

MINISTRY OF HEALTH OF UKRAINE
KHARKIV STATE MEDICAL UNIVERSITY

Department of Biological and Medical Physics
and Medical Informatics

Discipline "Medical Informatics"

Specialties: 7.110101 – Medical care,
7.110104 - Pediatrics,
7.110105 - Medical prophylaxis
7.110106 - Dentistry

WORKING CURRICULUM
of the discipline of "Medical Informatics"
(Developed on the basis of the standard curriculum of 2010)

PROGRAM
of the discipline of "*Medical Informatics*"

The discipline program is structured on the basis of the ECTS module into the composition of which content modules are included. The volume of the academic load on students is described in ECTS credits which are received by the students in case of the successful assimilation of the corresponding module (pass-fail credit). *The course of medical informatics is divided into three modules:*

Module 1. Basics of information technologies in the health care system. The procession and analysis of medical-biological data

Content modules:

- 1. Basic notions of the medical informatics. Computer in the activity of a future doctor.*
- 2. Medical data. The methods of the information procession, analysis and submission.*

Module 2. The support of decision-making systems in medicine.

Content of the module:

- 3. Medical knowledge and decision-making in medicine*
- 4. Systems aimed at patients, and institutional information systems in health care.*

A structured preparation plan of the discipline "Medical informatics" for students from the Medical Faculty with the specialties "Medical care", "Pediatrics", "Medical Prophylaxis", qualification - Doctor. Year of study - the 2nd

Structure of the educational discipline	Number of hours, out of them				Types of control
	In total hours/credits	Class hours		Independent work	
		Lectures	Practical courses		
	105	10	50	45	
ECTS credits	3,5				
<i>Test credit:</i> Module 1 (2 content modules)	45 hours. - 1,5 credits	4	20	15	Final test control. Control of practical skills, test tasks
<i>Final credit:</i> Module 2 (2 content modules)	60 hours. - 2 credits	6	30	24	Final test control. Control of practical skills, test tasks
Total		10	50	45	

Note: 1 ECTS credit – 30 hours. Classroom academic load – 57,1%, independent work of a student – 42,9%

3. Content of a program

Module 1. Basics of information technologies in the health care system. The procession and analysis of medical-biological data.

Content module 1. *Basic notions of the medical informatics. Computer in the activity of a future doctor.*

Topic 1. Safety appliances. Aims of the course. Course's structure. Data and information. Data procession by means of electronic tables. The application program EXCEL.

Topic 2. Medical informatics as a science.

Basic notions of the medical informatics. Medical information systems. Information. General informatics. Information processes in medicine. Types of medical information systems. Elements of computer techniques. Computer's hardware. Application programs of the general usage. System and service software. Operating system. Standard applications.

Topic 3. Medical information systems.
MIS of the basic level. MIS of the territorial level. Information-reference systems. Consultative-diagnostic systems. Screening systems. Information systems of the medical and preventive treatment institutions. Hospital information systems (HIS). Electronic history of a disease.

Content module 2. Medical data. Methods of information procession, analysis and submission.

Topic 4. Coding and classification. Formalization and algorithmization of medical tasks. Classification, coding, classification systems. Algorithms, their features. Algorithmization of medical tasks. Ways of the algorithm presentation.

Topic 5. Evidence-based medicine.
The usage of proves in medical decision-making. Sources of available evidences in medicine.

Topic 6. Biostatistics.
Elementary techniques of the statistic procession of the results of medical-biological tests by means of a computer. Control of the execution of a stage of the calculation-graphic work.

Data description. The evaluation of parameters and verification of hypotheses. Elementary techniques of the statistic procession of the results of medical-biological tests by the computer means. The control of the execution of the stage of the calculation-graphic work.

Topic 7. The application of the DBMS for the solution of medical tasks.
The creation of databases. The work with databases: sorting of data, information search by means of the filters usage. The creation and application of queries for the information search in a database.

Topic 8 Visualization of medical-biological data. The procession and analysis of medical images. The means of the image acquisition. The procession of medical images. The transformation of images. Modern technologies of the image procession.

Topic 9 The analysis of biosignals. Methods of the biosignals procession.
The analysis of biosignals. The registration, transformation and classification of signals. Types of signals.

Topic 10 Multimedia technologies in medicine.
The preparation of reports and presentations. Basic notions and terms. The creation of a report about clinical researches.

The oriented structure of the test credit - module I. The basics of information technologies in the health care system. The procession and analysis of medical-biological data.

