minimum number of points for the current learning activity, but who have not passed the final examination. A grade of "F" is assigned to getter who have attended all classes in the discipline, but have not achieved a grade point average (3.00) for the current academic activity and are not admitted to the final examination.

Applicants who study in one course (one specialty), based on the number of points scored in the discipline, are ranked on the ECTS scale as follows:

Conversion of traditional discipline grade and ECTS scores

Оценка ECTS	Statistical indicator
«A»	Top 10% of getter
«B»	The next 25% of getter

«C»	The next 30% of getter
«D»	The next 25% of getter
«E»	The last 10% of getter

### 10. Methodological provision of discipline:

Working program of the academic discipline

- Syllabus
- Multimedia presentations
- Methodical developments for lectures
- Methodical developments for practical classes
- Methodical recommendations for independent work of higher education applicants

The list of didactic teaching aids

№№ п.п.	The name of the equipment is used.	Number of topics in which equipment is used	Notes
1.	Terminal station	All Topics	30
2.	Internet resources of the department	All Topics	30
3.	Software	All Topics	
4.	Overhead projector	№ 1-5	1
5.	Presentations of lectures (on electronic media)	№ 1-5	
6.	Multimedia projector	№ 1-5	1
7	Ask for a ticket program	All Topics	

### 11. The list of theoretical questions to the differentiated offset

1. The concept of information as a resource. Information and messages. Interpretations of the concept of "information".
2. Types and properties of information.
3. Information processes. Basic data operations
4. The concept and definition of information technology. Stages of development of information technology.
5. The basic components of information technology.
6. The main properties of information technology.
7. Toolkit of information technology.
- 8 The main types of number system, their differences.
9. Hardware and software information technology.
10. Types of information technology (IT).
11. Prospects for the use of IT in pharmacy.
12. The use of IT in pharmacy.
13. The introduction of information technology. Methodology for the use of information technology.
14. local computer networks in pharmacies. Work automation in a pharmacy.
15. Fundamentals of computer networks, methods of combining computers.
16. Global network INTERNET. Basic INTERNET services.
17. INTERNET resources in professional activities a pharmacist.
18. Programs supporting the operation of the WWW service. Their main characteristic.

19. Search engines. Description of the main components.
20. INTERNET network protocols
21. Modern WEB TECHNOLOGIES. General information and classification of websites.
22. Information systems in pharmacy.
23. The concept of an information model and their types.
24. The concept of modeling methods. Modeling methods in pharmacy.
25. Relational data model. Basic properties.
26. Basic concepts and classification of databases.
27. The concept and classification of a database management system (DBMS).
28. The purpose and main functions of the DBMS. DBMS architecture.
29. The main objects of the DBMS.
30. The stages of database design.
31. The technology of creating forms, requests, reports.
32. Properties of algorithms and methods for representing algorithms.
33. Classification of algorithms. Structural schemes of algorithms.
34. The basics of propositional logic. Statements and their classification.
35. Logical operations and truth tables.
36. Properties of logical operations. Logical functions in a table processor environment.
37. Types of diagrams and their purpose. Possibilities of creating diagrams in the environment table processor.
38. Elements of statistical analysis of experimental data. The main concepts.
39. The basics of statistical processing of research results. application statistical methods in pharmacy.
40. A graphical representation of the results of statistical analysis.
41. The concept of approximation of experimental data. Approximation in the environment table processor.
42. Modern computer communication technologies. features and application area.
43. E-commerce. Key business processes.
44. Internet marketing. Major payment systems on the Internet
45. Search engines. (Composition, functions, principle of operation)
46. The basics of distance education. Programs and components. Modern methods of distance learning.
47. Codes: coding, numerical and mnemonic codes, hierarchical and combination codes, matching codes.
48. The history of classification and coding. Basic medical and pharmaceutical classification systems.
49. Analysis of biosignals. Processing biosignals.
50. Analysis of biosignals. Registration, transformation and classification of signals. biosignals and non-stationary signals. Types of signals.
51. Applied application of the analysis of biosignals.
52. Visualization of biomedical data. Processing and analysis of medical images.
53. Means of obtaining images. Medical image processing.
54. Problems of image processing and analysis. Image transformation. General and local transformation of images.
55. Current trends in image processing.