Topic	Lectures	Practical courses	Student's independent work	Individual work
<i>Content module 1. Basic notions of the medical informatics. Computer in the activity of a future doctor.</i>				

1. Safety appliances. Aims of the course. Structure of the course. Data and information. Data procession by means of electronic tables. The application program EXCEL.	2	2	2	
2. Medical informatics as a science.		2		
3. Medical information systems.	2	2		
<i>Content module 2. Medical data. Methods of the information procession, analysis and submission.</i>				
4. Coding and classification. Formalization and algorithmization of medical tasks.		2		
5. Evidence-based medicine. The usage of proves in medical decision-making. Sources of available evidences in medicine.		2		
6. Biostatistics.		2	2	
7. Application of the DBMS for the solution of medical tasks.		2	2	
8. Visualization of medical-biological data. Procession and analysis of medical images.		2		
9. Analysis of biosignals. Methods of the biosignals procession.		2		
10. Multimedia technologies in medicine		2		
Control of the assimilation of Module 1		2		
ECTS credits – 1,5. Hours in total - 32	4	22	6	

Classwork – 53%, independent work of a student – 47%

Subject plan of lectures

№	Topic	Hours
1	Basics of medical informatics. Medical information systems	2
2	Medical information systems	2

Subject plan of practical classes

№	Topic	Hours
1.	Safety appliances. Aims of the course. Structure of the course. Data and information. Data procession by means of electronic tables. The application program EXCEL. (Opening lesson. The control of the initial level of knowledge: laboratory work “The composition of the medical prescription of the cryoaction time by means of EXCEL) (Practical lesson. Topic 1)”. 2	2
2.	Medical informatics as a science. Basic notions of medical informatics. (Seminar. Topic 2)	2
3.	Medical information systems. (Seminar. Topic 3)	2
4.	Coding and classification. Formalization and algorithmization of medical tasks. (Seminar. Topic 4)	2
5.	Evidence-based medicine. Seminar. Topic 5)	2
6.	Biostatistics (Seminar. Topic 6)	2
7.	Application of the DBMS for the solution of medical tasks. (Practical lesson. Topic 7).	2
8.	Visualization of medical-biological data. Procession and analysis of medical images.	

	(Seminar. Topic8)	
9.	Biosignals analysis. Methods of biosignals procession (Seminar. Topic 9)	2
10	Multimedia technologies in medicine. (Seminar. Topic 10)	2
11	Module control	2
	IN TOTAL	22

Independent work of students

№	Topic	Hours
1.	Application program EXCEL.	2
2.	Biostatistics.	2
4.	Databases. DBMS application for the solution of medical tasks.	2
	IN TOTAL	6

The evaluation of the academic activity of students (Module I)

A grade for a module is determined by means of calculating the grades for the current academic activity of a student and a grade for a final module control. The current activity of a student is evaluated by the 4-point grading scale, which is converted to points in the following way:

"5" - 12; "4" - 10; "3" - 7; "2" - 0.

№	Content module, topic	Maximum quantity of points
1	<i>Content module 1</i>	
	Topic 1	12
	Topic 2	12
	Topic 3	12
2	<i>Content module 2</i>	0
	Topic 4	12
	Topic 5	12
	Topic 6	12
	Topic 7	12
	Topic 8	12
	Topic 9	12
	Topic 10	12
	<i>Content modules in total</i>	120
	<i>Independent work</i>	0
	<i>Final module control</i>	80
	IN TOTAL sum of points	200

The minimal quantity of points which a student must obtain for the current progress during the module study to pass Module 1 is equal to: ~~71~~ ~~70~~ 70 points (basic points) and points for the individual independent work (maximum 3 points). The current module control is considered to be passed if a student gained not less than 70 points.

The final module control is considered to be passed if a student gained not less than 50 points.

Module 2. The medical knowledge and decision-making in medicine.

Content module 3. The medical knowledge and decision-making in medicine.

Concrete aims:

Topic 11. Examples of mathematical modeling in biology and medicine

Types of models. Levels of complexity and adequacy of a mathematical model. Mathematical modeling. Limits and advantages of the mathematical modeling method. Examples of mathematical models.

Topic 12. System analysis.

The essence and principles of the systems approach. The systems approach to the life phenomena. Basic notions of the system theory and system analysis. System analysis and its basic stages. Principles of the system analysis of the interaction of the organism structures. Features of the system analysis during the solution of medical tasks.

Topic 13 Cybernetics.

Basic notions of cybernetics. The subject, methods and content of the biological cybernetics. The notion “Functional cybernetics”. The theory of functional systems as the basis of understanding of vital activity processes. The notion “Medical cybernetics”. Basic trends of medical-cybernetic researches.

Topic 14. Formal logic in the solution of tasks of the diagnostics, treatment and prophylaxis of diseases.

Basics of the proposition logic. Logical operation. Means of presentation of logical functions. Properties of logical operations. Formalization and algorithmization of medical tasks. Basics of the algorithmization of medical tasks. Algorithms and their properties. Means of algorithms presentation. Types of algorithms. The composition of the structural scheme of simple and branched algorithms. The composition of the structural scheme of an algorithm with the inner cycle.

Topic 15. Neural networks.

Neural networks, basic notions. The algorithm of the neural network construction. Evaluation of the adequacy and neural network models. Methods of the neural network construction.

Content module 4. Systems aimed at patients and institutional information systems in the health care.

Topic 16. Expert systems in medicine.

Knowledge base. Formal models of the knowledge image. Production models. Semantic models. Frame type model. Tendencies of the knowledge system development.

Topic 16.1 The development of expert systems. Examples of the construction of expert systems.

Topic 17. Decision-making.

The problem of the decision approval. Basic components of the decision approval process. The interactive approach during the decision approval. The classification of tasks of the decision approval. Basic methods of the decision approval in medicine.

Topic 18. Medical hardware-software complexes. The purpose and principles of their building. Types of hardware-software complexes. The architecture of the computer research. Basic stages of a computer functional research. Basic types of computer-hardware researches.

Topic 19. Apparatuses and systems of replacement of the lost functions of a person. Cardiac stimulators. Modern technologies in hearing aids prosthesis. Artificial kidney. Artificial blood circulation and artificial heart. Artificial pancreas.

Topic 20 Medical information resources. Computer network and telecommunications. Computer networks. Classification of computer networks. Components of computer networks. Communications protocols. The modern state of telecommunications in Ukraine. Global networks. INTERNET. WWW. Internet addresses (IP). Hypertext. E-mail. E-mail address. Principles of a search query. Types of a query. Notion about medical resources of INTERNET.

Topic 21 Ethic and legal principles of information in the health care system. Information protection – security, privacy and confidentiality of medical information systems. The choice of necessary means. Legislation and regulation.

The approximate structure of the test credit – module 2. Medical knowledge and decision-making in medicine

Topic	Lectures	Practical courses	Student's independent work	Individual work
<i>Content module 3. Mathematical modeling in biology and medicine.</i>				
11. Examples of mathematical modeling in biology and medicine	2	2	6	
12. System analysis		2		

13. Cybernetics.		2		
14. Formal logic in the solution of tasks of diagnostics, treatment and diseases prophylaxis	2	2		
15. Neural networks.				
<i>Content module 4. Systems, aimed at patients and institutional information systems in the health care.</i>				
16. Expert systems in medicine.		2		
17. Development of expert systems. Examples of the building of expert systems.		2		
Test		2		
18. Decision-making.		2		
19. Medical hardware-software complexes		2		
20. Apparatuses and systems of replacement of the lost functions of a person		2		
21. Medical information resources. Computer networks and telecommunications		2		
22. Ethic and legal principles of the information management in the health care system.		2		
Control of the assimilation of Module 2		2		
ECTS credits– 1. Hours in total – 30	4	28	6	

Classwork – 60%, independent work of a student – 40%

Subject plan of lectures

№	Topic	Hours
3	Modeling in biology and medicine.	2
4	Formal logic in the solution of tasks of diagnostics, treatment and prophylaxis of diseases	2
5	Neural networks	2
	<i>TOTAL</i>	6

Subject plan of practical lessons

№	Тема	Години
11	Examples of mathematical modeling in biology and medicine (Seminar. Topic 11).	2
12	System analysis (Seminar. Topic 12).	2
13	Cybernetics (Seminar. Topic 13)	2
14	Formal logic in the solution of tasks of diagnostics, treatment and prophylaxis of diseases (Seminar. Tests based on the lectures matters and independent work). (Seminar. Topic 14)	2
15	Neural networks (Seminar. Topic 15)	2
16	Expert systems in medicine. (Seminar. Topic 16)	2
17	Development of expert systems. Examples of the building of expert systems. (Seminar. Topic 16) <i>additional</i>	2
18	Test	2
19	Decision-making. (Seminar. Topic 17)	2
20	Medical hardware-software complexes. (Seminar. Topic 18)	2
21	Apparatuses and systems of replacement of the lost functions of a person (Seminar. Tema 19)	2
22	Medical information resources. Computer networks and telecommunications (Seminar. Topic 20)	2

23	Ethic and legal principles of the information management in the health care system. (Seminar. Topic 21)	2
24	Module control	2
IN TOTAL		28

Independent work of students

5	Modeling in biology and in medicine (Topic 7)	6
IN TOTAL		6

The evaluation of the academic activity of students (Module 2)

A grade for a module is determined by means of calculating the grades for the current academic activity of a student and a grade for the final module control. The current activity of a student is evaluated by the 4-point grading scale, which is converted to points in the following way:

"5" - 10; "4" - 8; "3" - 6; "2" - 0.

№	Content module, topic	Maximum quantity of points
1	<i>Content module 3</i>	
	Topic 11	10
	Topic 12	10
	Topic 13	10
	Topic 14	10
	Topic 15	10
2	<i>Content module 4</i>	0
	Topic 16	10
	Topic 17	10
	Topic 18	10
	Topic 19	10
	Topic 20	10
	Topic 21	10
	Topic 22	10
<i>Content modules in total</i>		120
<i>Final module control</i>		80
Quantity of points in TOTAL		200

The minimal quantity of points which a student must obtain for the current progress during the module study in order to pass Module 2 is equal to 72 points. The final module control is considered to be passed if a student gained not less than 48 points.

The grade by the ECTS scale is converted to the 4-point grading scale in the following way:

<i>ECTS grade</i>	<i>Grade by the 4-point grading scale</i>
A	5
B, C	4
D, E	3
FX, F	2