56. Processing of two-dimensional and three-dimensional medical images.
- 57 Logical operators and expressions. Types of drug logic.
58. Presentation of decision support systems. Expert systems in medicine and pharmacy ..
59. Characteristics of expert systems.
- 60 Types of health information systems. Hospital information systems and their development.
61. Hospital Information Systems (GIS): clinical use and technical implementation. GIS architecture.
62. Individual medical records. Structuring the content of electronic medical records (EMC).
- 63 Health system information resources.
64. Ethical and legal foundations of information management in the health care system. Information security - security, confidentiality and confidentiality of medical information systems.
65. Medical Information Systems (MIS). Requirements and classification of IIAs.
66. Medical hardware and computer systems (MAX). The basic principles of building MAX.
67. Fundamentals of evidence-based medicine and its principles.
68. Stages of mathematical modeling. Mathematical modeling on the example of the growth of the population of microorganisms.
69. Automated control systems. in the pharmacy. Principles of maintaining medical records. Data protection.
70. Use of evidence in medical decisions

## **12. List of educational-methodical literature**

### Basic

1 Medical Informatics : textbook / I.Ye. Bulakh, Yu.Ye. Liakh, V.P. Martseniuk, I.Yo. Khaimzon. — 4<sup>th</sup> edition. — Kyiv : AUS Medicine Publishing, 2018. — 368 p.

### Additional

1. Eric Frick. Information Technology Essentials Volume 1: Introduction to Information Systems / Kindle Edition. 2019. – 288 p.
2. Eric Frick. Information Technology Essentials Volume 2: The Beginner's Guide to C / Kindle Edition. 2020. – 277 p.
3. Медична інформатика в модулях. Практикум : практикум для мед. (фармац.) ВНЗ IV рівня акредитації / І. Є. Булах [та ін.]. ; за ред. І. Є. Булах ; НМУ ім. О. О. Богомольця. – К. : Медицина, 2012. – 208 с.
4. Комп'ютерне моделювання у фармації : навч. посіб. для фармац. ф-тів ВНЗ МОЗ України / І. Є. Булах, Л. П. Войтенко, І. П. Кривенко. – К. : Медицина, 2017. – 208 с.

### Additional

1. Практикум з інформаційних технологій у фармації [Електронний ресурс] : навч. посіб. для студ. ВНЗ / С. В. Вельма, Н. М. Яценко, Ю. М. Пенкін ; НФаУ. – Х. : НФаУ, 2016. Ф А 1.1-26-295
2. Інформаційні технології у фармації : підруч. для фармац. ВНЗ і фармац. ф-тів мед. ВНЗ IV рівня акредитації / І. Є. Булах, Л. П. Войтенко, Л. О. Кухар ; за ред. І. Є. Булах. – К. : Медицина, 2008. – 224 с.
3. Форкун Ю. В. Інформатика : навч. посіб. / Ю. В. Форкун, Н. А. Длугунович. - - Львів : Видавництво «Новий світ – 2000», 2018. – 464 с.
4. Комп'ютери та комп'ютерні технології: навч. посіб. / Ю. Б. Бродський, К. В. Молодецька, О. Б. Борисюк, І. Ю. Гринчук. – Житомир : Вид-во «Житомирський національний агроекологічний університет», 2016. – 186 с.



### 13. Information resources in the internet

1. <https://info.odmu.edu.ua/chair/pharmacognosy/files> - site of guidelines of the Department of Pharmacognosy of Odessa National Medical University.
2. [www.uacm.kharkov.ua](http://www.uacm.kharkov.ua) - Ukrainian Association "Computer Medicine"
3. <http://www.drlz.com.ua/> - State Register of Likarskie Zasobiv of Ukraine
4. <http://www.compendium.com.ua> - Compendium, drugs
5. <http://www.openoffice.org/> - official site of OpenOffice.org
6. <https://www.libreoffice.org/> - official site LibreOffice.org
11. <http://www.apteka.ua> - online newspaper "Pharmacy"
7. [www.medinfo.com.ua](http://www.medinfo.com.ua) - medical poshukova system of Ukraine
8. <https://tabletki.ua/uk/> - pharmaceutical system of Ukraine
9. <https://allchemistry.info/services/onlayn-redaktor-himicheskikh-formul> - online editor for chemical formulas